

ETHIOPIAN JOURNAL OF HEALTH DEVELOPMENT

Special Issue on:

**Health Research
in
Training Institutes**

Guest Editor:

Charler Larson

—

Vol 5

Number 1

June 1991

The Ethiopian Journal of Health Development

EDITORIAL BOARD

Editor-in-chief: Fisseha Haile Meskal

Asfaw Desta
Elias Gebre-Egziabher
Gebre-Emanuel Teka
Adanetch Kidane Mariam
Jemal Abdulkadir

Guest Editor: Charles Larson

EDITORIAL CONSULTANTS

Desta Shamebo
Tewabech Bishaw
Gebre-Selassie Okubagzi
Zewdie Wolde-Gebriel
Nebiat Tafari

Publication officer: Derege Kebede Secretary: Manyaheshal Kebede.

The Editorial Office of the Ethiopian Journal of Health Development is the Department of Community Health in the Faculty of Medicine Addis Ababa University.

The Ethiopian Journal of Health Development
P.O.Box 32812, Addis Ababa, Ethiopia
Telephone: 15-77-01 or 51-89-99 ext.8

THE ETHIOPIAN JOURNAL OF HEALTH DEVELOPMENT

Special Issue on:

**Health Research
in
Training Institutes**

Guest Editor:

Charler Larson

**Addis Ababa University
Faculty of Medicine
Department of Community Health**

ANNOUNCEMENT

The Department of Community Health in the Faculty of Medicine of Addis Ababa University wants interested individuals to be aware of the Master of Public Health Degree Program which will welcome a new class of students in September 1992.

The program includes basic postgraduate courses in Management, Epidemiology, Biostatistics, Maternal and Child Health, Health Education, Environmental Health and Nutrition. Another vital part of the curriculum is the Community Health Residency in an Awraja Health Department or its equivalent.

The candidate's individual interests and career plans can be pursued in an area of concentration and thesis research. The applied research project is carried out during the second year, usually in the location of the Community Health Residency.

The program continues for 22 months from September 1992 until July 1994. Application forms are available at the Registrar's Office in the Sidist Kilo Campus of the University. All documents must be submitted to the Registrar's Office between March and May 1992. Equally important is obtaining letters of support from institutions which plan to utilize the new knowledge and skills acquired by the trainee. Most candidates are sponsored by the Ministry of Health. The Department encourages other institutions to do likewise.

Prospective students must have at least a baccalaureate degree, previous training in a health or related professions, and at least two years' experience in health or related services. Other academic requirements are as specified in the application form of the School of Graduate Studies of the University.

If you have inquiries please forward them to Dr.Derege Kebede, Head, Dept. of Community Health, Faculty of Medicine, P.O.Box 1176, Addis Ababa.

Fax: 251-1-51-77-01

INFORMATION FOR CONTRIBUTORS

1. The **Ethiopian Journal of Health Development** is a multi-disciplinary publication concerned with the broad field of health development. The **Journal** publishes analytical, descriptive and methodological papers, as well as original research, on public health problems, management of health services, health care needs and socio-economic and political factors related to health and development. Book reviews, letters to the editor, news items and short communication are also acceptable. Articles which support the goals of "Health for All by the Year 2000" through the primary health care approach are particularly welcome. Contributions from and/or about developing countries in general and African countries in particular will be given priority. The following is a representative, but not exhaustive, list of subjects of interest to the **Journal**: health policy and health politics, health planning, monitoring and evaluation, health administration, organization of health services, hospital administration, health manpower, including training, health statistics/health information systems, maternal and child health and family planning, environmental health and water, food and nutrition, communicable diseases, health education, epidemiology, community involvement, intersectoral activities, health economics/financing of health department, health technology, drug supply and distribution, international health organizations/technical cooperation among developing countries.

2. All manuscripts should be submitted to the Editor of the Journal. Manuscripts will be considered for publication on the understanding that they have not been previously published and are not simultaneously submitted or published elsewhere. This does not refer to papers presented orally at symposia or other proceedings. Each manuscript will be assessed by at least two reviewers knowledgeable in the relevant subject. Manuscripts that are accepted for publication become the property of the **Journal**; rejected manuscripts will be returned to the author.

3. Manuscripts should be submitted in triplicate, typewritten on one side of quarto or A4 paper with double spacing and liberal margins. There should be a single separate title page containing the title, each author's full name, with the senior author listed first, organization or institution where the work was done, each author's present address if different and the name and full postal address of the author to whom correspondence should be addressed. Acknowledgements of those making substantive contributions to the paper, and any relevant informations such as if the paper was presented at a meeting or is part of a large study should be noted at the end of the manuscript. A short summary or abstract should be included on a separate page.

4. The language of the **Journal** is English. Articles of national importance written in Amharic might be accepted for special issues.

5. References should be cited in the text as consecutive, bracketed numbers. Those appearing for the first time in tables or figures must be numbered in sequence with those cited in the text. References in numerical sequence should be listed on a separate sheet, double-spaced, at the end of the manuscript. It is the author's responsibility to verify that all references are accurate and complete. Titles of journals should be cited in full. References should give the full facts of publication. For a book, these are; full name of the author(s) or editor(s); year of publication; full title of the series, if any, and volume number; publisher's name and city of publication; page number(s) of the citation. For an article in a journal: author's full name; title of the document; information identifying the source and location, date; Ph.D. dissertation (include department and institution), paper presented at a workshop (include name, location, month and year of workshop), mimeo or photocopy (include department and institution). References to personal communications should be placed in brackets in the text, giving the full name and date. Ethiopian names should be referred to in accordance with national usage, e.g. Taye Daniel as Taye Daniel but will be cross-referenced in indexes as, e.g. Daniel, Taye.

6. Tables should supplement not duplicate the text, unnecessary and lengthy tables are discouraged. Each table should be typed (double-spaced) in triplicate, on a separate sheet, numbered and given a suitable title. The approximate place in the text should be indicated. Place explanatory material in footnotes. Figures and illustrations should be submitted in triplicate. They should be unmounted, black and white glossy prints of line drawings or photographs; do not send original art work or negatives. Each figure or illustration should be given a number, the author's name lightly marked in pencil on the back and a brief caption, double-spaced,

should be typed on a separate sheet. If it is not possible to provide glossy prints of figure, they should be accurately drawn in black ink on good quality white paper and the numbers and wording should be typed on an overly of tracing paper, not on the figure itself. Coloured illustrations will be reproduced at the author's expense.

7. Miscellaneous. The generic names of drugs should be used; if necessary, the proprietary name may be placed in parenthesis after the generic name. When percentages are used in case studies, the actual numbers should be indicated as well. e.g. 39/75, (52%). The first time an abbreviation or acronym is used it should be preceded by the full name for which it stands.

8. Twenty reprints will be supplied free to the senior author. Additional reprints may be ordered and paid for in advance.

9. The Editorial Board reserves the right of final acceptance, rejection and editorial correction of papers submitted. Authors are responsible for all statements made in their work including changes made by the copy editor. Priority and time of publication are governed by the Editorial Board's decision.

ANNUAL SUBSCRIPTION RATES

Ethiopian Journal of Health Development . The Journal publishes two issues in a year.

ETHIOPIA (in Birr)..... 30.00(Annual)

OUTSIDE ETHIOPIA IN (US \$)..... 50.00 (Annual)

All prices include postage (airmail outside if Ethiopia). Checks should be made out to:
**Chairman, Dept. of Community Health, Addis Ababa University. P.O.Box 32812,
Addis Ababa, Ethiopia**

Volume 5

Number 1

June 1991

Addis Ababa, Ethiopia

The Ethiopian Journal of Health Development

**THIS JOURNAL IS DEDICATED TO THE SOCIAL GOAL OF HEALTH
FOR ALL BY THE YEAR 2000 THROUGH THE
PRIMARY HEALTH CARE APPROACH**

CONTENTS

EDITORIAL.....	1
Analysis of Deliveries in Jimma Hospital: A Four Year Retrospective Study..... Ephraim Ghide, Makonnen Assefa, Seid Mohammed, Fassil Tessema	3
Description of Meningitis Epidemic in Haikoch Na Butajira District..... Belay Betemariam, Fekadu Beyene, John Mangwiro, Lulu Abera, Nebreed Fisseha & Derege Kebede.	7
Determinants of Community Health Agent Functionality in Arsi Region..... Damen Haile Mariam & Joyce Pickering	11
Determinants of Pre-eclampsia and Gestational Hypertension..... Asnake Hailu & Derege Kebede	17
Community Based Nutritional Survey: Geruke Jimate Peasants' Association, Illubabor Region, Ethiopia..... Louise Pilote, George Olwit, Gebreselassie Okubagzi & Charles Larson	25
Focus Group Identification of Barriers to the Use of Modern Contraception in the Gara Muleta District of East Hararghe... Mengistu Asanke & Charles Larson	29
Blood Pressure Distribution and Hypertension in Two Rural Communities of Gondar Region, Ethiopia..... Zein Ahmed Zein, Tekleberhan Berhe, Teshome Assefa & Yared Fantaye	35
Prevalence of Anemia Among Elementary and High School Students Living in Gorgora..... Melake Berhan Damena, Habteab Besuamlac, Asferd Mengesha, Dawit Mehret, Asmelash Fisseha & Yeshitla Hailu	43
Response of Plasmodium Falciparum to Chloroquine in Hospitalized Patients at Sidamo Regional Hospital..... Wondwossen Desta & Yohannes Gebrat	47

EDITORIAL

Those of us who teach in one or more of the Ethiopian training programs in community health are keenly aware of the wealth of information derived from student fieldwork. Only a small proportion of this work is published and therefore accessible to community health professionals. This is unfortunate, given the quality and relevance of much of the research conducted by students while in training. In this special issue of the Ethiopian Journal of Health Development 9 original research papers have been selected which are the result of work completed within these training programs. In certain instances manuscripts were submitted upon learning of this special issue, however this is the minority. Several had been "filed for future reference"; we all know what that implies.

Papers were selected on the basis of their scientific merit and in order to have representation from each of the training programs in community health. These programs include the undergraduate training conducted in the community health departments of Addis Ababa University (AAU), Gondar College of Medical Sciences (GCMS), and the Jimma Institute of Health Sciences (JIHS). At AAU and GCMS, final year students are divided into teams during a six week field attachment. Under the supervision of a faculty member, these student teams complete a community based study. The papers titled "Blood pressure distribution and hypertension in two rural communities of Gondar Region, Ethiopia" and "Prevalence of anemia among elementary and high school students living in Gorgora" are representative of the work carried out by these student teams. At the JIHS each final year student must complete a thesis project on a priority community health problem. Dr. Ephriam's paper on "Analysis of deliveries in Jimma Hospital a four year retrospective study", was chosen as an exemplary example of the thesis submissions from the Institute's first graduating class of physicians.

Three of the studies published in this issue were completed by graduate students in the MPH program at AAU. Two papers, "Determinants of community health agent functionality in Arsi Region" and "Determinants of pre-eclampsia and gestational hypertension", represent thesis research which was conducted in partial fulfilment of their degree requirements and the third, "Focus group identification of barriers to the use of modern contraception in the Gara Muleta District of East Hararghe", was done on the student's own initiative in implementation of his district health action plan. All were advised by faculty within the community health department at AAU. Additionally, one paper, "Community based nutritional survey Geruke Jimate Peasants' Association, Illubabor Region, Ethiopia", comes from the Training and Demonstration Center (TDC) of the Ministry of Health. Twice a year the TDC conducts a 10 week accelerated district health managers course. During this training, two weeks are spent in a field site where, among several activities, the course participants complete a survey on a topic chosen by local health officials.

It is the intent of the editors of the EJHD that papers published in this special issue will lead its readers in the future to pay greater attention to the work being carried out in the varied community health training programs found in Ethiopia. It is also hoped that this will encourage students and their supervisors to seek publication of their research findings in order that the knowledge obtained through their work in the field be shared with a wider audience.

Finally, I would like to thank the directors of the training programs involved for their assistance and support in putting this special issue together. They are; Dr. Gebreselassie Okubagzi (TDC), Dr. Derege Kebede (AAU), Dr. Tesfaye Sheferaw (JIHS), and Dr. Melake Berhanu (GCMS).

ANALYSIS OF DELIVERIES IN JIMMA HOSPITAL: A FOUR YEAR RETROSPECTIVE STUDY

Ephraim Ghide*,MD, Makonnen Assefa*,BSc,MPH, Seid Mohammed*,MD,MPH, Fasil Tessema*,BSc

ABSTRACT: This study was conducted to analyze the outcome of deliveries in Jimma Hospital between 1985 and 1989. There were a total of 4251 deliveries, 769 of which were abnormal. The maternal morbidity and mortality rates were 84.8 and 11.5 per 1000 live births respectively. The major causes of morbidity were postoperative surgical wounds in 91.8% and postpartum haemorrhage in 4% of cases. The leading causes of death were ruptured uterus (47.7%), puerperal sepsis (27.3%) and postpartum haemorrhage (13.6%). A significant proportion of deaths and illness occur in patients who were referred and among those unable to pay their hospital fees.

There were a total of 371 perinatal deaths with a stillbirth to neonatal death ratio of 3.09:1. The perinatal morbidity and mortality rates were 53.5 and 95.9 per 1000 live births respectively. The commonest causes of perinatal death were obstructed labor (22.8%) and ruptured uterus (18.2%). The major reported morbidity were low birth weight 58.9% and low Apgar Score 35.7%. Perinatal mortality is higher in referred mothers and in those who do not pay their hospital fees.

Finally the type of intervention received during deliveries are described. The association of maternal characteristics with maternal and perinatal mortality and morbidity are analyzed and recommendations given.

INTRODUCTION

Maternal and perinatal morbidity and mortality are common worldwide problems (1). Globally 500,000 pregnancy related deaths occur annually most unnecessarily. 95% of these deaths occur in developing countries where 85% of all births occur (2) and most neonatal deaths occur during the birth process or in the first week of life (3). Maternal and perinatal morbidity and mortality are clinical problems with social, economic, political and managerial facets (2). Insufficient health services, poor accessibility and low utilization contribute to the problem. Lack of transportation, high illiteracy rates, low family planning practices, poverty and malnutrition play an important role in this problem. For existing staff and facilities to be efficiently used to improve the maternity care of an area, the local obstetric pattern needs to be understood (4). This inevitably places a great emphasis on the value of good records, as well as their regular and frequent review. If this can be done, then maternity care can be closely adapted to the local needs and facilities of a community and be a dynamic, growing service, sensitive to changes in obstetric outcome over time. Hence, this study is intended to describe and analyze perinatal and maternal outcome

*Jimma Institute of Health Sciences, Ethiopia
A thesis presented to the Department of Community Health
Jimma Institute of Health Sciences in partial fulfilment
of the requirement for the degree of Doctor in Medicine (MD)

METHODS

Jimma Hospital has a 200 bed capacity, 12 of which are maternity beds. The hospital attends an average of 1000 deliveries per year. This review was conducted on deliveries attended in Jimma Hospital from September 11, 1985 to September 10, 1989. Each maternal delivery is routinely registered according to age of mother, address, outcome of delivery, weight, length, Apgar score and head circumference of live born, length of stay in the hospital and type of delivery as normal (N/D), cesarean (C/S), forceps (F/D), vacuum (V/D), etc. The cause of morbidity or death of mother or newborn is not available in the record book but was checked from the card of the mother, face sheet, lab results and discharge remarks. The study included 4251 mothers, out of which 769 were selected according to the following criteria, mothers who underwent C/S, F/D, V/D, hysterectomy, craniotomy, those who stayed more than 3 days, those who died during delivery, those whose newborn died before or after delivery, low birth weight, and Apgar ≤ 6 . The data collection was done during Hidar 1-30 1982 EC. The data was analyzed by computer and chi-square statistics calculated.

RESULTS

There were a total of 4251 deliveries during the years 1985-1989, for an average of 1062 deliveries per year. There were a total of 769 abnormal deliveries. The age distribution of mothers delivering during 1985-1989 is shown in table 1: the age group 19-22 compose the highest proportion, i.e. 27.2%.

329 mothers were ill from causes associated with delivery or its complications for a maternal morbidity rate of 84.8/1000 live births. The age specific morbidity includes a higher rate of maternal morbidity at the extremes of age, i.e.

Table 1. Distribution of Deliveries by age group.Jimma Hospital 1985-1989.

Age	No	%
15-18	557	13.1
19-22	1156	27.3
23-26	893	21
27-30	995	23.4
31-34	200	4.7
35-38	370	8.7
39-42	80	1.9
43-46	1	0.1
Total	4251	100

age groups 15-18 and 31-38, with 93 and 110 per 1000 live births respectively. These differences were not significant at $P < 0.05$. The causes of morbidity are shown in table 2. Post operative surgical wounds account for 91.8% of cases, postpartum hemorrhage (PPH) for 4%, puerperal sepsis 2.1% and vesicovaginal fistula 1.5%.

Table 2. Causes of Maternal Morbidity.Jimma Hospital. 1985-1989

No	Causes	No	%
1	post operative surgical wound	302	91.8
2	Postpartum hemorrhage	13	4
3	puerperal sepsis	7	2.1
4	vesico vaginal fistula	5	1.5
5	retained placenta	2	0.6
	Total	329	100

During 1985-1990 there were 44 maternal deaths recorded, resulting in a maternal mortality rate of 11.3 per 1000 live births. As shown in table 3, uterine rupture was the leading cause of death (47.7%) followed

by puerperal sepsis (27.3%), PPH (6.8%) and eclampsia (4.5%). There were significant differences in the incidence of maternal mortality by age groups at $P < 0.05$, which increased with age.

Table 3. Causes of Maternal deaths in Jimma Hospital, 1985-1989

Causes	No	%
1. uterine rupture	21	47.7
2. puerperal sepsis	12	27.3
3. postpartum hemorrhage	6	13.6
4. antepartum hemorrhage	3	6.8
5. eclampsia	2	4.5
6. others	1	2.3
Total	44	100

77.3% of deaths occurred in mothers who were referred and 22.7% occurred in those who were not. Similarly 53.5% of illnesses occurred in those who were referred. The difference was significant at $P < 0.05$ (table 4). 59% of the deaths and 45.3% of illnesses occurred in mothers who could not pay their hospital fee, but this was not significant ($P < 0.05$).

Table 4. Maternal Morbidity and death by referral status. Jimma Hospital, 1985-1989

	Referred		Not Referred	
	No	%	No	%
Death	34	77.3	10	22.7
ill	176	53.5	152	46.2

$P < 0.05$

There were a total of 372 perinatal deaths with 281 stillbirths and 91 neonatal deaths making the stillbirth to neonatal death ratio 3.09:1. The perinatal mortality rate is 95.9 per 1000 live births. Obstructed labor accounts for 22.8% of the perinatal deaths, uterine rupture for 18.2% and 17.2% are unexplained. (see table 5). There was no significant difference in the rate of perinatal deaths in different age groups ($P > 0.05$).

Table 5. Causes of perinatal death in number and percent. Jimma Hospital. 1985-1989.

Causes	No	%
1. Obstructed labor	85	22.8
2. Uterine rupture	68	18.2
3. Unexplained	64	17.2
4. Preterm	35	9.4
5. Prolonged labor	33	8.8
6. Fetal distress (unexplained)	22	5.9
7. Cord prolapse	18	4.8
8. Antepartum	16	4.3
9. Pre-eclampsia	11	2.9
10. Sepsis	9	2.4
11. Respiratory distress (unexplained)	6	1.6
12. Others	5	1.3
Total	372	100

The perinatal morbidity rate was 53 per 1000 live births; low birth weight accounted for 58.9% of cases, low Apgar score for 35.7% and preterm deliveries for 2.4% (table 6). No significant difference in perinatal morbidity by age of mother was found. 41.2% of deaths and 68.4% of sickness occurred in newborns of referred cases and 57% of perinatal deaths and 65% of illness occurred in newborns of mothers who do not pay their hospital fees.

Table 6. Causes of perinatal morbidity. Jimma Hospital. 1985-1989.

Causes	No	%
1. Low birth weight	122	58.9
2. Low Apgar score	74	35.7
3. Preterm	5	2.4
4. Congenital abnormalcy	2	1.0
5. Others	4	1.99

Total	209	100
-------	-----	-----

Among the various intervention used, C/S occurred in 5.4% of deliveries, forceps in 1.8%, and hysterectomy in 1.7% (Table 7).

Table 7. Type of intervention. Jimma Hospital. 1985-1989.

Type	No	%
Cesarean section	230	5.1
Forceps delivery	77	1.8
Hysterectomy	75	1.7
Craniotomy	19	0.4
Vacuum	9	0.2
Normal delivery	3841	90.5
Total	4251	1000

DISCUSSION

It was reported in Ethiopia in 1972 that maternal mortality constituted 7% of all deaths and it was estimated that the maternal mortality rate was 20 per 1000 (5). If this estimate was true, maternal mortality would be four times higher than the highest estimate for the regions of the world as defined by WHO 1977 (6). This was challenged by a community based study done in Addis Ababa by Kwast (1985) (7), which revealed a MMR of 5.66 per 1000 live births which is in good agreement with WHO estimates. Hospital based studies in Addis Ababa by Frost (1984) and Seyoum (1988) (8,9) found rates of 7.8 and 9.6 respectively. In this study the MMR, despite exclusion of abortion, was found to be 11.3 which is higher than previous studies. This could be explained by the fact that the previous studies were done in Addis Ababa where health facility accessibility is better than Jimma. Jimma is more representative of rural communities with relatively poor health service accessibility, lower socio-economic conditions and literacy rates and poor transportation. Causes of maternal death identified by Seyoum are similar, except that deaths due to abortion are excluded from this study. Uterine rupture rather than puerperal sepsis was leading cause of death in this study.

The lower incidence of maternal death in the age group 15-19 may be explained by the exclusion of deaths from abortion. On the other hand, the higher rate of morbidity in this age group could be explained by the use of cesarean section in this age group, who are usually primi.

Perinatal mortality in this study is 95.9 per 1000 live births. This is significantly higher than reported by Naeye et al (10) which found a rate of 63. Comparison is difficult between these two studies. The latter is a community based study on perinatal mortality in Addis Ababa and the differences could be due similar reasons for maternal mortality. On the other hand, a hospital based study by Frost (8) in Addis Ababa found a perinatal mortality rate of 80 per 1000 live births, which is similar to this study. The still- birth to neonatal death ratio is 3.09:1, indicating the importance of maternal factors in perinatal mortality. This is unlike developed countries (11) where the ratio is 1:1, with maternal and fetal factors contributing equally to perinatal mortality rate. This ratio as reported by Naeye et al (10) and Frost (8) were 2.7:1 and 1.9:1 respectively.

The leading causes of perinatal death reported by Naeye et al were amniotic fluid infection, obstructed labor, and congenital syphilis in descending order and in Frost's study were uterine rupture, cord prolapse and obstructed labor. This study showed obstructed labor and uterine rupture as the leading causes.

CONCLUSION AND RECOMMENDATION

This study, though it has its limitations, indicates there may be regional differences in the causes of perinatal and maternal mortality and morbidity. This variance may be explained by social, culture, economic and other influences. The study supports the importance of reviewing one's own maternity records in order that major problems can be identified which are regionally specific and appropriate solution sought. The fact that

uterine rupture is the commonest cause of maternal death indicates that antenatal follow up, early identification and referral of high risk mothers before labor starts is of paramount importance. In this way a significant reduction in maternal mortality can be expected. Similarly as obstructed labor is the major cause of death, the above measures should reduce the MMR. Finally this study is not an end in itself but a means for others to do further study on these maternal and perinatal problems.

ACKNOWLEDGEMENT

We are extremely grateful to the Community Health Department for its material and manpower support. We are also very grateful to W/t Bekelech Tilahun who typed the research proposal and final manuscript. Last, but not least, we thank the hospital staff who were cooperative all the way during collection of data.

REFERENCES

1. Studying maternal mortality in developing countries. Rates and causes. A guide book. WHO document (FHE) 87.7. 1987.
2. Women's health and the midwife. A global perspective. A report of collaboration preconference workshop. The Hague Netherlands. WHO Document <CJ/87.5. 21-22, August, 1987.
3. *World Health Forum*. International Journal of Health and Development. WHO, Geneva. 1986; 7(1).
4. King M. Medical care in developing countries. Oxford University press. 1966.
5. Captovilch A. Paper presented at VIth Annual Conference of Ethiopian Medical Association, Addis Ababa. 1972.
6. World Health Organization. *Maternal Mortality World Health Statistic Quarterly*. 1981; 34:2-13.
7. Kwast B.E., Widad Kidanemariam, Ebrahim Said and Fowkers, FGR. Epidemiology of maternal mortality. A community based study. *Ethiop. Med. J.* 1985; 26:115.
8. Frost O. Maternal and Perinatal death in Addis Ababa Hospital. *Ethiop. Med. J.* 1984; 22:143.
9. Seyoum Yoseph and Getahun Kifle. Six year review of maternal mortality in teaching Hospital. *Ethiop. Med. J.* 1988; 26:115.
10. Naeye, Teferi, Marboe, Judge. Cause of perinatal mortality in an African city. *Bul. Wld. Hlth. Org.* 1977; 55(63).
11. Hammond E.I. Studies in fetal and infant mortality II. Differentials in mortality in sex and race. *Am. J. Pub. Hlth.* 1965; 55:1152-1163.

DESCRIPTION OF MENINGITIS EPIDEMIC IN HAIKOCH NA BUTAJIRA DISTRICT

Belay Betemariam,* Fekadu Beyene,* John Mangwiro,*
Lulu Abera,* Nebreed Fisseha* and Derege Kebede,** MD

ABSTRACT: A retrospective review of a recent meningitis epidemic in Haikoch na Butajira District for the months of February and March 1989 was conducted. The epidemic is described in terms of person, place and time. The relationship of the epidemic with weather changes (rainfall and temperature) is assessed. There were a total of 6968 reported cases of meningitis with 203 deaths. The case fatality rate was 2.9%. The male to female ratio was 1.05 to 1. The peak of the epidemic was found to be during the second half of the month of February. There were 864 cases from urban, 3321 from villagized and 2783 from non villagized areas giving period prevalence rates of 6%, 8% and 2%, respectively, during the two months. Based on this study, surveillance and control recommendations are made.

INTRODUCTION

Epidemic meningitis, a recurrent major health hazard in Ethiopia, has been caused by the gram negative diplococci bacteria *Neisseria meningitides*. Epidemic strains mainly involved in major outbreaks have been types A, B and C. Serogroup B and C have been observed to cause localized outbreaks in some American Army base camps (1) and are endemic within the western world, while serogroup A has been responsible for most African epidemics. With the introduction of vaccines, strain similar to the western world have been observed. An example is the changing pattern of carrier strains to B and C reported recently in Eastern Nigeria (2).

Within Subsaharan Africa repeated major outbreaks of meningitis have been located in the cerebrospinal meningitis belt (CSM Belt). The belt is located north of the equator and south of the Sahara. Included in the belt are Cameroon, Chad, Ethiopia, Mali, Morocco, Niger, Nigeria, Sudan, Upper Volta. The countries in this zone share common characteristics, namely, a dry hot climate at the time of the peak of the epidemic, coupled with semi arid zones and desert winds resulting in very cold nights which forces people to crowd. Crowding is one hypothesis suspected as a precipitating fact for the recurrent occurrence of epidemics (1). Another hypothesis related to the episodic occurrence of outbreaks is a threshold in the population of the proportion of individuals who lack antibodies to current meningococcal strains (1). This may explain other features of epidemics in the CSM Belt, such as the occurrence of epidemics every 5-10 years. For example, in Nigeria outbreaks were observed in 1949-1950, 1960-1962, 1969-1970 and 1977-1978 (3). On the other hand, in Ethiopia, there continue to be yearly, localized smaller outbreaks. Other suspected factors include the mobility of the non-immune population, major weather changes observed in Ethiopia over recent years, virulence of the strains (which is not well understood), and carrier rates which range

* Senior Medical Students

** Dept. of Community Health, Faculty
of Medicine, Addis Ababa University

from 5-10% between epidemics to 20-90% during epidemics. Surveys undertaken at the time of the 1949-1950 epidemic in Northern Nigeria showed a carriage rate of 20% in healthy villagers (3).

The susceptible age group are mainly those below 15 years which account for 60-70% of cases, with 15-20% in the age group of 15-24 years and 5-10% above 25 years of age. The male to female ratio is around 2:1 in most instances.

There has been limited investigation of meningococcal meningitis epidemics in Ethiopia and the epidemiological features of these outbreaks is poorly documented. In Ethiopia, the Gondar, Gojjam, Wollega, Eritrea and Shoa regions have been most commonly affected (3). It has been established that meningitis outbreaks typically start in early January and decline in frequency towards the end of June, which coincides with the coming of heavy rains. It is also evident that there have been no cyclic patterns from 1982 to 1989.

This study was conducted to describe the 1989 meningitis epidemic in Haikoch Na Butajira District in terms of time, place and person.

METHODS

Lists of reported cases from hospitals, health centers, health stations and treatment shelters within Haikoch na Butajira District were obtained and reviewed. These lists provided information about the age, sex and address of each case. Any individual treated for meningitis was identified as a case.

Information about the rural areas and local climatic reports were obtained from the office of the district branch of the Ministry of Agriculture or Haikoch na Butajira District. Information about the urban areas, their population and the total population of the District was obtained from the National Population and Housing Census of Ethiopia of 1984.

A standard data collection form was used to record information about age, sex, address and death. Description of the magnitude of the epidemic in terms of case fatality rate, sex specific case fatality rate, sex ratio, and age group preponderance were undertaken. From the daily reports of rainfall and temperature, the weekly average for the months of February and March were calculated, plotted, and compared with the total number of cases and case fatality rate each week. In addition the incidence rates were compared among villagized, non villagized and urban areas.

RESULTS

There were a total of 6968 cases (3566 males and 3402 females) for a male to female ratio of 1.05:1. The sex specific case fatality rates were 3.2% for male and 2.6% for female. The total number of cases from each treatment center is shown in Table 1.

Table 1. Case fatality rates in different treatment centers of Haikoch na Butajira District, during the meningitis epidemic, February-March, 1989.

District with treatment center	Number of cases	Number of deaths	Case Fatality rates
Zeway surrounding	1287	12	0.93%
Siliti	1058	13	1.20%
Meskanena Mareko	954	36	3.70%
Koshe	842	28	3.32%
Siraro	242	18	7.40%
Negele	570	13	2.28%
Lanfero	541	19	3.50%
Meki	513	22	4.30%
Shahshemene Hosp.	413	20	4.80%
Shahshemene Hlth cener	222	9	4.05%
Alaba	208	13	6.26%
Dalocha	118	0	0%
Total	6968	203	2.90

The highest number of cases (1278) were reported from the urban Ziway and the lowest from rural Dalocha shelter (118 cases). The highest case fatality rate was reported from the rural Siraro District shelter (7.4%). Over 75%

Table 2. Age Specific Case Fatality Rates (Haikoch na Butajira District, February - March, 1989)

Age group	Number of cases	Number of	Case fatality
-----------	-----------------	-----------	---------------

	(%)	deaths (%)	rate (Age specific)
<1	215(3.1)	8(3.9)	3.7%
1-4	1106(15.9)	52(25.6)	4.7%
5-14	2577(36.9)	89(43.8)	2.2%
15-49	2669(38.3)	49(24.1)	1.7%
50+	201(2.8)	5(2.5)	02.5%
	6968(100.0)	203(100.0)	2.9%

of the cases were between the ages 5 and 49 years (Table 2). Age specific case fatality rates are also shown in the same table. The highest (4.7%) was for the age group 1-4 years.

864 (0.6%), 332 (0.8%) and 2783 (0.2%) of the cases were from urban, rural-villagized and rural non-villagized areas, respectively (Table 3).

Table 3. Description of meningitis cases in Haikoch na Butajira District as to their residential areas, February -March, 1989

Residence	No	(%) Population	No	(%) cases
Urban	135,817	(7.5)	864	(0.6)
Rural				
Villagized	393,995	(21.7)	3321	(0.8)
Non-villagized	1,284,063	(70.8)	2783	(0.2)
Total	1,813,875	(100.0)	6968	(0.3)

The progression of the epidemic during the eight weeks of the study period is shown in Table 4. The peak of the epidemic was reached during the 3rd and 4th week of February.

Table 4. Progression of the epidemic Haikoch na Butajira District 1989.

Month	Week	# cases	% of reported
February	1st	777	(11.1)
	2nd	841	(12.0)
	3rd	1357	(19.5)
	4th	1545	(22.2)
March	1st	769	(11.0)
	2nd	620	(8.9)
	3rd	429	(6.1)
	4th	287	(4.1)
Unknown		343	(4.9)

DISCUSSION

In Ethiopia meningitis epidemics have typically occurred during the dry season which begins in December, peaks in February and lasts through to April. The last epidemic in the District was in April 1987, two years prior to the present one. This was comparable to a two year gap reported in Wollega, western Ethiopia in 1983 (2). The case fatality rate in our study was 2.9% as compared to 4.5% from the Wollega study (3), and 2.3% from a study conducted in Gondar in 1989 (2).

The disparity between the fatality rates reported in this study and those from Wollega and Gondar may be due variations in reporting of deaths, the establishment of treatment centers closer to the patients' residences, efficient surveillance leading to early diagnosis and treatment, or the limitation of this study to two months while the other studies were for the entire year.

The male to female ratio in our study is 1.05 to 1; it compares favorably to that which was observed in the study done in Gojjam in 1977, which was 1.2:1 (1).

The case rate differences of 0.8% in the villagized and 0.2% in non villagized population may be due to the recent crowding which took place during villagization. These people residing in crowded village are more prone to the spread of the epidemic. On the other hand, it could be due to the increased proximity of health

services in villagized areas leading to higher reporting of cases. This is supported by the finding of similarly high figures in urban areas, which had a case rate of 0.6%. The lower rate in the urban areas as compared to the villagized areas could be due to the fact that the urban people have been crowded for a longer time than the villagized people and have therefore adjusted much more to the crowding effects than the recently villagized population.

There are some limitations to this study. Since the figures reported here are based on treatment center reports, they probably represent only a portion of the total cases that have occurred in the District. The reports from these centers were at times not complete and a uniform format was not followed.

Our findings, although not conclusive, indicate higher case rates occur among urban and recently villagized rural populations than among non-villagized rural populations. They also indicate to a high case fatality rate in general.

ACKNOWLEDGMENTS

We would like to thank Ato Alemu Berta, Head of the Information and Epidemiology Sector of Haikoch na Butajira District office of the branch of Ministry of Health, for his help in data collection and to the office of the branch of Ministry of Agriculture for Haikoch na Butajira District, for providing us with data on villagization and weather condition for Zway and to the academic staff of the Dept. of Community Health for their valuable comments and suggestions on the conduct and report of this study.

REFERENCES

1. Eyassu Habte Gaber and Estifanos Tekle. Cerebrospinal Meningitis in West and Central Ethiopia, *Ethiopian Medical Journal*. 1979; 17:9-17.
2. Ministry of Health. Control of Cerebrospinal (Meningococcal Meningitis in Ethiopia. Proceeding of symposium and workshop held in Addis Ababa, Ethiopia. November 20-23, 1981.
3. Eyassu Habte Gabre, Estifanos Tekle and Mengistu Mammo. Meningococcal Meningitis in Ethiopia 1974-1983 and Strategies for Control. *Ethiopian Journal of Health Development*. 1984; 1:47-65.

DETERMINANTS OF COMMUNITY HEALTH AGENT FUNCTIONALITY IN ARSI REGION

Damen Haile Mariam*,M.D. & Joyce Pickering**,M.D.,FRCP(C)

ABSTRACT: A comparative case-control study to assess the determinants of Community Health Agent (CHA) functionality was done in two Arsi districts, in mid-southern Ethiopia. This was a census study which was conducted by interviewing 347 CHAs from a structured questionnaire. The objectives were to describe the situation of the CHAs trained up to the end of 1987, and to elucidate determinants of CHA functionality by comparing the attributes of functional CHAs (cases) with that of the nonfunctional ones (controls). The findings revealed that only 25.8% of the CHAs interviewed were performing 50% or more of the activities mentioned in their job description. It also revealed a point prevalence attrition rate of 45%. Comparing cases and controls showed a strong association between functionality and community support for the CHAs (RR = 72.4 with 95% CI 35 - 153). Association was also found between functionality and supervision by health institutions, presence of health posts, provision of stationary drugs and to the CHA, and establishment of an active health committee. These findings emphasize the importance of provision of proper community and health system support for the success of the community health services program.

INTRODUCTION

The concept of health auxiliaries such as community health workers (CHW), has been around for about 40 years, and has been attempted in many different countries (1). The concept of CHWs who are generally local inhabitants given a limited amount of training to provide basic health needs, such as promoting preventive activities and giving simple curative services, relevant to their specific area has received emphasis with the emergence of the PHC concept (2,3,4). CHWs are expected to remain in their home villages or neighbourhood as part time workers. They may be volunteers, or may receive salary or other forms of remuneration from the community.

Despite widespread experience in the training and use of CHWs worldwide, little evaluative research has been done. Although the works published have demonstrated a higher service coverage achieved by CHWs than the previous health care delivery systems, and higher rates of utilization by the poorer section of the population, many weaknesses have also been evident. Many of the weaknesses and seeming failures of the CHW programmes arise from a lack of community support and failure to provide backup from the health services.

Ethiopia, being one of the countries that signed the Alma-ata charter, has almost a decade of experience in training and use of CHWs, both in the form of community health agents (CHAs) and traditional birth attendants (TBAs) (5). Up to the end of 1988, 13,085 CHAs and 11,762 TBAs had been trained and returned to their respective communities (personal communication, MOH, Division for Health Stations & Community Health Services).

* Arsi Regional Health Department, Ministry of Health

** McGill-Ethiopia Community Health Project

This work was done as part of the Masters of Public Health

Program at Addis Ababa University for Dr. Damen H.Mariam, and was supported by the International Development Research Centre of Canada.

It has been repeatedly mentioned that the community health service (CHS) programme in

Ethiopia is having problems partly due to the lack of remuneration of the trained CHWs, and it has been seen that more than 75% are not functional (6,7). Despite this fact, the training of CHAs and TBAs is still continuing. The purpose of the present study is to assess the determinants of functionality of CHAs who had been trained up to the end of 1987 in the study area. This is done by comparing the functional CHAs with the non functional ones.

METHODS

The study is a cross sectional census survey with a case-control analysis, with functional CHAs as cases and non-functional CHAs as controls. After interviewing all CHAs in two districts of Arsi region, functionality score was determined by comparing the activities of the CHA with the items in the job description published by the Ministry of Health of Ethiopia. The functionality score was then graded from 0 to 20 points. Those who were performing 50% or more of the job description were classified as functional, and the remainder were classified as non-functional. The possible determinants of functionality, such as community support, selection by the community, and support by the local health institution were inquired about on the same questionnaire. An attempt was made to verify the responses of the CHA by interviewing the community leaders and local health workers and comparing the responses. Before the interview took place, informed consent was obtained, and all respondents were assured of confidentiality.

The questionnaires were coded and data was entered on an SPSS/PC program for analysis.

RESULTS

Out of a total of 582 CHAs trained up to the end of 1987, a total of 347 were able to be interviewed. Of these 347 CHAs, 159 were not performing any activity at the time of the interview, making an attrition rate of 45.8%. 99 CHAs or 28.6% were performing less than 50% of the activities required in the job description, and 89 CHAs or 25.6% were found to perform 50% or more of the activities mentioned in the job description (Fig.1).

Table 1 shows attributes of the functional CHAs compared with the non-functional ones.

The odds ratio of the most important associations are seen in table 2.

Of the community leaders who responded that they gave no support in cash or in kind, the reasons given for not supporting were:

- 56.9% expected the CHA to be supported by the government.
- 27.7% were not aware that the CHA needs to be supported.
- 12.4% had no capacity to support the CHA.

Only 20.3% of the clinic staff who responded to the interview participated in the selection of the particular CHA. 6.3% of the clinic staff responded as having no awareness as to the presence of a CHA in the particular sub-districts, only 14% of the clinic staff gave regular supervision, and 15.2% claimed to have given the CHA drugs at least once in the past.

The reasons given by the clinic staff for not supervising the CHAs were:

- 21.4% felt that there was no point in supervising CHS who are not supported by their community.
- 26.4% felt that it was not worth supervising the CHAs, because the CHAs were not interested in being supervised.
- 52.2% ascribed their inability to lack of budget.

DISCUSSION

In this study it is shown that the proportion of functional CHAs is about 26% in the two Arsi districts, with 45% being completely inactive. The study also has revealed that CHA functionality is associated with remuneration by the community, and health institution supervision (RR = 72.4 and 28 respectively).

The problem of maintaining the activities of CHWs is encountered in many countries and projects which have trained them (8,9,10). The reasons given for high attrition rates of CHWs is that the community and health system give

Table 1. Characteristics of functional and non-functional CHAs.

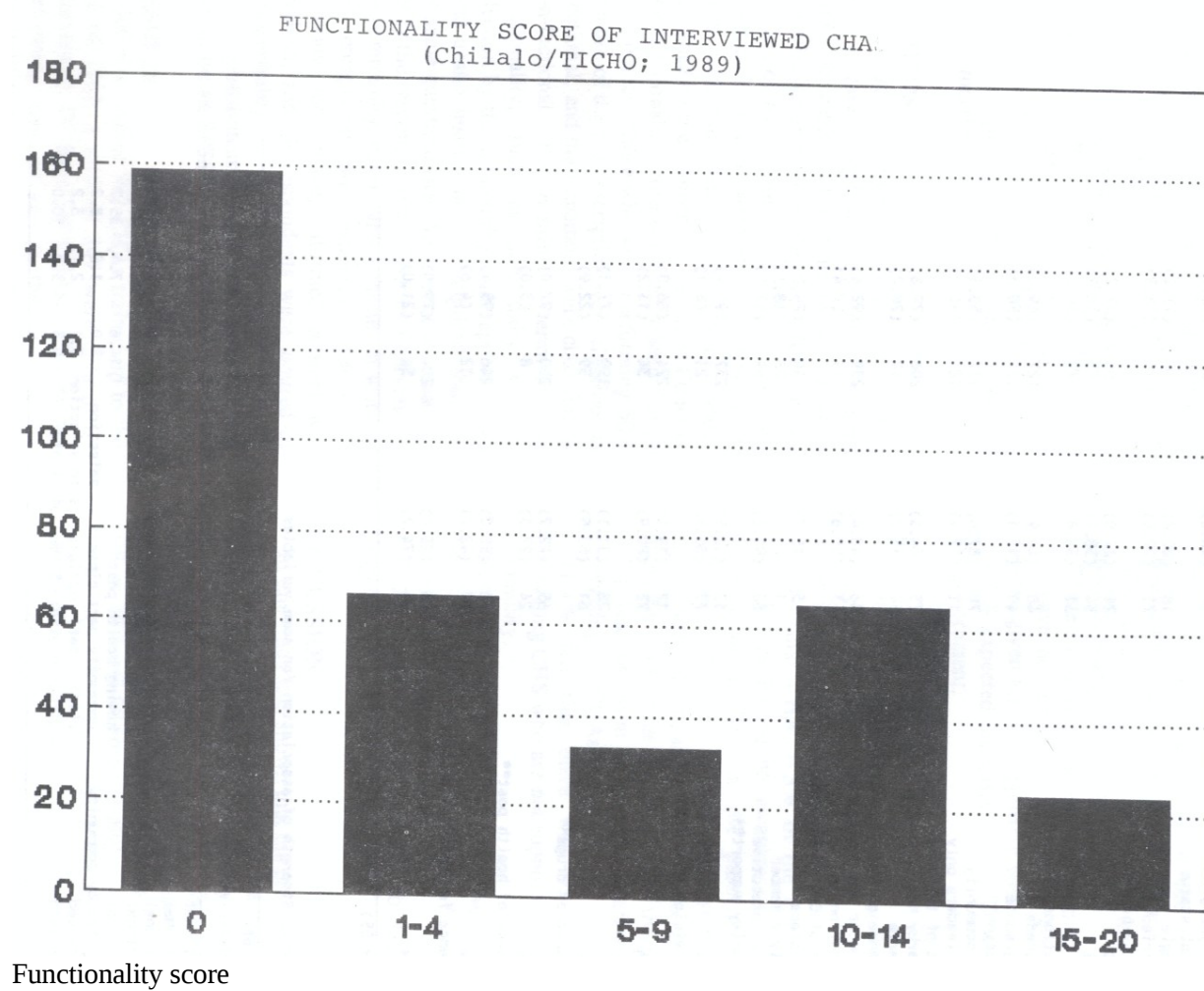
Comparison variable	Cases		Cases	
	Freq.	(%)	Freq.	(%)
Age				
<27 years	39	(43.8)	133	(51.5)
>27 years	50	(56.2)	125	(48.5)
Marital status				
single	18	(20.2)	34	(13.2)
married	71	(79.8)	224	(86.8)
Size of household				
1-3	24	(27.0)	96	(37.2)
4-5	34	(38.2)	83	(32.2)
>6	31	(34.8)	79	(30.6)
Educational status**				
≤ grade 6	40	(44.9)	127	(49.2)
> grade 6	49	(55.1)	131	(50.8)
Selection**				
by community	78	(87.6)	137	(53.1)
by leaders only	11	(12.4)	121	(46.9)
Place of training				
nearby health center	75	(84.3)	206	(79.8)
Agarfa	14	(15.7)	52	(20.2)
Presence of health committee**				
none functioning	36	(40.4)	239	(92.6)
functioning	53	(59.6)	19	(7.4)
Place of CHA in the committee**				
no place	5	(5.7)	30	(24.2)
only a member	1	(1.1)	23	(18.3)
as an executive	80	(93.2)	69	(57.5)
Community support**				
no	12	(13.5)	237	(91.9)
yes	77	(86.5)	21	(8.1)
Supervision from HI**				
no	17	(19.1)	224	(86.8)
yes	72	(80.9)	34	(13.2)
Refresher course**				
no	28	(31.5)	199	(77.1)
yes	61	(68.5)	59	(22.9)
Presence of health drugs**				
no	65	(72.7)	250	(97.0)
yes	24	(27.3)	8	(3.0)
Presence of health post**				
no	52	(58.0)	246	(95.4)
yes	37	(42.0)	12	(4.6)
Presence of registration book**				
no	23	(25.8)	204	(79.0)
yes	36	(74.2)	54	(21.0)

* (p<.05)

**(p<.01)

Table 2. Strength of association for some variables

Odds of being.....	When.....	Ratio	95%	C.I.
functional	supported by community	72.4	34.0	153.0
functional	supervised by clinics	28.0	14.6	53.4
functional	getting refresher course	7.3	4.5	12.2
functional	having drugs	11.5	4.9	27.0
functional	having health post	14.6	7.1	35.7
supported by community	community participants in selection	3.0	1.2	8.2
supervised	clinic staff participants in selection	3.1	2.7	8.2
supervised	situated within 5kms of clinic	5.3	3.0	10.0



inadequate support for them. The reasons why there is inadequate community and health system support for CHWs range from inappropriate selection of CHWs to the lack of proper structure to evaluate their training programs (11,12).

That community support is vital to the function of CHAs is an established fact and has been shown in studies from China, Kenya, Zambia, India and Ethiopia (13). In the present study, community support for remunerating CHAs (in cash or in kind) is shown to be strongly associated with function (OR = 72 [95% CI = 34, 153]). Besides remuneration in cash or in kind, community support may also be in the form of providing logistics like health posts, drugs and stationary and establishing an active health committee. Having drugs has been seen to be effective in CHW programs in Somalia, Kenya and Peru both as an incentive and in increasing the respect for the CHWs (14,15). The successes of CHW projects in Kenya and Nigeria were also ascribed to the presence of active health committees (16).

The other major finding of this study is that health institution support to CHWs is vital both in the form of supervision (OR = 28 [95% CI = 14.6, 53.4]) or continuing education (OR = 7.3, [95% CI = 4.5, 12.2]). This fact was also shown in earlier studies in Ethiopia and Canada (17,18).

It should be remembered, that as a cross sectional study, this study can only show association, rather than cause and effect. It is possible that it is the CHA's functionality that stimulates community and health institution support. However, we believe it is likely that it is the support which determines functionality. For example, community participation in selection of the CHA is strongly associated with functionality. Clearly, selection comes before functionality in time. The same is true to a lesser extent of health institution involvement in the CHA's selection.

On the basis of this study it is recommended that communities be made aware of the benefit of CHAs and try to support them. Health institutions should also be enabled to give support to CHAs. CHAs should be provided with essential drugs. Health posts and active health committees should be established at every sub-district. It is hoped that this will help accelerate the progress towards the goal of "Health for All by the year 2000".

REFERENCES

1. Storms, D.M. Training and use of auxiliary health workers: lessons from developing countries. *American Public Health Association International Health Programs monograph series*, No.3, 1979.
2. Walt, G., and Vaughan, P. An introduction to the PHC approach in developing countries. *Ross Institute of Tropical Hygiene*, publication No.13. London School of Hygiene and Tropical Medicine, 1981.
3. Gray, C.S. State sponsored PHC in Africa: the recurrent cost of performing miracles, *Soc. Sci. Med.* 1986; 22(3):361-368.
4. WHO. Alma-Ata. *Primary Health Care*. 1978.
5. Ministry of Health. *Curriculum for Training of CHAs*, July, 1978. 1977.
6. Ministry of Health. *Primary Health Care Review*. 1985.
7. Mechie, H., Dibaba, T. and Bennett, J. The training and use of CHAs in Ethiopia. *The Ethiop. J. Hlth. Dev.* 1984; 1(1):31-39.
8. Ofosu-Amaah, V. National Experiences in the use of Community Health Workers, WHO, Geneva. 1983.
9. Madebo, G. Community Health Services in Ethiopia: Use of CHAs and TBAs in Sidama Awraja (Sidamo). Masters thesis, Addis Ababa University, School of Graduate Studies, (unpublished). 1986.
10. Wakbulcho, M. Community participation in health services. Masters thesis, Addis Ababa University, School of Graduate Studies, (unpublished). 1988.
11. Leslie, C. What caused India's massive Community Health Worker scheme: a sociology of knowledge. *Soc. Sci. Med.* 1985; 21(8):923-930.
12. Berman, P.A., Gwatkin, D.R. and Burger, S.E. Community-based health workers: head start or false start towards health for all? *Soc. Sci. Med.* 1987; 25(5):443-459.
13. Kaseje, D.C.O. and Spencer, H.C. The Saradidi, Kenya Rural Health Development Program. *Ann. Trop. Med. Paras.* 1987; 81(1):1-12.
14. Akenzua, G.I., Izogie, J.M., Ozigbo, E. and Osuhir, P.D. Obadan Project in Bendel State of Nigeria, *J. Trop. Paediat.* 1984; 30:310-312.
15. Kaseje, D.C.O. Community participation and leadership in the Saradidi, Kenya Rural Health Development Program. *Ann. Trop. Med. Paras.* 1987; 81(1):46-55.
16. Benyoussef, A. and Christian, B. Health Care in developing countries. *Soc. Sci. Med.* 1977; 11:399-408.
17. Lavalley, C. Evaluation of the Community Health Representatives program serving the James Bay Cree, Dept. of Community Health, Montreal General Hospital. 1987.
18. Okubagzhi, G.S. Fulfilling the potential of traditional birth attendants. *Wld. Hlth. Fourm.* 1988; 9:426-431.

DETERMINANTS OF PRE-ECLAMPSIA AND GESTATIONAL HYPERTENSION

Asnake Hailu*,M.D. and Derege Kebede**,M.D.

ABSTRACT: To examine the determinant factors for pre-eclampsia and gestational hypertension, a total of 567 pregnant women were randomly selected from 13 urban sub-districts and 13 rural villages from a central region in Ethiopia and included in the study. Albuminuria was detected in 11.5% and abnormal diastolic blood pressure in 12.2%. 2.9% and 9.2% were classified as pre-eclamptic and gestational hypertensive, respectively. Younger educated women, in a higher income category, and in their first pregnancy were found to be at a higher risk of pre-eclampsia and gestational hypertension. Strenuous physical exertion and low dietary protein intake during the early months of pregnancy also increased the risk of both pre-eclampsia and gestational hypertension. A high dietary calcium intake during the early months of pregnancy increased the risk of pre-eclampsia but not gestational hypertension.

INTRODUCTION

Globally, an estimated 500,000 maternal deaths occur each year. Nearly all of these deaths occur in developing countries where women's health is poor and maternal health care is scarce (1). The estimates for maternal mortality in Ethiopia are 5.66 per 1000 live births (2), and 9.6 per 1000 patients (3).

Pre-eclampsia or eclampsia are recognized as one of the major complications of pregnancy. Hypertension is the commonest disorder of pregnancy (4).

Dietary factors are now suspected of being associated with the development of pre-eclampsia. Low protein content in the diet has been correlated to pre-eclampsia (5). Another observation was the inverse relation between calcium and the incidence of pre-eclampsia and gestational hypertension. Calcium has been also implicated in the pathogenesis of essential hypertension (6).

Physical activity has also been implicated in the development of pre-eclampsia and/or gestational hypertension (7), and has also been shown to affect fetal growth (8).

Population-based studies on the determinant factors for pre-eclampsia and gestational hypertension have not been reported from Ethiopia. The purpose of this study was to quantitate whether dietary protein and calcium intake and physical activity are risk factors for pre-eclampsia and gestational hypertension.

* Ada-a District Health Office, Debre Zeit Health Center, Debre Zeit.

** Dept. of Community Health, Faculty of Medicine, Addis Ababa University, P.O.Box 1176, Addis Ababa, Ethiopia

METHODS

The study was conducted in urban and rural communities of Ada-a district in the central part of the country in 1990/91. Ada-a district is administratively and geographically divided into 15 urban sub-districts and 293 rural peasant associations. It has a population of 294,171 (from the district administrative office in 1989). All the 15 sub-districts in the urban and 57 accessible villages in the rural were included as our sampling frame. Simple random selection was adopted for both urban and rural villages to obtain 13 urban and 13 rural villages from which all pregnant women (n=567) were included in the study.

The questionnaire comprised the following items: demographic, socio-economic and other characteristics of the pregnant woman. The total monthly family income were categorized into 0-99 Birr, 100-249 Birr, 250-449 Birr and above 500 Birr to be designated as very low, low, medium, and high respectively for use in the text. Past and current obstetric and medical history; recordings of height, blood pressure measurements and the presence of albumin in the urine were noted.

A semi-quantitative food frequency questionnaire was used which consisted of a list of 57 food items with portion sizes and a set of frequency response options to indicate how often each food is consumed during the first 20 weeks of pregnancy. The nutrient content of the food items were calculated using an Ethiopian Food Composition Table (9). Daily dietary intakes as expressed in terms of percent of caloric intake were used for grouping the pregnant women into three categories of relative nutrient intake levels: low, moderate and high intake.

The assessment of physical activity consisting of leisure time, occupational and household activities was done by use of a recall of specific physical activity during the first 20 weeks of the current pregnancy. The questionnaire had 20 physical activity items and a set of frequency response options to indicate how often a specific physical activity was carried out. Daily activity scores were developed by classifying tasks into one of the three (light, moderate, heavy) based on values for total energy expenditure reported from other studies (8). Thus light work requires ≤ 3.5 KCal/min, while moderate work involves an expenditure between 3.5-5.5 KCal/min and heavy ≥ 6 KCal/min. Examples of physical activity in each class are:- Light - walking and sweeping floor, moderate - washing cloths and carrying water from a distance and heavy - grinding grain and farm activities. The maximal intensity of physical activity performed by a subject was determined by the intensity level of the activity with the highest intensity code. Daily energy expenditure was obtained by multiplying the intensity code of each activity by its corresponding duration, and by summing up the values of all activities reported. Daily energy expenditure was then categorized into low, medium and high to divide subjects into groups based on the habitual activity to measure the relationship between physical activity and pre-eclampsia and/or gestational hypertension.

Blood pressure was measured, the mother sitting comfortably, the sphygmomanometer cuff tied on the right arm at the same level as the heart. Diastolic blood pressure was taken at the point of muffling (Phase IV) of the korotkoff sound. This measure corresponds closely to the true values in pregnancy (10). Two blood pressure measurements were taken at the mid and end of the interview by the enumerator and the supervisor respectively. Measurements done by supervisors (health assistants) were used in the analysis. Diastolic blood pressure ≥ 90 mm Hg were considered abnormal.

Random midstream urine was then collected at the end of the interview. Reading was made visually by comparing the reagent areas to the corresponding color chart on the bottle in 60 seconds. The results were recorded as negative, trace, +, ++, and +++ on the space provided. Because of the possibility of false positive results a high cutoff point, therefore, 2⁺ or more was considered as significant proteinuria.

The following operational definition of pre-eclampsia was used: diastolic blood pressure ≥ 90 mm Hg with albuminuria $\geq 2^+$.

A pre-test was carried out in Dukem clinic. Data collection was conducted twice, the first survey took six weeks, four weeks for urban and two weeks for rural. After a period of two months the second reassessment of those pregnant women who were on their first 20 weeks of gestation and were negative during the first survey was conducted and required a period of four weeks. A six day training was given for enumerators (12th grade female students) and supervisors (health assistants). The two supervisors conducted a 10% repeatability check of the pregnant women in each sub-district/village on daily basis.

Data entry was carried out via a visible screen terminal into a disc file, using a data entry program. After computer input was complete, a 2% check of all the questionnaires in the completed computer information was carried out. The analysis was done using SPSS (PC) program (11). The EPI-INFO program (12) was additionally used to assess the strength of the associations.

RESULTS

A total of 48,546 people were surveyed. This was 90% of the estimated total population for the study area. Of the 567 pregnant women studied, 60% were urban, and 40% rural inhabitants. 14.3% were with in the age group of 15-19, 71.4% with in 20-34 and the rest 14.3% were with in 35- 49 years of age during the survey.

21.7% were nulliparous women and those who had 1-4 live births were 56.1%. 22.2% had 5-10 live births. 60.2% were in their 3rd trimester, 30.6% in their 2nd trimester and 7.4% were in their first trimester (Table 1).

Table 1. Socio-demographic and other characteristics of pregnant women in Ada-a District, Ethiopia, 1990.

Characterstics		Total No. %
Maternal age in years	15-19	81(14.3)
	20-34	403(71.4)
	35-49	81(14.3)
Parity	0	123(21.7)
	1-4	318(56.1)
	5-10	126(22.2)
Period of gestation in months	1st Trimester	42(7.4)
	2nd "	173(30.5)
	3rd "	340(60.0)
	Unknown	12(2.2)
Occupation	Home maker	513(91.8)
	Non home maker	46(8.2)
Education	Illiterate	222(39.2)
	Elementary	258(45.6)
	>Secondary	86(15.2)
Total Family monthly income in Birr	0-99	243(42.9)
	100-249	152(26.8)
	250-499	63(11.1)
	500+	28(4.9)

1 Birr= 0.48USD

92% of the total pregnant women were homemakers. 39.2% were illiterate. 42.9% of the pregnant women had a total family monthly income of 0-99 Birr, 26.8% had 100-249 Birr, 11.1% had 250-499 Birr, and 4.9% earned 500 Birr and above.

11.5% had albuminuria. 12.2% had a diastolic blood pressure ≥ 90 mm Hg and 2.9% had pre-eclampsia. The relative risk of pre-eclampsia decreased with increasing age of mothers although this trend was not statistically significant, $P > 0.05$ (Table 2). Pre-eclampsia was also associated with education. The lowest relative risk was among the pregnant women attended elementary school. The observed differences were however not statistically significant. Pre-eclampsia was associated with income. The relative risk decreased with a decrease in monthly family income. The trend was statistically significant ($P < 0.05$).

Nulliparous women had a 6 times higher risk of developing pre-eclampsia than the rest of the study group. The difference was statistically significant ($P < 0.01$). Cases of pre-eclampsia tended to be engaged in physical activities which require high energy expenditure during their first 20 weeks of gestation. The group of pregnant women who had a high level of energy expenditure were at risk 3 times higher than those with low level of energy expenditure. However the difference was not statistically significant.

High dietary protein intake during the first 20 weeks of gestation is observed to have a protective effect against the development of pre-eclampsia. The relative risk decreased with an increase in a daily dietary protein intake. However, the trend was not statistically significant.

In this study, low dietary calcium intake during the first 20 weeks of gestation was found to have a protective effect for pre-eclampsia. The relative risk decreased with a reduced daily dietary calcium intake. The observed trend, however, was not statistically significant.

Pregnant women in the age group of 15-19 had a 2 times higher risk of having gestational hypertension than those in the age group of 35-49. However, the difference was not statistically significant (Table 3). No association was observed between educational status and gestational hypertension.

Table 2. Distribution of Cases of Pre-eclampsia Among Pregnant Women in Ada-a District by Different Maternal Characteristics.

CHARACTERISTICS	CASES No (%)	CONTROL No(%)	RR (95% CI)	CHI-SQUARE
Maternal age in years				
15-19	4(23.5)	77(14.1)	1.0 ^a	
20-34	12(70.6)	391(71.3)	0.59(0.17,.6)	1.9
35-49	1(5.9)	80(14.6)	0.24(0.01,2.72)	
Education				
Illiterate	5(29.4)	217(39.5)	0.5(0.14,1.65)	
Elementary	1(5.9)	85(15.5)	0.26(0.01,1.87)	1.7
>Secondary	11(64.7)	247(45.0)	1.0 ^a	
Total family monthly income in Birr				
0-99	5(29.4)	270(49.2)	0.3(0.06,1.07)	12.78
100-249	6(35.3)	194(35.3)	0.4(0.11,1.7)	(4.7)**
250+	6(35.3)	85(15.5)	1.0 ^a	
Parity				
Primi	10(58.8)	112(20.4)	5.6(1.83,15.92)	0.0008***
Others	7(41.2)	437(79.6)	1.0 ^a	
Total energy expenditure				
Low	1(5.9)	89(16.2)	1.0 ^a	
High	16(94.1)	460(83.8)	3.0(0.47,131)	0.22***
Daily protein intake				
Low	1(5.9)	14(2.5)	5.1(0.06,403.5)	
Moderate	15(88.2)	464(84.5)	2.3(0.34,97.9)	1.2
High	1(5.9)	71(13.0)	1.0 ^a	
Daily calcium intake				
Low	1(5.9)	47(8.6)	0.42(0.01,5.44)	
Moderate	13(76.5)	443(80.7)	0.58(0.15,3.25)	0.48
High	3(17.6)	59(10.7)	1.0 ^a	

^a Referent category * 1 Birr=0.48 USD ** P<0.05 (trend test) *** P-Value for Fischer's exact test

Gestational hypertension was associated with income. The relative risk decreased with a decrease in the monthly family income. However, the trend was not statistically significant.

Parity was also associated with gestational hypertension. The relative risk for primiparous women was two times higher than the others. The observed difference was however not statistically significant.

Physical activities which required high energy expenditure during their first 20 weeks of gestation were associated with gestational hypertension. The group of pregnant women who had a high level of energy expenditure had five fold higher risk than those with low level of energy expenditure. The observed difference was statistically significant ($P < .05$).

Distribution of cases of gestational hypertension have little or no variation in the three categories of protein intake. The relative risk was lower in the group with moderate daily dietary protein intake. However, the difference was not statistically significant.

Low dietary calcium intake during the first 20 weeks of gestation was associated with gestational hypertension. The relative risk increased with the reduced dietary calcium intake. The observed trend was however not statistically significant.

DISCUSSION

The risk of pre-eclampsia decreased with increasing age. A "J shaped" curve have been reported for the relationship between maternal age and the incidence of pre-eclampsia in nulliparous women (13).

Cases of pre-eclampsia tended to be among the group who attended secondary school or more. This is in general agreement to other reports where pre-eclampsia was more common among the highly educated group (14).

Table 2. Distribution of Cases of Pre-eclampsia Among Pregnant Women in Ada-a District by Different Maternal Characteristics.

CHARACTERISTICS	CASES	CONTROL	RR (95% CI)	CHI-SQUARE
	No (%)	No(%)		
Maternal age in years				
15-19	11(21.2)	66(13.3)	1.5(0.51,4.57)	
20-34	33(63.5)	358(72.2)	0.83(0.36,2.17)	0.79
35-49	8(15.3)	72(14.5)	1.0 ^a	
Education				
Illiterate	24(46.2)	193(48.6)	1.0 ^a	
Elementary	19(36.5)	131(33.0)	1.2(0.58,2.32)	1.66
>Secondary	9(17.3)	73(18.4)	0.99(0.39,2.34)	
Total family monthly income in Birr				
0-99	19(44.2)	221(51.6)	1.0 ^a	
100-249	13(30.2)	133(31.1)	1.14(0.5,2.52)	1.6
250+	11(25.6)	74(17.3)	1.7(0.71,4.03)	
Parity				
Primi	17(32.7)	95(19.1)	2.1(1.03,3.95)	
Others	35(67.3)	402(80.9)	1.0 ^a	5.4
Total energy expenditure				
Low	2(3.8)	87(17.5)	1.0 ^a	
High	50(96.2)	410(82.5)	5.3(1.35,45.77)	7.3**
Daily protein intake				
Low	11(21.2)	60(12.1)	1.1(0.20,11.46)	
Moderate	39(75.0)	425(85.5)	0.55(0.12,5.25)	1.9
High	2(3.8)	12(2.4)	1.0 ^a	
Daily calcium intake				
Low	5(9.6)	42(8.5)	1.6(0.33,8.74)	
Moderate	43(82.7)	400(80.5)	1.5(0.51,5.88)	0.5
High	4(7.7)	55(11.0)	1.0 ^a	

^a Referent category * 1 Birr=0.48 USD ** P<0.05 (trend test) *** P-Value for Fischer's exact test

Pre-eclampsia was significantly more common among the group with a relatively higher income. Most studies on risk factors for pre-eclampsia were conducted in developed countries within homogeneous income groups and were unable to measure the relationship between income and pre-eclampsia.

A significant association was observed between pre-eclampsia and parity. Nulliparous women had a higher risk of pre-eclampsia. This finding is in agreement with those of some other studies, where pre-eclampsia was considered predominantly a disease of nulliparous women (10,15). Hypertensive disorders of pregnancy are taken to be essentially diseases of primigravidae. Even if hypertensive disorders recur in a subsequent pregnancy it tends to be less severe. The combination of age 35 or more and being a primigravida leads to a particularly high risk of severe pre-eclampsia (16). Other study considered relative proportion of primigravidae of 1.3 or more as a test for a valid definition of pre-eclampsia (15). In our case the relative proportion is 1.4.

The result from this study suggests that women who had physical activities which require high energy expenditure during the first 20 weeks of their pregnancy are at a higher risk of pre-eclampsia. Another report suggested a protective effect of leisure time physical activity on pre-eclampsia (7). However, their report focused mainly on leisure time activities in affluent communities. The non significant results observed might be the reflection of the smaller sample size.

Low dietary protein intake in the first 20 weeks of gestation was observed to be a risk factor for the development of pre-eclampsia. This was in agreement with another study (4).

Low dietary calcium intake was negatively associated with pre-eclampsia. This is in contrast to other findings where calcium has been shown to be protective (6). It is likely that this is a chance finding as the association was not statistically significant.

Gestational hypertensive women were also observed to be younger than the controls. This however is in contrast to other reports where a "J" shaped curve for the relationship between maternal age and gestational hypertension which was probably attributed to the unmasking of latent hypertension in these older women is seen (16).

Education was observed to have no significant effect on the development of gestational hypertension. However, the effect of education on the development of gestational hypertension cannot be differentiated from that of the socio-economic status. Gestational hypertension was significantly more common among the group with a relative higher income. Most studies on risk factors for gestational hypertension were done in developed countries with homogenous income groups and did not measure the relationship between gestational hypertension and income. Nulliparity was also observed to be a risk factor for gestational hypertension. The finding is also in agreement with those of some other studies where gestational hypertension was accepted as essentially a disease of nulliparous women (10,15,16).

The result of this study suggests that women who had physical activity which require high energy expenditure during the first 20 weeks of gestation are at a higher risk of developing gestational hypertension. However, a study from Europe suggested a protective effect of leisure time physical activity on gestational hypertension (7). However, this study was based on a high socio-economic group where the extent of physical activity is different from ours. Thus similar studies on a similar population base are required for comparison.

In this study it was observed that dietary protein intake has no influence on the development of gestational hypertension. This is in agreement with suggestion from other reports where protein diet was considered not to influence the occurrence of gestational hypertension (16).

Higher levels of dietary calcium intake in early pregnancy is observed to be protective against the development of gestational hypertension. This finding is in agreement with those of other findings where a negative dose- response relationship was observed between calcium supplementation and blood pressure levels (6). The observed non-significant difference might be due to the smaller sample size used in the study.

The results from this study are unlikely to be biased. Exposure data that was collected (diet, physical activity, etc.) was on the first 20 weeks of gestation prior to the occurrence of outcome measures. This assumed an appropriate temporal sequence between the exposure and the disease. The information collected was prior to the classification of cases and controls. The enumerators being non-health professionals making them unaware of the objective of the study was possible. The place and circumstance of interview and measurements were similar.

Because of the gender similarity of enumerators, the cooperation from the study group was very high.

The problem of differentiating secondary hypertension from that of gestational hyper-tension is problematic since it requires post partum evaluation. Random misclassification as a result of the inherent variability of blood pressure, the use of questionnaires for the assessment of diet and physical activity, is likely to occur in our results. Our use of the second measurement of two BP measurements and a cut-off point to classify hypertensive is likely to reduce this misclassification. Moreover, the misclassification will be non directional with a tendency to decrease the relative risk. Because of the small number of cases the confounding effect of several variables were also not controlled.

In conclusion, pre-eclamptic women tended to be younger, attended secondary school or higher and earn a relatively high monthly income. Nulliparity was observed to be a risk factor for the development of pre-eclampsia. Strenuous physical activity during the early periods of gestation is observed to be a risk factor for pre-eclampsia. A protective effect of high dietary protein intake in early pregnancy was also observed. No association between dietary calcium intake in early pregnancy and preeclampsia was found.

Gestational hypertensive women also tended to be younger, and earn a relatively higher monthly income. Education showed no influence in the occurrence of gestational hypertension. Nulliparity was observed to be a risk factor for gestational hypertension. Physical activity which requires high energy expenditure during the first 20 weeks of gestation was observed to be a risk factor for gestational hypertension. Differences in dietary protein intake showed no influence on the occurrence of gestational hypertension. High dietary calcium intake was observed to have a protective effect against the development of gestational hypertension.

Pregnant women normally have lower total serum proteins, reduced albumin-globulin ratio and reduced oncotic pressure of the plasma. These are further decreased in pre-eclampsia or eclampsia. Animal experiments show that the lower albumin concentration is accentuated if the maternal diet is low in protein (4,5). Thus a low dietary protein intake in early pregnancy will likely increase the risk of pre-eclampsia.

A higher dietary calcium reduces the level of parathyroid hormone which in turn reduces the cytosolic calcium ion resulting in reduced muscular reactivity and eventually in reduced blood pressure. A low dietary calcium has the opposite effect (6). Thus a low dietary calcium intake in early pregnancy will likely increase the risk of developing hypertension.

Further research on the magnitude and determinants of high risk pregnancies should be encouraged. Until such a time when conclusive evidence is obtained on the protective effect of a high protein and calcium diet and moderate physical activity, specific nutrition education to encourage a high dietary protein and calcium rich intake and advice on physical activity during pregnancy should probably be part of the strategies in the health care services for pregnant women.

ACKNOWLEDGEMENTS

The study was supported by a grant from the International Development Research Center, Canada (IDRC). We gratefully acknowledge the cooperation given by the Peasant Associations in Ada-a district, the City Council of Debre-zeit town, the districts, sub-districts and rural villages involved in the survey, the enumerators and supervisors, the pregnant women enrolled in this study, the Ministry of Health for allowing use of existing resources in the respective health service units.

We also thank Dr.Francis Aboud for her assistance in data processing, Dr.Adanetch KidaneMariam for her kind help and advice in the preparation of the protocol, W/O Woudie Fikre, for her help in the training programme, and W/t Manyaheshal Kebede for typing the manuscript.

REFERENCES

1. Population reports, September. *Maternal Health in the Community*, Series L, 1988; No.7, pp 1-26.
2. Kwast BE, W Kidanemariam, EM Seid and FGR Fowkes. Epidemiology of maternal mortality in Addis Ababa, A community based study. *Ethiop. Med. J.* 1985; 23:7-16.
3. S Yoseph and G Kifle. A six year review of maternal mortality in a teaching hospital, Addis Ababa, Hospital based study. *Ethiop. Med. J.* 1988; 26(3):115-119.
4. Charles P. MC Cartney. *Toxemia of pregnancy in obstetrics* (eds. Greenhill), W.B.Sounders Company, Philadelphia and London, 13th edition, chapter 31, 1965; 501-34.
5. Briand A, C Carles. Protein deficiency and pregnancy toxemia in Africa, *Lancet*, 1978; 8056:146.

6. Belizan JM, J Villar, J Repke. The relationship between calcium intake and pregnancy induced hypertension. *Am. J. Obstet. Gynecol*, April 1988; 158(4): 898-902.
7. Marcoux S, J Brisson, J Fabia. The effect of leisure time physical activity on the risk of pre-eclampsia and gestational hypertension, *Journal of Epidemiology and Community Health*, 1989; 43:147- 152.
8. N. Tafari, RL Naeye, A Gobeze. Effects of maternal undernutrition and heavy physical work during pregnancy on birth weight, *British Journal of Obstetrics and Gynecology*, March 1980; 87:222-226.
9. Agren G, R Gibson. *Food Composition Table for use in Ethiopia*. The food analytical department, children's nutrition unit, Addis Ababa, 1968.
10. Davey DA, I MacGillivray. The classification and definition of hypertensive disorders of pregnancy. *Am. J. Obst. Gynecol.* 1988; 158(4):893-898.
11. Statistical package for social sciences (SPSS) Version II, 1989.
12. EPI-INFO Version V, June 1990 Georgia.
13. Chesly LC, BM Sibai. Clinical significance of elevated mean arterial pressure in the second trimester, *American Journal of Obstetrics and Gynecology*, 1988; 159(2): 257-259.
14. Klebanoff MA, PH Shiano, GG Rhoads. Outcomes of pregnancy in a national sample of resident physicians, *The New England Journal of Medicine*, 1990; 323(15): 1040-1045.
15. Redman CWG, M Jefferies. Revised definition of pre-eclampsia. *Lancet*, April 9, 1988; 809-812.
16. World Health Organization. The hypertensive disorders of pregnancy. Genva, *Technical report series*, 1987; 758:20-29.

COMMUNITY BASED NUTRITIONAL SURVEY: GERUKE JIMAT PEASANTS' ASSOCIATION, ILUBABOR REGION, ETHIOPIA

Louise Pilote*, MD, MPH, FRCP(C), George Olwit*, MD, MSc,
Gebreselassie Okubagzhi**, MD, PhD, Charles Larson*, MD, MSc, FRCP(C)

INTRODUCTION

Adequate nutrition is a basic need and prerequisite for health. Its promotion has been made one of the eight elements of PHC. In many developing countries the balance between an adequate level of nutrition and malnutrition is finely posed. Relatively minor changes in the environment or political-economic situation of a region can seriously disturb this balance and precipitate widespread malnutrition.

Ethiopia's population is over 80% rural and heavily dependent upon agriculture for its livelihood. Despite the country's agricultural potential, the sector remains under developed and per-capita food production and consumption remains less than optimal. Illubabor Region has greater farming potential than most regions of Ethiopia. Farmable land is abundant and the annual rainfall sufficient to support its population of 3.5 million inhabitants. In spite of this situation, childhood malnutrition has been reported to be widespread within the region and in excess of national rates.

The regional health office in Illubabor has identified malnutrition as one of its leading priority health problems. During preliminary discussions leading up to the arrival of the fourth accelerated district health managers' field experience in the region, it was agreed that a survey examining factors predictive of childhood malnutrition be carried out. Of particular interest was the need to examine factors which during periods of expected food self-sufficiency explained the continued presence of malnutrition. It is expected the results of this survey will assist the local health institutions and other sectors in the future prevention of malnutrition.

METHODS

Study Design and Setting: A cross-sectional survey was carried out in November 1989 in a rural peasant association (Geruke Jimat and Dala villages) located within Mana Kersa District, Illubabor Region of southwestern Ethiopia. These two Moslem villages were selected because of persistently high levels of reported malnutrition in the area for reasons unclear to the district and regional health offices. The villages are located among fertile lands with adequate rainfall 8 months of the year.

Study Population: Any household with a child between 6 and 59 months of age was eligible to enter the study. Of the 284 households visited, 108 had a child under five-years of age for a total of 136 children.

Measurement: Weight was measured using a hanging Salter spring balance with a capacity of 25 Kg. for children under two-years of age and an upright adult scale for the remainder. Readings were made to the nearest 0.1 kg. For children under two length was measured by having them lie down on a wooden length board with a flat surface. Older children were measured using a vertical, fixed rod attached to the adult scale. Length was recorded to the nearest 0.1 cm. Each child was examined for the presence of edema.

*McGill-Ethiopia Community Health Project
Dept. of Epidemiology & Biostatistics, McGill University,
Montreal, Quebec, Canada.

**Training and Demonstration Centre, Ministry of Health, Addis Ababa, Ethiopia.

Using WHO guidelines¹ each child's percentile of expected for weight for height and height for age and standard deviation were tabulated. Following the Waterloo method, children were then classified as 1) normal, 2) stunted; $\leq -2SD$ Ht/Age, 3) wasted; $\leq -2SD$ Wt/Ht, or 4) stunted + wasted. Children in category 3 were considered to be acutely malnourished, those in category 2 to be chronically malnourished, and those in category 4 to have elements of both. Those with acute or active malnutrition were compared with normal children for odds of exposure to the factors documented in the questionnaire and the appropriate odds ratios were calculated.

The mother, or in her absence primary caretaker, was interviewed using a pretested questionnaire which documented socioeconomic, cultural, and health related factors potentially predictive of malnutrition. The questionnaire was translated into Oromo from Amharic and pretested in a village similar to those surveyed. During pretesting the translation of the questionnaire, understanding of content, and time required for completion were verified. Appropriate modifications were then made.

RESULTS

The 136 children entered into the study came from 108 households. All heads of households were farmers and 70% of the mothers interviewed were illiterate. Fifty-three of the children were under two-years old and the male to female ratio was 1:1.

The results of the anthropometric measurements are summarized in table 1. Based upon

Table 1. Age distribution according to nutritional status.

Age years	Nutritional Status Category				Total	%
	1	2	3	4		
<	26	17	5	5	53	50.9
>	32	32	8	11	83	61.4
Total	58	58	13	16	136	100

Total nutritional prevalence rate = 57.4%

2 = Stunted children = 37%, 1 = normal = 32%

3=Wasted children=9%, 4=Both wasted & stunted=12%

standard deviation from expected calculations the overall prevalence of malnutrition was 57.4%; 37% stunted, 9% wasted, and 12% stunted + wasted. Alternatively, based upon determination of the overall percentile distribution of these children, 52.9% were below the 3rd percentile for Ht/Age and 29.7% were below the 3rd percentile for Wt/Ht. The percentage above the 50th percentile for these two measurements were 10% and 7% respectively.

Among the household surveyed, 56.9% were farming cereals and vegetables exclusively, while another 37.3% also harvested cash crops (either coffee or khat). Crops were sold by 33.1% and additional food purchased in markets by 64.7% of households. Unsafe water was consumed by 42% of the sample. All the children surveyed had been or were presently being breast fed. Supplementary feeding was started before 4 months in 11.7% and between 4 and 6 months in 32.3%. Mothers were asked if, in their opinion, their community had suffered from a famine at anytime in the past two years and 85.7% replied in the affirmative. Two-thirds gave inadequate rain as the reason, while 9% thought it was due to poor farming habits.

Table 2 summarizes the bivariate analyses for the strength of association between nutritional

Table 2. Different categories of nutritional status in relation to exposure to socio-economic, cultural and health related determinants as calculated by odds ratio.

Determinants	O.R. acute malnutrition	O.R. for chronic malnutrition
Age group between 24-35 months	1.56	1.90
Early supplementation of food (<4 months)	1.90	0.88
Number of meals/day (<2)	*	2.40
Unsafe water supply	2.04	1.79
Absence of history of bottle feeding	2.00	1.70
Family not possessing oxen	1.52	1.37
Family not possessing cow	1.24	1.04
Illiteracy of mother	2.89	1.07
Not buying food item	1.25	1.51
Selling food crops	1.96	2.27
Growing food crops	1.82	2.56

* inadequate number for analysis

status and specific exposure histories. These are reported separately for those with acute and chronic malnutrition. Acute malnutrition had highest odds of exposure (odds ratios over two) to unsafe water supply and mother being illiterate. Chronic malnutrition had highest odds of exposure to less than two meals per day, selling of food crops, and growing cash crops. Malnutrition was not significantly associated with breastfeeding (little variance), family size, number of different food items feed child, marital status, eating patterns, and reported morbidity.

DISCUSSION

The overall prevalence of malnutrition in the villages is high. Similar results have been reported in Gondar Region at times when no drought was suspected². The national figure ranges from 27% in Addis Ababa and East Hararge Region to 40% in the former Kefa Region³. Our study found a predominance of chronic malnutrition in under five children. The finding that most of the children are below the 3rd percentile for height for age attest to the gravity of the problem and the need for further preventive efforts.

The finding that 58% of the population obtains water from safe sites is high compared to the national figure of 6.3% and 4.2% for the Region^{3,4}. The importance of safe water consumption in the prevention of malnutrition is supported by the strong protective effect it had on acute and chronic malnutrition in this survey. The effect of early food supplementation on acute malnutrition found in this study was contrary to an expected greater effect on chronic malnutrition. This association was not examined in the Gondar study since none of the children received supplementation prior to 4 months². We were unable to ascertain additional Ethiopian studies examining this relationship. This association needs to be examined further. The ownership of oxen or cows provides an indirect measure of the family's wealth. Ownership of cows also is related to opportunity for milk consumption and oxen to the food production capacity of the family. The presence of either had modest protective associations with malnutrition.

Among the study population, 69% had a history of bottle feeding. Even more surprising was the finding that such exposure had a protective effect. It should be pointed out these were crude, bivariate analyses which do not control for important confounders such as socioeconomic status (SES). It may be that those bottle fed are of higher SES. Moreover, since the majority of mothers during the day are in the field with their husbands, it is likely those infants left at home and bottle fed are ensured nutrition.

The finding that chronically malnourished children are much more likely to come from household selling their food and engaged in cash crop production may prove to be very important in explaining the high

prevalence of malnutrition in this region. Those selling food are not necessarily those with excess production. Selling of food may also be associated with family instability, a factor which deserves much greater emphasis in future etiologic investigations. There is a long history of cash crop production in the region and a tremendous dependence upon it. Those engaged in cash crop production may do so at the expense of food crops, thus placing their families in a much more vulnerable food security situation, in particular during years when cash crops fail. These findings corroborate the theory of "green famine" in the region.

CONCLUSIONS

This cross-sectional survey, conducted in an area with adequate rainfall and fertile land, has shown a high prevalence of acute and chronic malnutrition. Compared to an unpublished survey carried out in the same villages two years previously the prevalence of malnutrition has risen and reveals an important public health problem requiring immediate action. The major factors at play are related to economic, cultural, and social shortcomings governing the farming practices, environmental sanitation, and feeding practices of the communities studied.

RECOMMENDATIONS

1. An urgent evaluation of the food security situation in the study area and the District as a whole, with the view to instituting food supplementation programs for the more severely malnourished children.
2. Liaison with the agriculture sector to promote nutritionally optimal food production and improve its storage and distribution.
3. Greater efforts should be made in nutrition education, with an emphasis on early childhood feeding and factors effecting nutritional status.
4. Involvement of the community in recognizing its existing problem of childhood malnutrition and in identifying solutions.
5. Expanded access to safe water.
6. Establishment of a local growth monitoring station.
7. Institution of a regularly scheduled

ACKNOWLEDGMENT

This survey was conducted as part of the Fourth Accelerated District Health Managers' Course conducted by the Training and Demonstration Centre, Ministry of Health of Ethiopia.

The survey was supported through an International Research Development Centre of Canada grant to the McGill-Ethiopia Community Health Project.

REFERENCES

1. Measuring change in nutritional status, Guidelines for assessing the nutritional impact of supplementary feeding programmes for vulnerable groups. WHO publication. 1983.
2. Asefa, M. and Ahmed Z. Health status in the new peasant cooperative in Gondar region, Ethiopia. *Eth. Med. J.* 1986; 24(123).
3. Ethiopia, Ministry of Health. Primary Health Care review document. 1985.
4. Ethiopia, Ministry of Health. Report on rural health surveys. 1982-83;1.
5. Provisional Military Administrative Council, Socialist Ethiopia, ten year perspective plan, 1984-85 to 1993-94.
6. Abdulkadir, J. Utilization of traditional medicine among hospital admitted patients in Addis Ababa. *Eth. Med. J.* 1986; 24(2).

FOCUS GROUP IDENTIFICATION OF BARRIERS TO THE USE OF MODERN CONTRACEPTION IN THE GARA MULETA DISTRICT OF EAST HARARGHE

Mengistu Asnake*, MD, MPH, & Charles Larson**, MD, MSc, FRCP(C)

ABSTRACT: With a crude growth rate in excess of 5% for the district and a contraception prevalence rate of less than 1%, the identification of barriers to the use of modern contraception was made a priority by the district health management team of Gara Muleta District, East Hararghe Administrative Region. As very little was known about barriers to use, it was decided to conduct focus group sessions with specific homogeneous groups of interest. These were young married males and females, older men and women (> 45 yrs), clergymen, and trained traditional birth attendants. Samples of each were taken from urban and rural settings. Large disparities based on sex and whether urban or rural dwellers were identified. Specific gaps in knowledge and misinformation regarding modern contraception were identified upon which the planning of initial family planning interventions will be based.

INTRODUCTION

The crude rate of growth in Ethiopia is estimated to be about 3% per year (1). With such rates of growth the population of Ethiopia will reach 100 million by the year 2015. In a recent survey conducted in the district of Gara Muleta, located in the eastern region of East Hararghe, the crude birth rate was estimated to be 68 live births per 1000 inhabitants (2). This, combined with a crude death rate of 18 per 1000 inhabitants, results in a crude growth rate of 5.0% and a population doubling time of less than 15 years. There are several consequences of the rapid growth rate in Gara Muleta. At present approximately 50% of the population is under 15 years of age and women of child bearing age between 15 and 49 constitute another 20%.

(2). These populations are particularly vulnerable to preventable causes of morbidity and mortality. The infant mortality and maternal mortality rates are estimated to be 153 and 10 per 1000 live births respectively. The Ministry of Agriculture has identified Gara Muleta as a food security problem area. Rapid increases in population can be expected place increase burdens upon the already marginal food supplies in the district.

Gara Muleta is a predominantly rural population of 180,000 inhabitants. Little is known about their knowledge and attitudes towards modern contraception. Less than 1% of eligible women are using modern contraception methods (2). Given this information, the district health management team identified family planning as one of its highest priorities. However, prior to the planning of specific interventions it

*Regional Health Department, East Hararghe Administrative Region, Harar, Ethiopia

**McGill-Ethiopia Community Health Project

Dept. of Epidemiology & Biostatistics, McGill University,
Montreal, Quebec, Canada

0

This research was funded through a Canada Fund Grant from the Canadian Embassy in Addis Ababa, Ethiopia

was decided more information was required regarding the population's understanding and interest in family planning and barriers to the use of modern contraception methods. The purpose of this study was to gather baseline information on these subjects through focus group discussions with particular subgroups of the population thought to have influence over the decision to institute family planning practices.

METHODS

Study Design: Focus group discussion (FGD) methodology was employed. This is a qualitative method which involves in-depth discussion sessions with a small (4 to 8), homogeneous group of subjects (3). They are conducted in neutral, non-threatening settings which are intended to foster free and spontaneous discussion. This study employed a trained nurse to animate the discussions and each session lasted between one and two hours. Responses were recorded by a research assistant who did not participate in the discussion.

Population: The FGD's were conducted in one urban (Girawa town) and one rural area of the district. The make up of the groups was as follows; rural [young (<30 yrs) married females, young married males, older (>45 yrs) males, community health agents] and urban [young married females, older women, trained traditional birth attendants, priests (Ethiopian Orthodox Church)].

Focus Group Discussion Content: The nurse animator was provided a general guideline which would insure the following topics were included in the discussions; optimal age at first marriage, family size, interval between pregnancies, family decisions about spacing, knowledge about modern contraception and their sources.

RESULTS

Tables 1 and 2 summarize the results for rural and urban focus groups. Among the rural groups, the optimal age at first marriage was consistently thought to be at 15 for a female and between 17 and 20 years of age for a male. Urban opinions varied more with the range for females being between 12 and 18 years. The younger ages given by the priests interviewed is to be noted. The most common reason given for early marriage was "to avoid spoiling of girls". Other frequently mentioned reasons for early marriage had to do with an early start on children who will help support the family and to improve the relationship between husband and wife (an early marriage results in a stronger bond between the two).

Groups were asked what represented too few and too many children. Here there were large differences between rural and urban dwellers, with larger families envisioned as more optimal among the rural groups. The largest estimates of family size came from the priests' focus group, however it was stated in this group that "instead of increasing food production, it is better to decrease the number of consumers". Common reasons given for larger families were increased family wealth, many workers, and God's will. It was also commonly acknowledged among the rural groups that too few children would invite the husband to search for another wife. Lack of knowledge about contraception was mentioned as a reason for too many children among the urban groups.

There seemed to be a general consensus among the focus groups that spacing between children should be 2 to 3 years. The one exception being young rural women who preferred a one year spacing. This group mentioned fear of divorce and community rumors of sterility as reasons for short spacing. Regarding how partners should decide on spacing, urban groups felt it was necessary that both be involved, while among rural groups this was not discussed between partners and was considered a male prerogative. Both urban and rural groups equated spacing with the health of the mother and her children.

A large variety of alternative contraceptive methods were identified, including herbs, rhythm method, breast feeding, injections, condoms, loops (IUD's), and the birth control pill. It was widely believed that the BCP

provided through health institutions induce abortion, which is contrary to religious teaching. Lay knowledge of modern contraception methods was most complete among young married males.

Misconceptions about modern contraceptive methods were prevalent in all the focus groups conducted. The birth control pill was thought to lead to weight loss, heartburn, weakness, and

Table 1. Focus group discussion (rural)

	Type of focus group			
	Young married males (5)	Young married females (5)	Elderly males >45 yrs (5)	Community health agents (3)
Age of first marriage				
males	15	15	15	15
females	17	20	18-20	20
family size				
Few	7	4	<6	5
Many	12	10-13	8-12	11
Interval between pregnancies	2yrs	1yr	2 yrs	3-4yrs
Decision for spacing between partners	No decision	No decision	No decision	No agreement
Known contraceptive	-pills	No knowledge	Methods in Health institutions (unspecific) - Herbs, religions belief	- Rythm method - Breast feeding - Pills, condom, - Root of bambo Feeling of sterility
	-Injection			
	-condom			
Rumors on side effective s of contraceptives	Skin pigmentation	No knowledge	No knowledge	
	Clotting of			
	Menstrual blood			
	Infection of the			
	Uterus			
Source of knowledge on contraceptives	Health post		- Mass media	- Health institutions
	Radio		- Freinds	- Friends
	Freinds		- Health workers	
	From the town		- From the town	
	Type of focus group			
	Young married males (5)	Elderly women >45 years (5)	Trained TBA's (4)	Orthodox church priests (4)
Age of first marriage				
males	18	13	14-15	12-15
females	20-25	18	20	15-18
family size				
Few	2-3	3-4	2-3	<6
Many	6-7	12	9-10	14
Interval between pregnancies	3yrs	3 yrs	2-3yrs	3yrs
Decision for spacing between partners	Necessary	Necessary	Necessary	Necessary with God's will
Known contraceptive	- Rythm methods	- Breast feeding	- Breast feeding - Rythm method - Pills - Herbs	- Rythm method - Condom - Pills
	- Pills	- Pills		
	- Injection	- Herbs		
	- Condom			
Rumors on side effective s of contraceptives	- Loss weight	- Heart burn	- Weakness	- Loss of weight
	- Obesity	- Loss of weight	- Joint pain	
	- Melting of loop	- Pregnancy	- Accumulation of the pill in the body	
Source of knowledge on contraceptives	- Radio	- Health institution	- Mass media	- Health institution
	- Health institution	- Public meeting	- Freinds	- Mass media
	- School	- Social gathering	- Health workers	
	- Freinds	(Idir, Holidays)	- From the town	

joint plans. Others mentioned fear of the loop melting. Almost all felt side effects were likely to occur in those with inadequate dietary intake.

DISCUSSION

One of the principal advantages of focus group discussions is their ability to elicit a large amount of information in an efficient manner(4). In terms of the human and physical resources required, the cost of conducting focus group studies is considerably less than that of a survey or analytic research designs. Limiting factors are the qualitative nature of the information obtained, difficulties in summarizing the information, and concerns about the generalizability of the findings.

From this investigation it is evident that in rural and urban communities in Gara Muleta expectations regarding the optimal age of marriage and family size will need to be carefully considered by health educators in the district. Women are expected to marry and have children at a young age. Decisions about family size and spacing are generally not openly discussed and are dominated by males. Health education programs may therefore be more effective if their content and presentation are planned with specific subgroups in mind. In addition to women of childbearing age, these could include adolescent males and females, husbands, and community and religious leaders who have an influence over family planning decisions.

Widespread misinformation about the ill-effects of modern contraceptive methods will also impair further progress with family planning programs in the district. Fears of sterility and abortion following use of the birth control pill are common. Health education will need to directly address these concerns and encourage people to openly discuss these two important issues. If not included in health education it is likely the local population will continue to distrust modern contraception and reject its use.

This study was restricted to only a small segment of potential focus group participants. The findings should be considered preliminary, with continued group discussions indicated among a wider spectrum of communities throughout the region.

REFERENCES

1. United Nations Children's Fund. Children and Women in Ethiopia. The Children, Family and Youth Service Organization, Addis Ababa, Ethiopia, August, 1989.
2. Asnake M. Health profile and action plan for Gara Muleta District. Ministry of Health. 1990.
3. Kahn ME, Anker M, Patel BC, Barge S, Sadhwani H, Kohle R. The use of focus groups in social and behavioral research: Some methodological issues. *Wld Hlth Statist Quart.* 1991;44:145-9.
4. Morgan DL. Focus groups as qualitative research. *Qualitative research methods*, Vol 16. SAGE Publ, Inc., 1988.

BLOOD PRESSURE DISTRIBUTION AND HYPERTENSION IN TWO RURAL COMMUNITIES OF GONDAR REGION, ETHIOPIA.

Zein Ahmed Zein, MD*, Tekleberhan Berhe**, Teshome Assefa**
and Yared Fantaye**

ABSTRACT: The purpose of this study was to document the distribution of blood pressures and the prevalence of hypertension in two rural communities located in the northwestern Gondar Region of Ethiopia. Based upon a systematic random sampling, 226 households (724 persons) were selected. Mean systolic and diastolic blood pressures (SBP and DBP) were calculated separately for male and female children (5 -15 years) and adults. Among male and female children the mean SBP's were 110.0 +/- 9.5 and 113.4 +/- 10.0, while the mean DBP's were 73.8 +/- 8.2 and 73.8 +/- 7.9, respectively. The difference in mean SBP's was statistically significant ($p < 0.05$). Among adult males and females the mean SBP was 118 +/- 13.3 and 114.0 +/- 14.5, while the mean DBP was 73.5 +/- 8.2 and 72.7 +/- 9.2 respectively. The difference in mean SBP's was statistically significant ($p < 0.05$). Blood pressure was found to rise with age. The prevalence of hypertension in children was 4.3% and in adults 2.7%. Prevalence rates were not significantly different in females and males.

INTRODUCTION

Blood pressure distributions among Ethiopian populations have not been extensively studied. The few studies conducted in Ethiopia have concentrated on the detection of hypertension (1). It has been reported that Ethiopian highlanders have a higher average blood pressure than lowlanders (2). Research done in several isolated and primitive communities in Chile, New Guinea, the Easter Islands, and among rural African and Asian populations have found little or no increase of systolic or diastolic blood pressure with increasing age in adults (3). This is in contrast to industrialized societies and underdeveloped populations assimilated into western lifestyles and diets, in whom increasing blood pressure with age is well documented (2). One study conducted in rural Ethiopian communities has found that blood pressure rises with age (4).

The aims of this study are to determine the blood pressure distribution and prevalence of hypertension within two typical rural communities located in the northwestern Gondar Region of Ethiopia (Wawa and Tsehay Egir Cherkos).

*Dept of Community Health, Gondar College of Medical Sciences

**Senior medical students, Gondar College of Medical Sciences

METHODS

Study Design: A cross-sectional, descriptive survey was undertaken in April 1990, in two settlement areas located in Dembia Awraja; lowland communities situated southwest of Gondar town. The total population of the two settlement areas (Wawa and Tsehay Egir Cherkos) is 4430 (5-8). The population is typical of rural farming communities in northwestern Ethiopia, whose economy is subsistence agriculture. Cereals and legumes are the staple diet, but beef and mutton are also eaten occasionally.

Population: All residents of the two communities were eligible for entry into the study. Households were enumerated and then study subjects selected on the basis of a 1:4 systematic random sampling of households. All members of

Table 1. Mean systolic (SBP) and diastolic (DBP) blood pressures by sex among children and adults

	SBP		DBP	
	Mean +/-1SD	(95% CI)	Mean +/-1SD	(95% CI)
Children				
male	110.0 +/-9.5	(108.5,111.5)	73.8 +/-8.2	(75.2, 75.1)
female	113.4 +/-10.0	(111.6,115.2)	73.8 +/-7.9	(72.4,75.2)
Adults				
male	118.1 +/-13.3	(116.3, 119.9)	73.5 +/-8.2	(72.4, 74.6)
female	114.0 +/-14.5	(112.2, 115.8)	72.7 +/-9.2	(71.5,73.9)

the household were entered into the study. Of 243 selected households, 226 were surveyed. The age-sex breakdown was as follows: children, 153 males and 125 females; adults, 360 males and 364 females.

Measurement: An aneroid sphygmomanometer (cuff size 12cm x 15cm) for adults and a mercury sphygmomanometer (cuff size 8 x 15cm) for children were used to measure blood pressure.

Measurements were made on the right arm. This was done after the arm had been comfortably supported in semi-flexion. The cuff was applied firmly to the arm and then quickly inflated to 20-30 mm Hg above the pressure at which the radial pulse was no longer audible. The stethoscope was applied to the arm overlying the point at which the brachial pulse had been palpable. Cuff pressure was allowed to fall and the point at which the audible pulse beat occurred was taken as the systolic blood pressure and the Kortkoff sound V as the diastolic blood pressure. The measurement was taken twice in a one minute interval and the average value was recorded.

The WHO definition of hypertension was used to identify hypertensive above the age of 15 years. For those 30 to 64 years, a systolic blood pressure of 160 mm Hg or above and a diastolic blood pressure of 95 mm Hg or above were used as cut off points. For subjects between the ages of 16 and 29 years, the cut-off values were 150 mm Hg systolic and 90 mm Hg diastolic. For those 65 years and above, the cut-off values were 165 mm Hg systolic and 95 mm Hg diastolic (9). For children 15 years and under hypertension was defined as 2 SD greater than the mean systolic or diastolic estimate derived from the study population (10).

Prior to the survey, piloting was conducted in ten households in order to standardize measurement procedures and reduce inter- observer bias.

RESULTS

Sex specific frequency distribution curves for systolic and diastolic blood pressures among children and adults are summarized in figures 1 through 4. Figures 1 and 3 illustrate lower but generally symmetrical systolic distribution curves among females.

The diastolic blood pressure distribution among adult males (figure 4) is bimodal with modal values in the ranges of 70-74 and 80-84 mm Hg. The frequency distribution curve for adult females is symmetrical with a modal value in the 70-74 mm Hg range.

Table 1 summarizes the mean systolic and diastolic blood pressures for adults and children by sex. Standard deviation and 95% confidence intervals are included for each estimate. The male-female differences in mean systolic blood pressure for children and adults is significant ($p < .05$). Figures 5 and 6 summarize the change in mean systolic and diastolic blood pressures with increasing age in children and adults. There is no significant change in BP with increasing age among children. For adult males and females there is a trend towards increased diastolic and systolic blood pressure with increasing age.

The overall prevalence of hypertension was found to be 3.3%. The prevalence rate in children was 4.3%. Among adults 2.7% had hypertension. The prevalence rates in adult females and males were 2.9% and 2.4%, respectively. This difference is not statistically significant.

Although systematic random sampling was used through out, X^2 goodness of fit test revealed that data did not come from a normally distributed population.

DISCUSSION

This study suggests that, as in other rural populations within developing countries, mean systolic and diastolic blood pressures are lower than those found in industrialized societies(4,11). These findings are also lower than those reported in surveys of urban Ethiopian populations (12,13).

We have found that adult mean systolic blood pressure is higher in males than females, whereas the diastolic blood pressure is almost the same. Conversely, among children the mean systolic blood pressure was higher among females than males, while the mean diastolic blood pressure was essentially identical.

These results are not free of potential sources of bias. Non-differential information bias could be due to stress imposed upon subjects not accustomed to modern medicine home visitors and the unfamiliar blood pressure apparatus (BP cuff). Blood pressure was measured in adults before children in order to minimize this effect in the latter.

Previous studies in less developed communities throughout the world show that blood pressure does not rise with progression in age (14). Two studies done in Ethiopians (14) claim that this situation holds true among Ethiopians as well. Our results indicate that blood pressure increases with progression in age. This result is in accordance with other previous studies conducted in Ethiopia (4,11-13) and in developed countries. Nevertheless, stress, concurrent pathology, and high salt intake could be important sources of distortion which this study does not control for.

The overall prevalence of hypertension in the world is reported to range between 8 and 18% (2). In this survey the results are much lower, at 3.3%. This may be explained, in part, by the relative absence of several important risk factors for hypertension in the population studied. These include the relative absence of obesity, smoking, and a high dietary caloric/cholesterol intake. This finding indicates that hypertension may not be a great public health problem in rural Ethiopia at the present time.

In the pediatric age group, hypertensive children accounted for 4.3% of the population. This prevalence is greater than that of the adults. The higher prevalence could have been caused by secondary hypertension due to glomerulonephritis, which is common in the region. A urine examination was not included and it is therefore not possible to objectively estimate the potential influence of renal disease. Although an adjustment in cuff size was made for children, this may not have been adequate and could account for a spuriously high estimate in both mean blood pressures and the proportion with hypertension.

Statistical test using X^2 goodness test revealed that our sample was not taken from a normally distributed population. This may be due to differential rates of migration or infant mortality.

Figure 1. Frequency distribution of systolic blood pressure

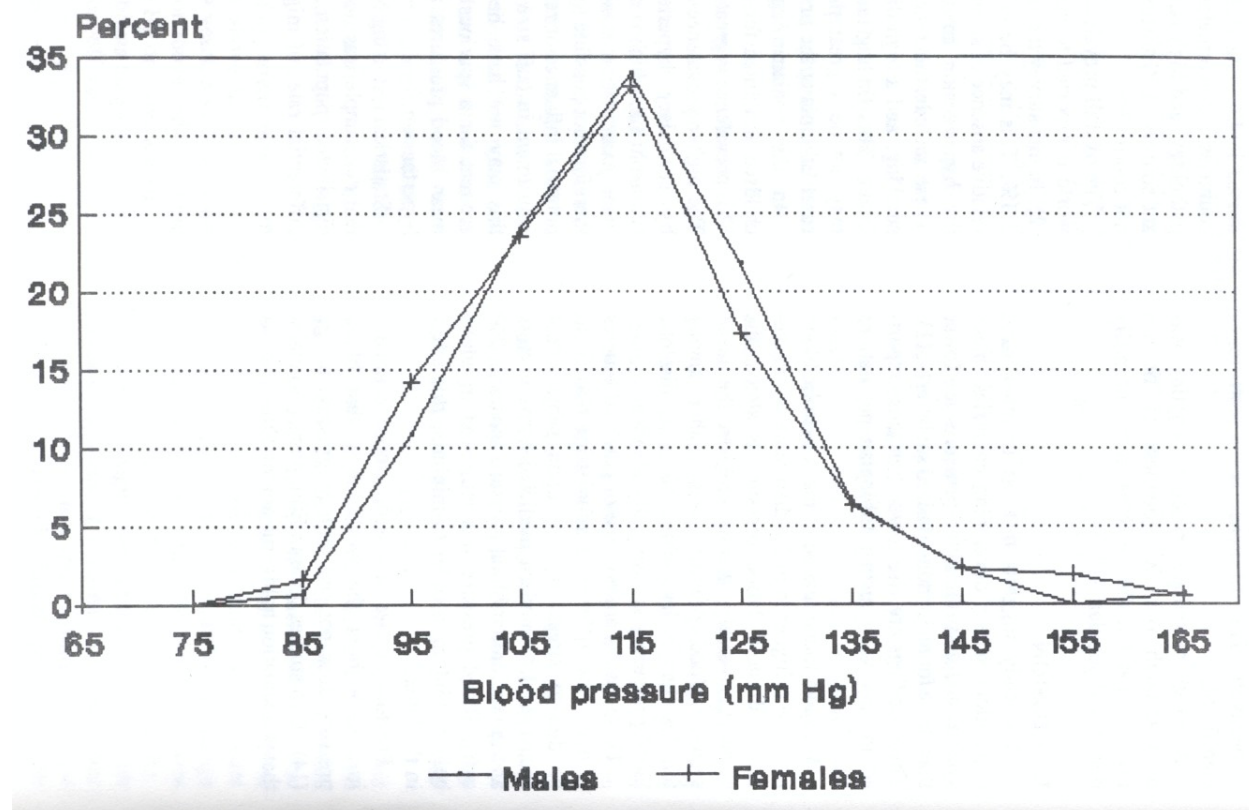


Figure 2. Frequency distribution of diastolic blood pressure

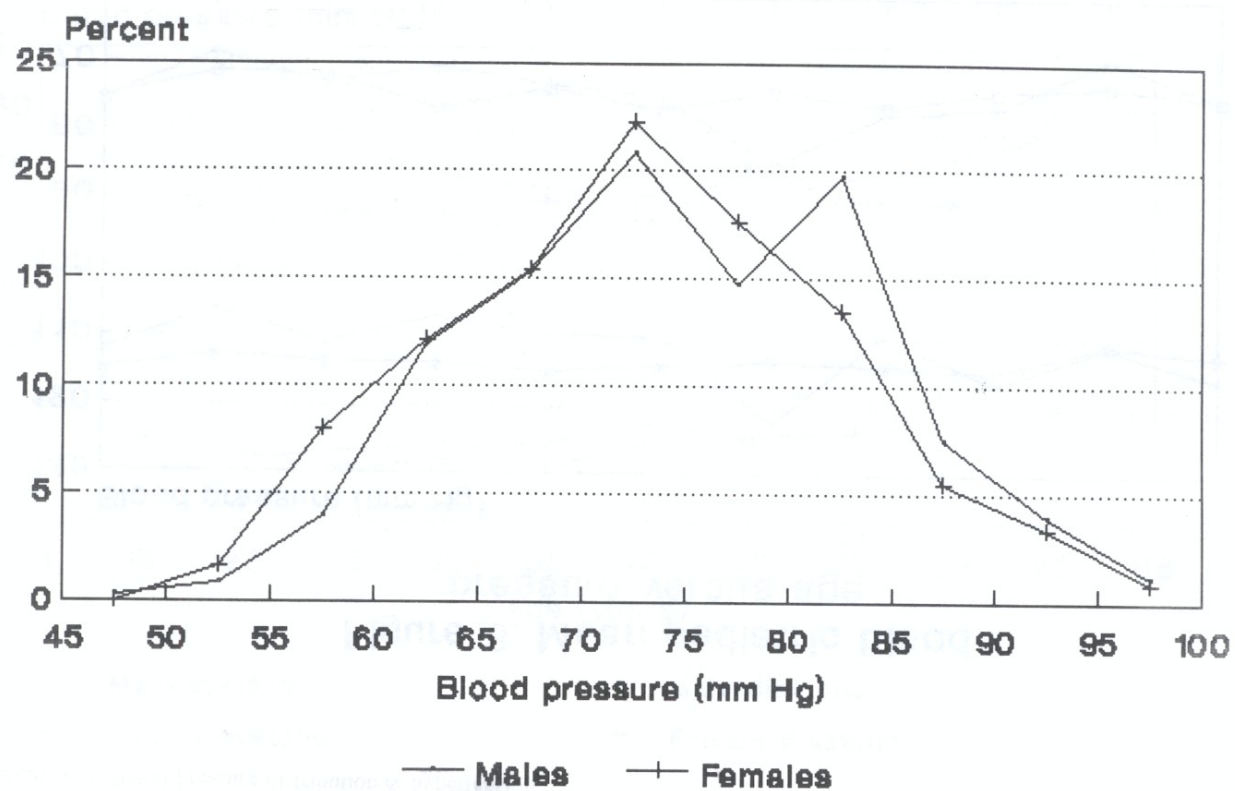


Figure 3. Mean pediatric blood pressure versus age

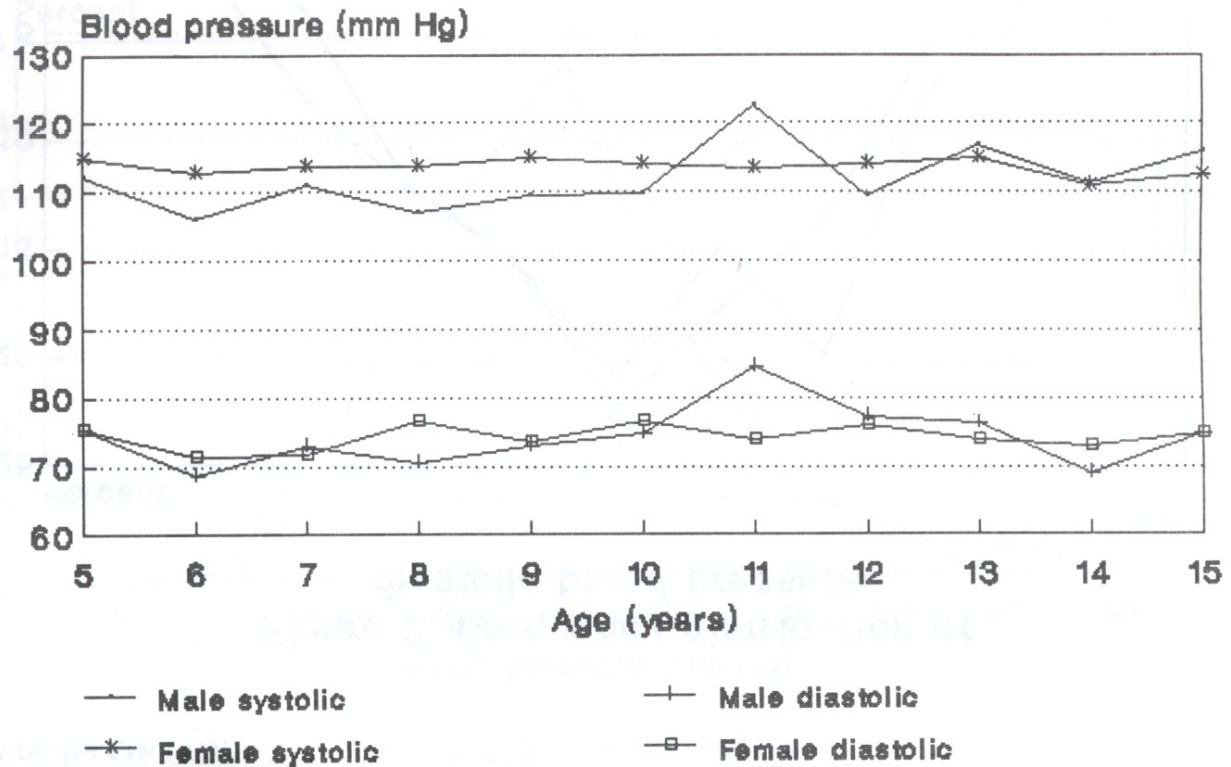
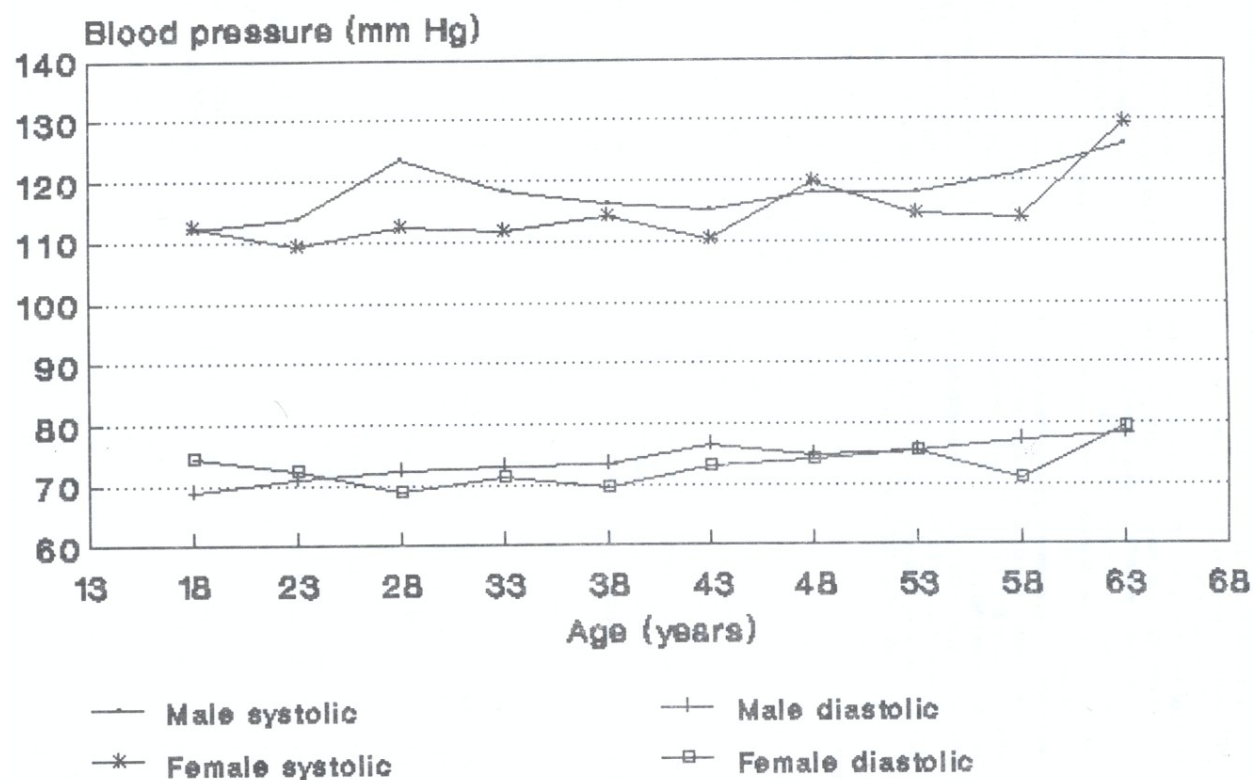


Figure 4. Mean adult blood pressure versus age



REFERENCES

1. Bayu Teklu. The prevalence of hypertension in Bank employees. *Eth. Med. J.* 21, 217, 1983:217-21.
2. WHO. Arterial hypertension. Technical Report Series. No. 628, Geneva. 1978.
3. M. Afzal Mir, Farooq Mir, Triloke Khosla, Robert NewCombe. The relationship of salt intake and arterial blood pressure in salted tea drinking kashmiris. *International Journal of Cardiology.* 13, 278-288.
4. Zein Ahmed Zein and Makonnen Assefa. *Eth. Med. J.* 24, 169. 1986:169-178.
5. Abu Beyene, et al. Community diagnosis of Wawa villages I and Farmers Cooperatives, November 1989:12.
6. Asfaw Wondimu, et al. Community diagnosis of Wawa village II, January 1990:13.
7. Solomon Melaku, et al. Community diagnosis of Tsehay Egir Cherkos village I. 1988-89:14.
8. Anteneh Addisu, et al. Community diagnosis survey at Tsehay Egir Cherkos village II, March 1989. 1988-89:12.
9. World Health Organization. Arterial hypertension and ischemic heart diseases: preventive aspects. No.231, Geneva. 1962.
10. C. Henery Kempe, Henry K. Silver, Donough O'Brain. Hypertension in children, current pediatrics diagnosis and treatment. California, 1980:525.
11. Interdepartmental Committee on nutrition for national defense. Ethiopian nutrition survey. Ministry of Defense. Washington D.C., USA. 1959.
12. Parry, EHO. Ethiopian cardiovascular studies, III. The casual blood pressure in Ethiopian high landers in Addis Ababa. *East Africa Med. J.* 1969;46, 246-251.
13. Lester, FT. Blood pressure levels in Ethiopian out-patients. *Eth. Med. J.* 1973:11, 145-154.
14. Shaper, AG. Communities without hypertension in Cardio-vascular diseases in the tropics (eds. AG Shaper, MSR Hutt and Z Fyfar) British Medical Association, London. 1974: 77-83.

PREVALENCE OF ANEMIA AMONG ELEMENTARY AND HIGH SCHOOL STUDENTS LIVING IN GORGORA

Melake Berhan Damena*, BSc.MPH, Habteab Besuamlac**, Asferd Mengesha**,
Dawit Mihrete**, Asmelash Fisseha**, Yeshitila Hailu**

INTRODUCTION

Anemia may be defined as a state in which the level of hemoglobin in the blood is below that which is expected, taking into account both age and sex (1). Patients with anemia have significant reduction of red cell mass and a corresponding decrease in the oxygen carrying capacity of the blood. Normally blood volume is maintained at a nearly constant level, therefore anemia entails a decrease in the concentration of red cells or hemoglobin in peripheral blood. The presence of symptoms related to anemia depend partly on this severity but also on how rapidly the anemia has appeared.

The purposes of this investigation were to determine the point prevalence rate of anemia among elementary and high school students and to identify important determinants of its occurrence among students residing in Gorgora (south Gonder). This study is not aimed at identifying anemia of specific causes, but will use technologies appropriate to the field situation and search among risk factors known to be prevalent in the region.

METHODS

Study Design: A cross-sectional descriptive survey for the presence of anemia was conducted in the elementary and high schools located in Gorgora during the month of November, 1990. Gorgora is a small town in North Gondar Administrative Region, found 60 km southwest of Gonder-town in, the temperate, lowland region of the Lake Tana basin. Subjects found to be anemic were matched with normal subjects and a case-control analysis applied.

Population: All students attending any of Gregoras' elementary or secondary schools were eligible to enter this study. Subjects were selected on the basis of a multistage random sampling procedure. First, all students were classified by grade and three grades from each school were randomly selected. Next, from each school three student classes (sections) within each grade were randomly selected. From this procedure 300 students were selected of which 295 were enrolled. This accounted for 24.0% of the eligible student population. Ages ranged from 7 to 31 years.

Measurement: Packed cell volume was determined by filling heparinized micro hematocrit tubes with blood from free flow finger pricks. The tubes were then sealed with plasticine and centrifuged in a micro-hematocrit centrifuge within two hours at 12,000 revolutions per minute. These were read immediately on a micro-hematocrit reading scale. Anemia is defined as the minimum point set forth by Harrison's principles of Internal Medicine (1). The PVC (%) cutoff points were as follows; ≤ 10 years, 31.0; 11 to 15 years, 34.0; ≥ 16 years, males 42.0 and females 37.0. A thin blood smear was taken from those found to be anemic and blood morphology examined by light microscope.

*Dept. of Community Health, Gondar College of Medical Sciences

**Senior Medical Student, Gondar College of Medical Sciences

A student found to be anemic (cases) was age and sex matched to a student with a normal PVC (control). An abdominal physical examination for organomegaly and a microscopic stool examination (formalin-ether method) was completed on all cases and controls.

An experienced laboratory technician from the Gondar College of Medical Sciences (GCMS) Hospital supervised all laboratory procedures and pretesting was done to minimize inter-observer bias.

Analysis: Descriptive statistics were used to calculate rates. T-test and chi-square statistics and odds ratio calculations were used in the bivariate analyses. A p-value ≤ 0.05 was taken as statistically significant.

RESULTS

There were 156 males (52.9%) and 139 females (47.1%) enrolled in the study. The age distribution was as follows; 79 (26.8%) 7-10 years, 157 (53.2%) 11-15 years, and 59 (20.0%) 16 years and above.

The mean hematocrit values by age and sex are summarized in table 1. It can be seen the mean hematocrit value rose with age and was similar for males and females up to age 15, with the mean in women over 15 being approximately 4% less.

Table 1. Distribution of packed cell volume among the students by age and sex.

Age Group (years)	Males			Females		
	No.	PCV X $\pm$ S.D	Reference range	No.	PCV X $\pm$ S.D	Reference range
7-10	44	40.3 $\pm$ 3.1	34.1-46.5	35	40.5 $\pm$ 2.7	35.1-45.9
11-15	70	42.1 $\pm$ 3.8	34.5-49.7	87	42.1 $\pm$ 4.3	33.5-50.7
≥ 16	42	45.2 $\pm$ 3.3	38.6-51.8	17	41.3 $\pm$ 4.7	31.9-50.7

The number and percentage of anemic persons found are presented in Table 2. It is noted that no subjects 10 years of age and under were identified as anemic. The overall prevalence rate of anemia was 11.9% with the 95% confidence interval being 10.6% to 13.2%. From microscopic examination, 17 (48.6%) were microcytic-hypochromic and the remainder were normocytic-normochromic. Stool examination and odds of exposure to specific parasites between cases and controls are summarized in table 3. The commonest parasites identified were ascaris lumbricoides, schistosoma mansoni and trichuris trichuria.

Those with microcytic-hypochromic anemia were compared with those with normocytic-normochromic anemia for odds of exposure to schistosoma mansoni infection. Those with microcytic-hypochromic anemia were 3.71 times more likely to have a stool exam positive for schistosoma. On physical examination only one anemic individual was found to have splenomegaly.

DISCUSSION

The age-sex specific mean hematocrit values obtained from each of the three age groups evaluated are generally comparable to those previously reported for Ethiopians (3-8). In general for each age group considered the mean packed cell volume exceed those levels obtained in comparable age groups in other tropical countries (9).

There were no significant differences in the mean hematocrit values of male and females children. Among adults, however, the sex differences were significant, ($P<0.01$). Again this is consistent with other developing and developed populations and may be attributed to the monthly menstrual blood loss.

The prevalence rate of anemia in our study was found to be lower than that reported by previous research carried out in the region (8). This could be due to the size and age range of the study population and differences in the methods applied, especially in the criterion used to define anemia. We chose PCV % because

Table 2. Prevalence of anemia among the students by age and sex.

Age Group	Males			Females				
	Anemic			Anemic				
(years)	Examined	No	%	Examined	No.	%	Total examined	Percent anemic
7-10	44	0	0	35	0	0	79	0
11-15	70	14	20.0	87	15	15	157	18.5
≥ 16	42	4	9.5	17	2	2	59	10.2
Total	156	18	11.5	139	17	17	295	11.9

of its ease of determination and wide use in clinics throughout Ethiopia. There were no significant sex or age differences in the prevalence rate of anemia ($P>0.05$).

In this study a high intestinal parasitic infestation rate was observed in both anemic cases and normal controls. There was a statistically significant difference between the anemics vs. controls in odds of exposure to schistosoma mansoni infestation. As well, there was a significantly decreased odds of exposure to a negative stool examination for parasites among those with anemia. Given the cross-sectional design of this study, it is not possible to determine the directionality of cause and effect in the parasite anemia relation.

Table 3. Odds of exposure to specific parasites in those with and without anemia.

Parasite	Anemia n(%)	Normal n(%)	Odds ratio	(95%CI)
Ascaris Lumbricoides	22(62.9)	20(57.1)	1.38	(0.53, 3.59)
Schistosoma mansoni*	15(42.9)	3(8.6)	8.00	(2.05, 31.2)
Trichuris trichuria	7(20.0)	3(8.6)	2.67	(0.63, 11.3)
Negative*	4(11.4)	12(34.3)	.247	(0.07, 0.87)

$P<0.05$

REFERENCES

1. Harrison's. Principles of Internal Medicine. 11th edition, 1987; 262-266, 1489-1526 and Table A-12.
2. L. Helen Jeyakuman, E.O Akpanyung, A.A Akinyemi and G.O.E Merole. An investigation into the iron status of children with sicklecell disease in Western Nigeria. *J.O.T. pediat*, Vol.33, 326-328.
3. Hofvandar Y. Hematological investigation in Ethiopia, with special reference to a high iron intake. *Acta Med Scand* 184, Supplement 494, 1968; 1-74.
4. Interdepartmental Committee on Nutrition for National Defence. Ethiopian nutrition survey, Ministry of Defence, Washington D.C., USA. 1959.
5. Ross S.M. Haemoglobin and Hematocrit values in pregnant women on a high iron intake and living at high altitude, *J. Obst. Gynecology Br. Common Wealth*, 1972; 79:1103-1107.
6. Abdulkadir, J. Bolodia, G. Tegege, N. Senta, M. Alemu, A. and Tessema, D. Haemoglobin and Hematocrit levels in young adult Ethiopian. *Eth. Med. J.* 1978; 16:5-8.
7. Peters, W.H. Hematocrit and Haemoglobin levels in adult males and in pregnant and non pregnant females in Northern Ethiopia. *Eth. Med. J.* 1984; 22:17-27.
8. Zein Ahmed Zein and Makonnen Assefa. The prevalence of anemia among populations living at different altitudes in North Western Ethiopia. *Eth. Med. J.* 1987; 25:105-110.
9. Gilles, H.M. Normal Hematological values in tropical areas. *Clin. Hematol.* 1981; 10:697-706.
10. World Health Organization. World Health Statistic quarterly. 1985; 38, 3:302-316.
11. Ministry of Health Ethiopia. Comprehensive health service directory. Planning and Programming Bureau, MOH, Addis Ababa. 1986; 167.

RESPONSE OF PLASMODIUM FALCIPARUM TO CHLOROQUINE IN HOSPITALIZED PATIENTS AT SIDAMO REGIONAL HOSPITAL

Wondwossen Desta*,MD & Yohannes Gebrat**,MD

ABSTRACT: The response of *p.falciparum* to a standard regimen of chloroquine (25 mg/kg body weight) was studied in 38 patients (27 males, 11 females) hospitalized at Sidamo regional hospital, Yirgalem, southern Ethiopia. Resistance occurred in 44.7% of the patients, 64.7% RI, 5.9% RII and 28.4% RIII. Resistance rates were highest (75%) in children below 9 years of age. Of those resistant to chloroquine all except one showed clearance of parasitemia and clinical cure after Quinine or Sulfadoxine pyrimethamine (Fansidar). This study has confirmed the presence of chloroquine resistant strains of *p.falciparum* in the area. It is recommended that additional in vitro and in vivo studies should be done in order to rationalize the use of alternate drugs like Quinine more economically.

INTRODUCTION

P.falciparum resistance to chloroquine has been increasingly reported from all over the world. The first reports were simultaneously published independently from Thailand in 1962, Venezuela in 1960 and in Colombia 1960 (1). The first confirmed African cases were found in Tanzania (2) and Kenya (3) approximately 10 years ago. There have been studies completed in Ethiopia, Nazareth town (4) and Addis Ababa (5,6) and in both resistance was found.

The present study was undertaken to identify the existence of *p.falciparum* resistance to chloroquine which was suspected following an observed mortality rate in patients taking chloroquine at Sidamo regional hospital. We considered chloroquine resistance to *p.falciparum* as one of the potential factors for failure of response to treatment and consequent increase in mortality.

PATIENTS AND METHODS

This study was conducted from July 8 to August 8, 1988 at Sidamo regional hospital, 120 beds, located 317 km south of the capital Addis Ababa. A total of >150 patients presented to the hospital with fever during the study period. The following inclusion and exclusion criteria were used.

Inclusion criteria were a smear positive for *p.falciparum*, any age, willingness to stay 8 days in the hospital giving blood for examination daily.

Exclusion criteria included a positive Dill Glasco test, very low ($<1000/\text{cm}^3$) or very high ($>100000/\text{cm}^3$) parasite counts, pregnant women.

42 patients fit the study criteria of which 4 were excluded during 7 days follow up (2 vomited the drug, 2 missed follow up). 38 patients were successfully followed up and reported here.

*Medical Department, Medical Faculty, Addis Ababa University

**Sidamo Regional Hospital

Considering the first as day 0 blood smear is taken daily from each patient up to day 7. Smears (thin and thick) from each patient were stained with Giemsa 3% for 15 minutes. Parasite counts of thick smear per 300 Leucocytes were made by 2 separate individuals, experienced microscopists and the average is recorded after being multiplied by a factor of 20 taking 6000 WBC per mm^3 as a normal average count.

Chloroquine phosphate tablets (Ephraim) Batch No.509122.1 with 150 mg base were used. Each patient received a total of 25 mg base/kg in three divided doses orally (10 mg/kg on day 0, 10 mg/kg on day 1, and 5 mg/kg on day 2) (8). The dose used is higher particularly in children where difficulties arise in dividing tablets and syrups. The intermuscular route has been used in two patients. Injection was followed by oral tablets. Chloroquine absorption was checked by Dill and Glazco (DG) tests of urine in the first three consecutive days.

Frequent visits of patients were made to insure drug ingestion, and to exclude patients who vomited the drug in the first three days of hospitalization. Alternate drugs, Quinine 25 mg/kg daily for 10 days or Fansidar (525 mg tablets) half to three tablets according to age difference once orally were given to patients who failed to clear parasitologically or deteriorated clinically.

RESULTS

38 patients completed the 7 day study in the hospital. Parasitemia cleared in 21 (55.3%) patients. This makes the rest 17 (44.7%) patients resistant (Table 1). The mean parasite density index (10) calculated from table 1 is 7.30. No correlation was seen between the level of parasitemia and the clearance rate time. This is best exemplified by case No.31 who had very high count on day 0 but showed progressive and rapid clearance in contrast to case No.6 who presented with low count but failed to clear later. Many of the patients showed day to day fluctuation of parasite count (Table I). Of the resistant cases 11 (64.7%) patients showed resistant at RI level, 1 (5.9%) at RII and 5 (29.4%) at RIII levels (Figure 1). The youngest patient was one year old and oldest 70 years old. The highest resistance rate recorded was in those less than 9 years of age and no resistance was noted above the age of 50 years.

DISCUSSION

This study as in other in vivo studies tried to adhere to the WHO standard 7 day test (8). The resulting 44.4% resistance at various levels may seem high but was expected considering the treatment failures and deaths we had recently encountered in patients receiving chloroquine. The resistance rate would have been even higher if the follow up had been extended up to 28 days. Comparable hospital study in Tanzania (8) revealed 46.2% resistance, while 22 of 98 patients (22.4%) resistance was reported from an Ethiopian (5) in vivo field study. Hospital base studies show higher resistance rates. One explanation for this could be patients in the former group come from the community where self medication and under dosage is widely practised resulting in intense drug pressure and emergence of resistant strains.

The majority of our patients are RI (64.7%) and only a few patients are RII and RIII (35.3%). This resembled the Ethiopian study (5) which showed 63.6% RI versus 36.4% RII plus RIII and contrasts to the Tanzanian study (5). 7.7% RI versus 92.3% RII plus RIII. The high RI level of resistance in our study may indicate a better response of parasites to chloroquine, but on the other hand makes the follow up of patients difficult i.e. in RI parasitemia clears rapidly in few days but recrudescence occurs later while patients are at home where as in RII and RIII patients can be recognized earlier with clinical follow up and examination of blood smears.

Analysis of resistance in terms of age shows that three fourths of the patients below 9 years are resistant and almost all patients above 50 years of age are sensitive. The difference in immunity between adults and children has been suggested to explain this (9).

All cases resistant to chloroquine showed clearance after Quinine or Fansidar in an average of 2 days following the start of the treatment. We used Fansidar in the minority when we did not have Quinine. Both drugs are well tolerated and we have not seen major side effects except headache and transient loss of hearing and tinnitus in some. Case No.32 died despite Fansidar which was started on day 3. Quinine which is preferred in a comatose patient i.e.

Table 1. P.falciparum Response to Chloroquine in Vivo WHO 7-Day Test. (Mean of 6000 Leucocytes/mm³)

Patients Serial No.	No. of Trophozoites/mm ³ on Day								Classification of
	0	1	2	3	4	5	6	7	
1	>100000	7720	0	0	0	0	1180	3340	RI
2	46000	53360	90000	10650	16800	18360	Lost	8100	RIII
3	7200	6000	4000	5300	3000	0	0	0	S
4	Lost	600	0	0	0	0	0	0	S
5	1280	880	2360	Lost	24000	0	19920	2880	RI
6	7100	2860	9120	2280	16500	4200	4760	5820	RIII
7	48700	23400	20880	4160	10920	10180	5660	4160	RIII
8	22560	Lost	7120	0	0	0	0	3120	RI
9	17640	0	0	0	0	0	0	0	S
10	3200	0	0	0	0	0	0	900	S
11	>100000	20300	0	0	0	0	0	0	RI
12	5700	11700	0	0	0	0	0	0	S
13	1800	480	0	0	0	0	0	0	S
14	13400	6720	9820	6000	1500	4100	2320	5260	RI
15	2820	0	5940	0	0	0	0	0	S
16	7800	1020	680	0	0	960	0	0	S
17	15480	21920	27340	0	0	0	0	1560	RIII
18	2320	1760	600	900	0	0	0	0	S
19	2300	1320	0	720	200	400	0	0	S
20	22560	19600	16800	9840	4640	3080	880	0	S
21	100000	2760	8400	1320	0	0	0	0	S
22	21360	4860	4600	0	0	0	0	19200	RI
23	1100	1440	0	500	0	0	9400	540	RI
24	14400	10660	2160	1360	0	0	0	1380	RI
25	3900	0	0	0	0	0	460	340	RI
26	600	520	0	0	0	0	0	0	S
27	2700	0	0	0	0	0	0	0	S
28	500	360	100	0	200	0	0	760	RI
29	2100	0	0	0	0	0	0	0	S
30	2960	Lost	800	0	2480	0	0	320	RII
31	100000	12720	0	0	0	0	0	0	S
32	100000	>100000	90000	44600	50000	Exp	-	-	RIII
33	47300	14160	10440	5160	13000	1220	Lost	600	RII
34	1700	1280	0	0	0	0	0	0	S
35	1200	0	0	0	0	0	0	0	S
36	3740	640	0	0	0	0	0	0	S
37	8420	2040	5680	0	1700	0	0	0	S
38	2920	100	600	Lost	580	1220	1120	0	S

cerebral malaria (1) was not available at that time.

In summary, we know that chloroquine, still the drug of choice is widely used at all level of health institutions in the area for proved or some times suspicious cases of malaria. Little follow up of ambulatory patients is seen unless they come by themselves with reinfection or recrudescence. Though we agree that over use or misuse of other drugs should be avoided (11) supply of drugs besides chloroquine should be available at least to the hospitals.

In areas like Sidamo increased awareness of the problem by health personnel, follow up blood smears at least on day 3, 7 and 28 (in order to act appropriately) may be mandatory. Finally we recommend further in vivo and in vitro studies here and in other parts of the country so as to have uniform and proper use of alternate drugs like quinine.

ACKNOWLEDGMENT

We are indeed grateful to Dr. Sigmund Lende (former Medical Director of the hospital) for his continuous encouragement and advice. We are also in debt to Dr. Karl Roth Medical Director of the hospital for reviewing the manuscript and financial support. Our thanks go to Dr. Tedbabe Degife, Dr. Tenbit G. Tsadik, Dr. Beede Lemma, Dr. Tesfaye Kassa, Dr. Einar Eriksen, Ato Ephrem Olane for their continuous assistance by referring patients to us and for their hearty collaboration throughout the study. We are also grateful to W/o Aynalem and Ato Assefa (microscopists) for their help in counting the slides. Finally we thank W/o Wubit T. Mariam for her secretarial services.

REFERENCES

1. G.T. Strickland. Clinics in Tropical Medicine and Communicable diseases Malaria. April 1986.
2. Campbell, CCchin, W. Collins, WE, Teurschk S.M and Moss, D.M. Chloroquine Resistant *P.falciparum* from East Africa: Cultivation and drug sensitivity of Tanzanian 1/CDC Strain from and American Tourist. *Lancet*. 1979. 11: 1151-1154.
3. FOgh, S. Gepseu, Siand Effe ose, P. Chloroquine resistant *P.falciparum* malaria in Kenya. *Trans R. Soc. Trop. Med Hyg*. 1979. 73: 228-229.
4. Nigussie, Gabre Mariam, Yahya, Abdulahi and Assefa Mebrate. Preliminary studies on responses of *P.falciparum* to chloroquine in Nazareth Town, central Ethiopia. *Ethiop. Med. J*. 1982. 25, 209.
5. Teklehaimanot - A 1986 Chloroquine Resistant *P.falciparum* malaria in Ethiopia. *Lancet*. 2: 127-129.
6. Tsehay-Assefa. A case of plasmodium falciparum infection resistant to chloroquine. *Ethiop. Med. J*. 1987. 25, 209.
7. Lelijveld, J. and Kortman, H. The Eosin test of Dill and Glazko. *Bul. Wld. Hlth. Org*. 1970. 42, 477.
8. Advances in malaria chemotherapy. Report of WHO Scientific Group. WHO Geneva. 1984.
9. T.K. Mutabingwa, E. Hills, W.L. Kilama. Response of *P.falciparum* in hospital patients at Mugeza, Tanzania. *E. Afr. Med. J*. 1985. 62 No.3: 161-170.
10. Bruce-Chwatt, L.T. Parasite density index in malaria. *Trans. Roy. Soc. Trop. Med. Hyg*. 1958. 52, 398.
11. Malaria control as part of primary health care. Report of a WHO study group . *Technical Report Series*. WHO Geneva. 1984.

**Publication of this issue was financially supported by Addis Ababa University,
Ethiopian Science & Technology Commission (SAREC) and
McGill-Ethiopia Community Health Project**