ASSESSMENT OF GONORRHOEA AND SYPHILIS IN PATIENTS ATTENDING CLINICS FOR SEXUALLY TRANSMITTED DISEASES IN ADDIS ABABA

A THESIS SUBMITTED

TO

THE SCHOOL OF GRADUATE STUDIES

ADDIS ABABA UNIVERSITY

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR

THE DEGREE OF MASTER OF SCIENCE IN BIOLOGY

BY:

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MAY, 1993.

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ACKNOWLEDGMENT

I would like to express my deepest gratitude to my research advisors Dr. Berhanu Abegaze Gashe and Dr. Afeworki Gebreyohannes, for the invaluable time, patience, advice, and encouragement they have given me throughout the course of this work. My deepest gratitude also goes to the National Research Institute of Health [NRIH] for providing me with all the necessary support (financial and material) towards the successful completion of this research project.

I am grateful to Ato Fikre for helping me with the statistics. Finally I would like to thank W/t. Zewdnesh Ayele for typing the thesis with much care and patience and all others who contributed in anyway to the completion of this work.

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ABSTRACT

In this study a total of 754 individuals were involved. The study population was divided into 3 groups: a/200 (27%) pregnant women, b/105 (14%) students, and c/449 (59%) patients attending clinics for STDs. Blood samples collected from all members of the study population, were examined for syphilitic infection. A seroprevalence of 13%, 11.2% and 21.6% were found among pregnant women, students and STD patients by both RPR and TPHA respectively. The validity of RPR as a screening test was determined using sensitivity, specificity, percentage of positive predictive value and efficiency. Strong positives and positives by the RPR test can be considered as positive for syphilis. Only weak positives require retesting. Endocervical and urethral (male) discharge samples, collected from 233 STD patients in addition to the blood samples, were examined for the presence of *Neisseria gonorrhoeae*. The organism was isolated from 68 (29.2%) subjects. Among the isolates, PPNG strains comprised 48 (70%) of the samples. PPNG strains were resistant to penicillin (100%), ampicillin (96%), bactrim (91%) and kanamycin (22%). Of the non-PPNG strains 25% were resistant to pencillin, 20% to ampicillin, 40% to bactrim and 15% to kanmycin. Both groups were, however, sensitive to erythromycin, tetracycline, chloramphenicol and ceftriaxone.

INTRODUCTION

Sexually Transmitted Diseases (STDs) are a group of communicable diseases that are transferred predominately by sexual contact (Fulford, *et al.*, 1983). Despite the progress that has been made in the methods of diagnosis and treatment, STDs are among the major public health problem at large in almost all countries (Morse and Sarafian, 1984).

Sexually transmitted diseases are serious because they threaten health in a variety of ways. They can cause sterility, stillbirths, miscarriage, blindness, brain damage, disfigurement, cancer and even death. They threaten the newborn because they can be passed from the infected mother to the child (WHO, 1984). In addition there is a growing evidence that both ulcerative and non-ulcerative STDs facilitate the transmission and acquisition of HIV during sexual contact (WHO, 1991).

Over 20 pathogens have been found to be spread by sexual contact. The agents could be bacterial, viral, protozoan or fungal. Some of these agents such as Chlamydia trachomatis, human [alpha] herpes viruses, types one and two, human papilloma viruses, hepatitis B virus, and the acquired immunodeficiency syndrome retroviruses, are beginning to replace the 3 classical

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bacterial diseases (gonorrhoea, syphilis, and chancroid) both in importance and frequency. These agents, regarded as the second generation of sexually transmitted organisms, are frequently more difficult to identify, treat and control, and they can cause serious complications, some of which result in chronic ill-health, disability and death (WHO, 1986).

Although the exact size of the problem is unknown, there is at least one new STD consultation per 100 persons per year in industrialized countries, while in many developing countries STDs rank among the top 5 diseases for which health care services are sought. World wide figure would be much higher if age-specific rates were available for the age group 15 - 44 years old (WHO, 1991). For most STDs, the over all morbidity rate is higher for men than for women. The frequency of sexually transmitted infection is higher among single, divorced, and separated persons than among married couples. Individuals from the lowest socioeconomic groups have the highest morbidity rates (WHO, 1986).

Prevention of sexually transmitted infections is rendered difficult by a variety of factors, including the relative ease of transmission, the development of strains which are resistant to antibiotic treatment, the difficulty of changing sexual behavior, the lack of vaccine (except for hepatitis B), and in some cases, curative treatment. Other factors include the

lack of resources, increased travel and migration, and exchange of sex for drugs (WHO, 1990).

In addition to providing health service, health education is another effective method of curbing sexually transmitted diseases. However, in most regions of the world, formal education on sexual matters either does not exist, is inadequate or is provided to late in adolescence (Schryuer and Meheus, 1990).

How venereal diseases got started is an area of controversy. But they have been passed on through sex-related contacts. Famous emperors, kings, noblemen,poets, painters, and scholars as well as the low born, have been infected. Earlier in this century before modern antibiotics came on the scene, venereal diseases, were feared widely. Gonorrhoea was the leading cause of blindness and syphilis alone has been responsible for thousands of the world's crippled, blind, insane and dead. The most common of the serious STDs (excluding HIV infection) are the three classical diseases (gonorrhea, syphilis, and chancroid), chlamydia infections and herpes virus infections (WHO, 1989).

With the introduction of penicillin (around 1943) which provided a quick, safe and rapid treatment for both syphilis and gonorrhea, hopes were entertained that this would lead to the

elimination of these diseases as a public health problem or at least to their control (Willcox, 1961). Despite the availability of treatment and methods of diagnosis, every year over 200 million cases of gonorrhoea and over 50 million cases of syphilis are reported worldwide. In almost all of the industrialized (developed) countries, gonorrhea and syphilis which were the major communicable diseases and which are perhaps the best known of the STDs are now better controlled, where as the situation is is worsening in the developing countries (WHO, 1989).

Syphilis

Syphilis, a chronic systemic disease caused by the spirochete *Treponema pallidum*, has been the most deadly STD until the appearance of AIDS (WHO, 1989). *Treponema pallidum* was identified as the causative agent of syphilis in the European epidemic in 1905 by Schaudin and Hoffman (Sehgal, 1978). Clinical experience backed by laboratory investigations suggest that *T. pallidum* has remained fully susceptible to penicillin. The vast majority of so-called failures of penicillin treatments are actually reinfections (Atlas, 1984).

Humans are the only natural host of *Treponema pallidum*, and with the exception of congenital syphilis, contact with contaminated fomites and blood transfusions, the disease is

acquired by contact with infectious lesions. The disease is transmitted only during the primary and secondary stages during which lesions contain viable treponemes (Boyd and Marr, 1980).

Syphilis is more common in non-whites than whites, and the incidence and prevalence are higher in urban than rural areas. Over 80% of reported cases occur between the ages of 15 to 30 years, and the male/female ratio is 2:1. The highest age specific incidence rates for primary and secondary syphilis were found in males aged 20 to 24 years. Highest age-specific incidence in females was also found in the 20-24 years age group, but on the average the females were younger (CDC, 1987). Interview of patients with early syphilis disclose an average of 3 sexual contact at risk per patient. Approximately one of 2 contacts of a patient with primary or secondary syphilis acquire the disease (Chapel, 1985). Approximately 30% of persons who become infected with *T. pallidum* develop syphilis. Of that group 35% will be cured spontaneously with no serious complications and 30% will remain in the latent stage throughout their lives (Boyd and Marr, 1980).

With the introduction of penicillin, the dramatic decline in the number of cases of early syphilis has everywhere been apparent (WHO, 1960). A steady decline in the reported cases of syphilis has taken place in countries where an effort to control it has been made, whereas in Africa there was no indication of a

downward trend in syphilis. For example, in the USA,in 1959 syphilis was the 4th most frequent infection among communicable diseases reported, but with the introduction of penicillin the number of cases of early syphilis declined by 94% (Brown, 1961). There has been a world wide increase in the incidence of primary and secondary syphilis from the low points achieved in the 1950s (WHO, 1975). Some of the reasons given were: a) the high proportion of infections in the male homosexual which appears to be increasing (Willcox, 1981). For example, in the USA, the proportion of men with infectious syphilis who named other men as sexual partners increased by about 200% between 1969 and 1976 (WHO, 1982); b) related to several factors including more sensitive serological screening programs, availability of more public clinics, more relaxed attitude toward sex, and increased promiscuity among children and young adults. The decline in late syphilis is due to early detection and prompt treatment of the primary and secondary stages (Rice, 1987). In the USA congenital syphilis dropped from a high of 17,000 cases in 1941 to 1334 in 1974. Much of this decrease is due to early detection and better medical care in the treatment of women during pregnancy (Boyd and Marr, 1980). In the USA, for example, from 1956 to 1965 there was a steady increase in primary and secondary syphilis followed by a consistent drop and the incidence of total syphilis dropped substantially and reached an all-time low of 28.5 cases per 100,000 population in 1986. Since then, it has increased again, reflecting a higher incidence in primary and secondary syphilis (Schyuer and Meheus, 1990).

The largest proportion of this increase has been in heterosexual non-white males, while a decrease was observed in homosexual and bisexual men. The increase has been attributed to several factors, the most important being: a) the increase in prostitution in which non-intravenous drugs are exchanged for sex; b) the wide spread use of spectinomycin rather than penicillin for the treatment of gonorrhoea, and c) the shifting of resources from syphilis control to AIDS (CDC, 1989). In the United Kingdom, after the high peak during the second World War, the number of cases of primary and secondary syphilis dropped to a low level in the late 1950s. During the sixties and seventies a new increase was seen, but since 1978, a consistent drop in incidence has taken place (Schryuer and Meheus, 1990). In Sweden syphilis has almost disappeared (Aral and Halmes, 1991). In the Netherlands infectious syphilis was on the decline until 1982 (Cutinho, *et al.*, 1987), but, recently an increase has been observed in heterosexual men and women (Vanden Hoek, 1988).

The most comprehensive data on incidence come from a few industrialized countries. Sexually transmitted diseases are hyperendemic in many developing countries including the rural areas where the facilities for diagnosis and treatment are usually inadequate. Incidence figures are therefore not reliable but prevalence data are available from ad hoc surveys in population groups that are not necessarily representative of the total population. These surveys provide useful estimates but

must be interpreted with caution (Schryver and Meheus, 1990). Some indication of prevalence is provided by serological testing of selected population groups (Piot and Meheus, 1983). For example, among antenatal clinic attendants the percentage of serological reactors recorded were: 10.9% in Ethiopia (WHO, 1982); 16.9% in Ethiopia (Perine, 1983); 11% in Gambia (Mabey, 1986); 16.3% in Tanzania (Cooper-Poole, 1986); 2% in Zaire (Piot and Meheus, 1983), and 12.5% in Zambia (Ratnam, 1982). The few reports available indicate very high rates of syphilis and a considerable risk of congenital syphilis in many urban areas in Africa.

Treponema pallidum is the causative agent of venereal syphilis, whereas yaws and pinta are caused by *Treponema peretenue* and *Treponema carateum* respectively. These treponemes are morphologically and antigenically quite similar and cannot be differentiated except by the nature of the lesion and the clinical course of the infection. None of the serological tests for syphilis can be used to distinguish antibodies produced in response to *Treponema pallidum* from those produced in response to other pathogenic treponemes (Larson and Bradford, 1986). Since direct observation of the spirochetes (under a dark-field microscope) is possible only during the active primary or secondary stages of the disease, serological techniques are the major diagnostic tool (Hailesellassie, 1984)].

T. pallidum infection produces multiple antibodies of 2 basic types, non-specific reaginic antibodies and specific anti treponemal antibodies. The non-treponema tests are not absolutely specific for syphilis but are easily performed and quantified, and are inexpensive. They are routinely used as screening tests and as a means of following the efficacy of treatment (Rose, *et al.*, 1986). The Venereal Disease Research Laboratory (VDRL) and Rapid Plasma Reagin (RPR) tests are the most widely used screening tests. Their results are readily reproducible although they may be non-specific in certain environments, but their non-specificity can be minimized by using treponemal tests (Cheesebrough, 1984). Both tests are based on the direct agglutination of cardiolipin antigen particles by antibodies. The antigen used in the RPR card test is similar to that used in the VDRL test. The antigen particles, however, are either carbon containing or dyed to enable the reaction to be read macroscopically (Larson and Bradford, 1986). The RPR test was introduced in 1957 as a screening test with a high reactivity for testing large groups of persons rapidly and economically (Rose, *et al.*,1986). The RPR test used as qualitative or a quantitative procedure has approximately the same sensitivity and specificity as VDRL test (Halsted and Halsted, 1981). Use of VDRL as a screening test for syphilis has steadily declined over the past ten years. Currently the most frequently used test is the RPR card test (CDC, 1989). The simplicity and the relative

accuracy of the test has made it popular in remote clinics in developing countries like Ethiopia (Hailesellassie, 1984). The RPR test has several advantages over the VDRL test (Rose, *et al.*, 1986): a) It is a kit test, containing all needed reagents; b) unheated serum is used; c) the antigen is ready to use and stabilized, and the remainder is not discarded at the end of each day; d) the reaction is read macroscopically; e) it can be performed in laboratories and clinics when facilities are limited; f) The technique is simple and quicker than the VDRL test to perform.

With the RPR test it is recognized that false positive can occur in autoimmune diseases, viral infections, malaria and a wide variety of other conditions including pregnancy (Nicol and Rodin, 1980). Because of the limitation of the lipoidal antigen tests including RPR, more specific tests for the detection of antitreponemal antibodies must be conducted before a definite diagnosis of treponemal diseases can be established (WHO, 1982).

Even though *Treponema pallidum* was identified in 1905 as the causative organisms of syphilis, the first *Treponema pallidum* Immobilization (TPI) test, was not developed until 1949 (Larson and Bradford, 1986). Today the TPI is performed only in a few research laboratories in the USA. Other less expensive, more sensitive and equally specific treponemal tests have replaced the TPI as a confirmatory test for syphilis (Rose, *et al*, 1986).

False positive treponemal test results do occur with about the same frequency (1%) as false positive non-treponemal test results. Although some false-positive results in the treponemal tests are transient and their cause unknown, a definite association has been made between false positive treponemal tests and connective tissue diseases (Larson and Bradford, 1986). The choice of a serological treponemal test for the confirmation of syphilis has been limited to either indirect fluorescence-antibody or hemagglutination techniques. The two commonly used techniques are the *Treponema pallidum* Hemagglutination Assay (TPHA)] and the Fluorescent Teponemal Antibody Absorption (FTA-ABS) tests, each with several variations (Rose, *et al* ., 1986) . The TPHA is similar to FTA-ABS tests in specificity and sensitivity. It is recommended in preference to the FTA-ABS because it is less costly, simpler and quicker to perform and requires no special equipment (VanDyck, *et al.*, 1987).

Gonorrhoea

Gonorrhoea is an ancient disease. It is amply described in the records of most ancient civilization such as the Chinese, Assyrians, Egyptians, Greeks, Romans and others. The causative organism of gonorrhea, *N. gonorrheae* was discoverd by Neisser in 1879 (Brown, *et al*, 1976). *N.gonorrheae* is an aerobic, non-motile, non-sporeforming gram negative diplococcus. It is oxidase positive, ferments glucose but not lactose, maltose or sucrose (Van Dyck, *et al.*, 1987).

Man is the only natural host for *N.gonorrheae*. The disease is transmitted exclusively by sexual contact and is highly contagious. The eyes of the infant born of a mother with urogenital gonorrhea become infected at the time of delivery (Fransen, 1984).

Approximately 90% of cases occur in persons under the age 30 and almost 25% of cases occur in the teenagers. The male/female (UK) ration which was around 4: 1 in 1950 was less than 1.5:1 in 1985. Women were mostly younger than men; the highest incidence among females was in the age group of 15-19 years and for males in the age group of 20-24 years (Schryuer and Meheus, 1990). The disease is usually spread by asymptomatic persons or persons who ignore their symptoms; thus a major reservoir of gonococcal infection in the community consists of asymptomatically infected men and women (Chapel, 1985). The rate of gonorrhoea acquisition for males is about 35% after a single exposure to infected female and rises to 75% after multiple sexual contact with the same individual (Atlas, 1984).

Throughout Europe, Austalia, New zealand and Japan the incidence of gonorrhoea has been declining steadily for the last 15 to 20 years. In Sweden alone the rate of gonorrhoea dropped by more than 95% between 1970 and 1989. These improvements probably reflect the effectiveness of the public health measures taken in those countries (Aral and Holmes, 1991). In the USA, after

the second World War, the incidence of gonorrhoea decreased sharply to its lowest level in 1957, after which a rapid increase took place. Between 1962 and 1975 the incidence increased steadily at about 15% per year, to reach an all-time high of 473 per 100.000 population in 1975. Since then, the rates have decreased again (particularly since 1987). This decrease may be related to fear of AIDS which has led to changes in sexual behavior (CDC, 1989).

National figures from most developing countries, even though grossly inaccurate, do reflect the seriousness of the situation (Owali, 1986). Studies of gonorrhea among population in Africa and Asia continue to reveal very high prevalence rates ranging from 3% to over 18% (Arya, 1981). The prevalence of gonorrhoea in women attending prenatal and family planning clinics varied from 3-17% in some African countries (Piot and Meheus, 1983). Survey conducted in Africa indicate an annual gonorrhoea incidence rate of 20-50% among high risk groups such as prostitutes (WHO, 1990): Aberra and his collaborators reported the prevalence of gonorrhoea to be 28% among prostitutes in Addis Ababa. When the prevalence rates of some African countries are compared with those of developed countries, it is obvious that STDs in Africa continue to be a major public health problem (WHO, 1986). For example, the rate of gonorrhea per 100,000 population in Kampala (Uganda) is 10,000 while it is 7,000 in Nairobi

(Kenya). The corresponding figure for London (United Kingdom) and Atlanta (USA) are 310 and 2,510 respectively.

Around 1944, the efficacy of sulfonamide therapy for gonorrhoea declined rapidly because of increasing gonococcal resistance and by the late 1940s approximately 90% of patients failed to respond to sulfonamide (Dunlop, 1949). Penicillin was then substituted as the drug of choice (Guthe, 1958).

Although the fall in the number of reported cases of gonorrhoea with the introduction of penicillin was initially marked (a 56.8% decrease was recorded in Canada between 1946 and 1956), this decline has not been as apparent as in the case of syphilis. This fact has been reported in many European, North American, South American, Asian and other countries. In the USA (Where gonorrhoea was the third and syphilis the fourth most frequent infection among communicable diseases reported), for example, between 1947 and 1958 there was a 45% decrease in the number of gonorrhoea cases, while the number of cases of early syphilis declined by 94% (Guthe, 1961).

Penicillin has been the first choice of treatment for gonorrhoea for several decades despite the emergence of resistant strains beginning about the mid 1950's (Herzog, *et al.*, 1983). The percentage of strains with chromosomally determined resistance has been increasing over the years all over the world

requiring the administration of increasing doses of penicillin to achieve satisfactory responses, although the rate at which resistance is increasing varies considerably (Sng, *et al.*, 1984). Alarming reports on the discovery of penicillinase producing ***N. gonorrhoeae*** strains in 1976 (Ashford, ***et al.***, 1976; Philips, 1976) which failed to respond to the usual therapeutic doses of penicillin and the high incidence of such strains in some regions aggravated the problem of antibiotic resistance in strains of ***N. gonorrhoeae.*** The problem is worsening in developing countries where penicillin resistant strains of ***N.gonorrhoeae*** now predominate (Owali, 1986).

Prior to 1976, reports on the incidence of ***N. gonorrhoeae*** did not include any information about it resistance to penicillin causedbypenicillinase production. During that year, researchers in the USA and England simultaneously reported the emergence of penicillinase producing *N.gonorrhoeae* (PPNG) (Philips, 1976). Since then, further studies on the characteristics of PPNG strains have revealed that there are 2 distinct types in the world: The Asian and West African (Perine, ***et al.***, 1977). Since their emergence in 1976, the 2 type of penicillinase producing gonococcal strains have spread to almost all areas of the world (CDC, 1984) and now represent 20-40% of gonococcal isolates in many countries (Owali, 1986). In East and South East Asia and Sub-saharan Africa, one third to one half of the gonococcal isolates are penicillinase producing. In most

industrialized countries the proportion of penicillinase producing gonococci remains at about 1% and many of these strains are imported (WHO, 1986). In Canada PPNG strains were 0.5% around 1985 and in 1988 the figure rose to 2.9%, about 90% of the strains were imported (WHO, 1990). In Denmark the prevalence of PPNG increased from 0.5-2% (1986-1987) to 4-8% in 1988 and 6.9% in 1989 (WHO, 1990).

In Tanzania, Kenya, Somalia and Nigeria PPNG strains accounted for 20%, 50%, 5% and 56% of the isolates, respectively (Osoba *et al.*, 1983; Maselle, *et al.*, 1984; Owali, 1986; Podgore and Omar, 1986).

The first published report on PPNG in Addis Ababa was in 1983 (Habte-Gaber, *et al.*, 1983). Messele and Tassew (1987) reported that PPNG strains in Addis Ababa accounted for about 49% of the total isolates. According to a recent report, 73% (Aberra, *et al.*, 1990) of all neisseria isolates were PPNG strains.

Strains of gonococci resistant to penicillin as well as to other antibiotics are being isolated and the danger of multiple antibiotic resistant strains has been reported from many parts of the world (Easmon, 1984). Multiple drug resistant strains of gonococci have been reported in Ethiopia since 1980 (Messele and

Tassew, 1980; Messele and Tassew, 1987; Aberra *et al.*, 1990). Infections with PPNG strains are treated with penicillinase resistant antibiotics such as spectinomycin and one of the cephalosporins which are expensive and are beyond the financial resoures of most health authorities in Africa. Thus alternative regimens for treating infections caused by penicillin resistant strains of gonococci must continue to be evaluated (Cheesebrough, 1984).

Sexually transmitted diseases are among the major health problems in Ethiopia becasuseoftheir wide spread and high incidence. The occurrence in Ethiopia of all types of STDs is well established. A review of available literature indicates the existence of syphilis, gonorrhoea, chancroid lymphogranuloma venerum, granuloma inguinal, and others including AIDS. Based on the information of the venereal disease control services in Addis Ababa, among 51,553 new patients seen in Addis Ababa at venereal disease clinics in 1959, 44.4% of the new patients were diagnosed as syphilis, gonorrhoea 39%, chancroid 11%, and lymphogranuloma venereum as 1.6% (Chang, 1962). During the eight years of retrospective study (1982-1989) in all hospitals and health centers of Ethiopia: 435,723 cases of gonorrhoea, 99,354 cases of syphilis, 72,344 cases of chancroid, and 55,405 cases of lymphogranuloma venereum (LGV) were reported (MOH, 1988; MOH, 1991). According to the 1988-1989 (one year) report of the Ministry of Health 93, 890 cases of gonorrhoea and 13,657 cases

of syphilis were reported from health centres and hospitals (MOH, 1988; MOH, 1991). National figures from most developing countries including Ethiopia, even though grossly inaccurate do reflect the seriousness of the situation (Owali, 1986).

In Addis Ababa, the assessment of the prevalence of STDs pathogens resulted in 28% ***N. gonorrhoeae***, 21 % ***T. vaginalis***, 14.7% *C.albicans* and 13.8% syphilis, from 282 randomly selected prostitutes (Aberra, ***et al.***, 1990). This shows that *N.gonorrhoeae* was the most prevalent agent of STDs. Multiple drug resistance and a very high incidence of PPNG were also reported by previous investigators (Messele and Tassew, 1980; Aberra, ***et al.***, 1990).

In a country where statistical data on the true prevalence of STDs is scanty, accurate information is very much needed and the purpose of this study is to :

- Provide additional data on the prevalence of gonorrhoea and syphilis.

- Obtain useful epidemiological information on the antibiotic sensitivity of local gonococcal strains as well as on the prevalence of penicillinase producing *N.gonorrhoeae* (PPNG).

- Determine the validity of RPR test as compared to TPHA, in specific diagnosis of syphilis, and

- Provide information that will assist in the development of better programs for the control of syphilis as well as gonorrhoea.

MATERIALS AND METHODS

STUDY POPULATION

The study population was composed of 754 individuals, of which 449 were patients attending the Arada, Tekele-Haimanot and Kasanchese health centers for Sexually Transmitted Diseases; 105 were senior high school students from Tikur Anbessa, Menelik II and Kolfe high schools as well as from the Laboratory Technicians School of NRIH; and 200 were women attending the health centers for antenatal care (ANC). Blood specimens from all 754 individuals were collected in 10ml vacutainer tubes by the investigator. In addition to the blood samples, 110 urethral (male) and 123 endocervical swabs were also collected from individuals with discharges. Due to the shortage of speculum encountered, students and pregnant women were not examined for the prescence of discharge. The process of collecting and testing of sample specimens was conducted between July, 1991 and September, 1992.

INTERVIEW AND EXAMINATION

For every subject a questionnaire detailing age, sex, occupation, marital status, socio-economic status (income), blood transfusion in the past, contact with prostitutes, contact with more than one sexual partner, use of condom, etc, were recorded by the investigator (refer to annex on page 90). Blood sample and discharge were collected from the participants following recommendations described in the

WHO Bench Level Manual for Sexually Transmitted Diseases (Van Dyck, *et al.*, 1987). Genital swabs after transfer into Ames transport medium, and blood sera were transported immediately to the STD diagnostic unit of Bacteriology Division of the National Research Institute of Health (NRIH) for examination.

Transport medium composition per liter of distilled water.

Charcoal, pharmaceutical neutral	10.0g
Sodium chloride	3.0g
Disodium phosphate	1.15g
Monopotassium phosphate	0.2g
Potassium chloride	0.2g
Sodium thioglycolate	1.0g
Calcium chloride	0.1g
Magnesium chloride	0.1g
Agar powder	4.0g

LABORATORY TESTS

As soon as the collected specimens arrived in the laboratory, the discharge samples were immediately inoculated into blood agar and Thayer Martin agar plates and smears were also prepared for direct Gram stain examination from the other swab (discharge was collected with 2 swabs for each patient).

Modified Thayer Marthin (MTM) selective growth medium

10g haemoglobin prepared in 500ml distilled water and 10ml of isovitalex enrichment solution were added to 36g of GC agar base prepared in 500ml distilled water to produce chocolate agar. Finally the media was supplemented with VCNT selective antimicrobials.

a) GC agar base (per liter of distilled water)

Peptone	15 g
Corn starch	1 g
Dipotassium phosphate	4 g
Potassium phosphate	1 g
Sodium chloride	5 g
Agar powder	10 g

b) Haemoglobin

Dried powder of bovine haemoglobin	10 g

c) Isovitalex enrichment (per 10ml distilled water)

Diphosphopyridine nucleotide (coenzyme 1)	2.5 mg
Cocarboxylase	1.0 mg
P-aminobenzoic acid	0.13 mg
Thiamine - Hcl	0.03 mg
Vitamin B^{12}	0.1 mg

L-glutamine	100 mg
L-cystine - 2HCl	11.0 mg
L-cystine - Hcl-$2H_2O$	259.0 mg
Adenine	10.0 mg
Guanine - Hcl	0.03 mg
Ferric nitrate - $9H_2O$	0.2 mg
Dextrose	1.0 g

d) VCNT antimicrobials (per 500 ml distilled water)

Vancomycin	1.5 mg
Colistine	3.75 mg
Nystatin	6.25 units
Trimethoprim	2.5 mg

Blood agar medium composition per liter of distilled water

Oxoid dehydrated medium formula (Cm_3)

	grams per liter
Lab-Lemco powder	1.0
Yeast extract	2.0
Peptone	5.0
Sodium Chloride	5.0
Agar	15.0

After dissolving and sterilizing the above components in one liter of water, 50ml sterile defibrinated sheep blood was added to make blood agar.

The endocervical and urethral swabs were also checked for *T.vaginalis* and *C. albicans*. The wet mount preparation with 10% KOH and saline was used to test for *C.albicans* and *T.vaginalis*.

The blood sera, as soon as they arrived in the laboratory, were placed at -20 °C and then tested in batches for the presence of antibodies *T. pallidum*.

a) Diagnosis of Neisseria gonorrhoeae - Laboratory diagnosis of *Neisseria gonorrhoeae* was made, based on the bench level laboratory manual for STDs (Van Dyck, *et al.*, 1987). The prepared smears were examined for gram negative diplococci using a bright light microscope and immersion oil with a 100 x objectives.

The swabs containing the specimens were smeared over approximately one-fourth of the plate. The inoculum was spread on the remaining part of the medium by means of sterile loop so as to be able to get isolated colonies. The inoculated plates were incubated at 35 - 37 °C in a humidified incubator (10%) enriched with 3-10% co_2. The co_2 was generated by burning a candle in a jar. The incubation was continued for at least 48 hours. After incubation, plates were examined for the growth of typical colonies (0.5 - 3mm in diameter, gray to white, transparent to opaque, and of raised or convex to flat structures) which are characteristics of gonococci. Colonies containing gram negative diplococci that possessed the characteristic morphology of *N.gonorrhoeae* were tested for oxidase production.

Oxidase - positive colonies that contained Gram - negative diplococci and that possessed the characteristic colonial morphology (on selective medium) of *Neisseria gonorrhoeae* were accepted as presumptive identification of *Neisseria gonorrhoeae*. For the oxidase test commercial oxidase discs containing dimethyl-p-phenylenediamine hydrochloride were used. Suspected colonies were picked using a loop and rubbed onto the discs. Positive reactions turned the disc purple within 20 seconds.

Species identification was done for oxidase positive diplococci by biochemical tests since other neisseria species are also positive for oxidase. In this test fresh subcultures of strains to be tested were prepared on non-selective chocolate agar (described above as part of MTM growth medium) with 5% blood (bovine). Two loopfuls of the isolate were taken after 24 hours growth into a tube containing 0.4ml Buffered Balanced salt Indicator Solution (BSS).

Buffered BSS composition (gm/liter)

Dipotassium phosphate	0.4 gm
Potassium phosphate	0.1 gm
Potassium chloride	8.0 gm
Phenol red	0.6 gm

The pH adjusted to 7.1 - 7.2

Five tubes were used for this test. 0.05ml 20% sterile glucose, maltose, sucrose and lactose were added to individual tubes followed by 0.1ml BSS to each one. The fifth tube which contained no sugar was used as control. Finally, 0.50ml of the bacterial suspension was transferred to each of the 5 tubes, mixed and incubated in a 37 $_0$c water bath for 4 hours. A color change from red to yellow was considered as positive. The control tube remained red. *Neisseria gonorrhoeae* utilizes (ferments) glucose but not maltose, sucrose or lactose. Other species of neisseria have different fermentation patterns.

Differentiation of neisseria based on carbohydrate degradation test

	Glucose	Maltose	Lactose	Sucrose
N. gonorrhoeae	+	-	-	-
N. meningitidis	+	+	-	-
N.lactamica	+	+	+	-
N.cinerea	-	-	-	-

B) *Detection of antibiotic resistance* : All *Neisseria gonorrhoeae* isolates were screened for penicillinase production by chromogenic cephalosporin methods. All the isolates were also tested for susceptibility to penicillin, tetracycline,

erythromycin, ampicillin, trimethoprim-sulphamethoxazal, [bactrim], ceftriaxone, and chloramphenicol by the agar disc diffusion method. In both cases the laboratory procedures of Van Dyck, *et al.* (1987) were followed.

i) Detection of penicillinase producing *Neisseria gonorrhoeae* [PPNG]: In this study the Chromogenic Cephalosporin Method was followed. A nitroceifin - containing disc (Cefinase, BBL) was hydrated with a drop of water and then inoculated with 5 colonies of the test organism. The test organism was considered as penicillinase producing when a red color become visible within 3 minutes.

ii) Susceptibility testing by agar disc diffusion method:

- a suspension of the gonococcal strain was prepared from an overnight culture in sterile nutrient broth.

- using a sterile swab, the surface of the chocolate agar was evenly streaked with the gonococcal suspension.

- then, antibiotic discs were applied and the plates were incubated in a humid 3-10%, Co_2 atmosphere for 48 hours at 35^0C .

- After incubation the zone of inhibition was measured and read as follows: Example

Antibiotic	Susceptibility	Resistant
Penicillin [10 ug]	Greater or equal 30mm	Less or equal 25mm
Tetracycline [30 ug]	" " " 35mm	" " " 30mm
Ceftriaxone [30 ug]	" " " 35mm	" " " 30mm

c) Diagnosis of syphilis - In the diagnosis of syphilis the laboratory procedures of Van Dyck, *et al.*, (1987) were used. Sera were first screened with a qualitative Rapid Plasma Reagin (RPR) card test. A volume of 50 ul of serum was placed on a circle of the test card by using a sampling pipette delivered with the RPR-card kit. The drop was spread to fill the entire circle. Then one drop of antigen in charcoal suspension was added. The card was placed on a mechanical rotator with a wet cotton for approximately 8 minutes. After removing the card from the rotator, reactive sera were differentiated from non-reactive sera by brief rotating and tilting of the card by hand. Small to large clumps or black flocculation indicated reactive serum while no clumping or only slight roughness indicated non-reactive serum.

NB = ug = Microgram
ul = Microliter

A *Treponema Pallidum* Hemagglutination Assay (TPHA) test kit was used for a qualitative test to confirm sera reactive by of RPR. Using a micropipette 25 ul of absorbing diluent (which consists of sonicated cell membranes from sheep and ox erythrocytes, normal rabbit testicular extract, sonicated treponemes, normal rabbit serum, Tween 80 and acacia powder in phosphate buffer-saline-PBS) was placed for each test serum in a microtiter plate wells numbered 1,3,4, and 5 of horizontal rows and 100 ul in well number 2. Then 25 ul of test serum was brought in to well 1 (dilution 1:2); it was mixed and 25 ul transferred to well 2 (1:10), the same was done to well 4 (1:20) and to well 5 (1:40) from where 25 ul was discarded after mixing. Using a new pipette tip transfer 25 ul from well 2 to 3 (1:20), mix and discard 25 ul. The dilutions of all test sera were completed and the microtiterplate was covered and incubated at room temperature for 30 minutes. After incubation, 75 ul of the unsensitized cells (2.5% suspension of formalized, tanned sheep erythrocytes not sensitized with *Treponema pallidum*) were added to well 3 (dilution 1:80) to serve as non-reactive control. With another pipette dropper 75 ul of sensitized cells(2.5% suspension of formalized, tanned sheep erythrocytes which have been senisitized with sonicated *Treponema Pallidum*) were added in well 4 (1:80) and 5 (1 :160). 25 ul of prediluted (1:80) positive control was placed into 5 wells of a horizontal row of the microplate and diluted with 25 ul of absorbing diluent. Add 75 ul sensitized cells to well 1 through 5.

Finally, the microtiter plates were shaken gently, covered and incubated at room temperature for 2 hours. The settlings patterns of RBCs were read with the naked eye from which hemagglutination or no hemagglutination was reported. A serum showing hemagglutination was considered as a positive diagnosis for syphilis.

The validity of RPR as screening test was determined using sensitivity, specificity, percentage of positive predictive value and efficiency which define the accuracy of a laboratory test (Galen, 1986).

STATISTICAL ANALYSIS

Data analysis was performed at the Department of Community Health, Faculty of Medicine, Addis Ababa University with Epidemiological Information (EPI info) statistical software. The prevalence of syphilis and gonorrhoea for the total sample population and for each demographic variable was calculated. Statistically significant differences in the rates of prevalence according to age, sex, occupation and marital status for different strata of these variables were calculated. Association within the different variables were analyzed by the chi-square and Fisher's exact test. Relative Risk (RR) was calculated in the case of statistically significant differences.

RESULTS

Demograhic data of the study population

In this study a total of 754 individuals were involved. The mean and median age of the participants were 25 and 24 years, respectively (range 13 to 60). Demographic data of the study population on the basis of age (1A), sex (1B), marital status (1C) and occupation (1D) are shown in Tables 1A-1D.

Table 1A.

Demographic data of the study population on the basis of age

Age groups (yrs)	Number tested	Percentage (%)
Less than 15	2	0.26
15 - 19	191	25.33
20 - 24	233	30.90
25 - 29	149	19.76
30 - 34	99	13.12
35 - 39	39	5.17
40 - 44	12	1.59
Grater than 45	29	3.84
Total	754	99.97

Individuals in the age groups of 15 - 29 made up the majority of the sample (76%). Those above the age of 30 represented about 25% of the study population. Below the age of 30 the number of females (62%) outnumbered the number of males (38%) (Table 1A).

Table 1B.

Demographic data of the study population on the basis of sex

Sex	Number tested	Percentage
Female	456	60.47
Male	298	39.52
Total	754	99.99

Of the total sample females made up the majority (60%) (Table 1B).

Table 1C.

Demographic data of the total population on the basis of marital status.

Marital status	Number tested	Percentage
Single	459	60.87
Married	267	35.41
Divorced	28	3.71
Total	754	99.99

As to the marital status, the majority were single (61%). Among the female population, 47% were single, 49% were married and 4% were divorced. Of the male population, 82% were single, 15% were married and 3% were divorced (Table 1C).

Table 1D.

Demographic data of the total population on the basis of occupation.

Occupation	Number tested	Percentage
House wives	213	28.24
Students	157	20.82
Prostitutes	79	10.47
Daily laborers	71	9.42
Govt. employees	62	8.21
Dependent on family/ relatives	48	6.36
Housemaids/servants	31	4.11
Ex-soldiers	31	4.11
Merchants	28	3.71
Tella/Te.j sellers	11	1.45
Male bar workers	9	1.19
Drivers	7	0.92
Others	7	0.92
Total	754	99.93

On the bases of occupation, house wives (28%), students (21%), prostitutes (10%) and daily laborers (9%) made up 70% of the study population and of the above females constituted 72% while males made up only 28% (Table 1D).

The study population was divided into 3 groups:

A) *Pregnant women attending antenatal clinics (ANC)* - 200 (27%).

B) *Students attending senior high schools and laboratory Technicians School* - 105 (14%) and

C) *Patients attending clinics for sexually transmitted diseases* - 449 (59%).

I. *Detection of antibodies to Treponema pallidum in sera obtained from the 3 groups.*

Blood samples for the detection of antibodies to *T. pallidum* were collected from all members of the 3 groups.

A) ***Pregnant women attending antenatal clinics (ANC)***

The study included 200 women with a mean age of 26 years and a median age of 24 years (range 14 to 44). Females in the age groups of 15 - 29 years comprised 75% of the total. Out of the total sample, 87% were married, while the remaining 13% were

single. Housewives made up the majority (85%) of the sample. Out of the 200 serum specimens, 26 were positive for syphilis by both RPR and TPHA giving a seroreactivity of 13%. Seroprevalence data for ANC according to age (2A), marital status (2B) and occupation (2C) are shown in Tables 2A-2C.

Table 2A.

Seroprevalence of syphilis among the ANC group on the basis of age.

Age groups (yrs)	Number tested	Percentage	RPR+ and TPHA+ Number	Percentage
a. 15-19	35	17.5	2	5.71
b. 20-24	66	33.0	9	13.64
c. 25-29	49	24.5	6	12.24
d. 30-34	28	14.0	4	14.29
e. 35-39	19	9.5	4	21.05
f. 40-44	3	1.5	1	33.33
Total	200	100	26	13.0

There was no significant difference ($P>0.05$) in sero-reactivity between the age groups when a,b,c, were compared with each other and when those below the age of 30 and above the age of 30 were compared (Table 2A).

Table 2B.

Seroprevalence of syphilis among the ANC group on the basis of marital status.

Marital status	Number tested	Percentage	RPR + and TPHA + Number	Percentage
Married	174	87	17	9.77
Single	26	13	9	34.62
Total	200	100	26	13.0

The difference in seroreactivity between that of married and single was statistically significant (P>0.05). Significantly higher seroreactivity was observed in singles than the married. The relative risk (RR) was 3.5 (Table 2B).

Table 2C.

Seroprevalence of syphilis among the ANC group on the basis of occupation

Occupation	Number tested	Percentage	RPR + and TPHA + Number	Percentage
Housewives	170	85	17	10.00
Govt.employees	4	2	-	-
Prostitutes	10	5	4	40.00
Daily laborers	7	3.5	2	28.57
Housemaids/ser.	6	3	2	50.00
Dependent on families/rel.	3	1.5	1	33.3
Total	200	100	26	13.00

Higher sero-reactivity was observed among prostitutes, daily laborers, housemaid and those dependent on families (34.6%) than in housewives and Govt. employees. Those groups with high seroprevalence were from the very low socio-economic status and had more than one sex partner (Table 3C).

B) Students:

A total of 105 students with the mean age of 20.3 and median age of 20 years (range 15 to 26) were included in this study.

Table 3A.

Demographic data of students

Age groups (yrs)	Number tested	%	Male Number	%	Female Number	%
15-19	42	40.0	24	57.14	18	42.86
20-24	45	42.86	31	68.89	14	31.11
25-29	18	17.14	12	66.67	6	33.33
Total	105	100	67	63.81	38	36.19

Of the total number of students males and females were 64% and 36% respectively. Students aged 15-24 years made up the majority (82%) of the sample. Of that group (15-24) males and females made up 62% and 38% respectively (Table 3A).

Out of 105 serum specimens, 12 were positive for syphilis both by the RPR and TPHA giving a seroreactivity of 11%. Seroprevalence data of the students are shown on Table 3B and 3C.

Table 3B.

Seroprevalence of syphilis among students on the basis of age.

Age groups (years)	Number tested	RPR + and TPHA +	
		Number	Percentage
15-19	42	3	7.14
20-24	45	7	15.56
25-29	18	2	11.11
Total	105	12	11.43

There was no statistical significant difference ($P>0.05$) between the age groups in seroreactivity, although a higher prevalence was observed in the age group of 20-24 years (Table 3B).

Table 3C.

Seroprevalence of syphilis among student on the basis of sex.

Sex	Number tested	RPR + and TPHA +	
		Number	Percentage (%)
Male	67	7	10.45
Female	38	5	13.16
Total	105	12	11.43

Although seroreactivity was slightly higher among female students than male students, it was not statistically significant (P>0.05) (Table 3C).

Table 3D.

Age and sex distribution of syphilis among students

	Sex					
	Male			Female		
Age groups (yrs)	Number tested	Number positive	%	Number tested	Number positive	%
15 - 19	24	1	4.2	18	2	11.1
20 - 24	31	5	16.1	14	2	14.3
25 - 29	12	1	8.3	6	1	16.7
Total	67	7	10.5	38	5	13.2

The highest age specific prevalence for syphilis (students) was found in males and females aged 20 to 24 years (15 %). In that age group, males and females made up 15.6% and 14.3%, of the group respectively. In the age group of 15 to 19 the prevalence of syphilis was much higher in females (11%) than males (4%). On the average the females were younger than the males (Table 3D).

C/ Patients attending clinics for STDs

This group included 449 individuals attending clinics for sexually transmitted diseases (STDs) and had a mean age of 26 and median age of 23.6 years (range 13 to 60). All the individuals in the group were screened for syphilis irrespective of sign and symptoms of the disease. Demographic data of the STD patients on the basis of age (4A), sex (4A), marital status (4B) and occupation (4C) are shown in Tables 4A- 4C.

Table 4A.

Demographic data of STD patients on the basis of age and sex.

Age group (yrs)	Number tested	%	Male Number	%	Female Number	%
<15	2	0.45	2	100	-	-
15-19	114	25.39	42	36.84	72	63.16
20-24	122	27.17	64	52.46	58	47.54
25-29	82	18.26	47	57.32	35	42.68
30-34	71	15.81	40	56.34	31	43.66
35-39	20	4.46	14	70.0	6	30
40-44	9	2.0	2	22.22	7	77.78
>45	29	6.46	20	68.97	9	31.03
Total	449	100	231	51.45	218	48.55

Of the total sample, males and females made up 51% and 49% respectively. STD patients aged 15 to 29 years made up the majority of the sample (71%). Of that group males and females made up 48% and 52% respectively. Those above the age of 30 represented around 30% of the sample. Of that group males and females made up 59% and 41% respectively (Table 4A).

Table 4B.

Demographic data of STD patients on the basis of marital status.

Marital status	Number tested	%	Male		Female	
			Number tested	%	Number tested	%
Single	328	73.05	181	55.18	147	44.82
Married	93	20.71	41	44.09	52	55.91
Divorced	28	6.24	9	32.14	19	67.86
Total	449	100	231	51.45	218	48.55

Of the total STD patients, 73% were single, 21% married and 6% divorced. In the case of females, 67% were single, 24% married and 9% divorced whereas in males 78% were single, 18% married and 4% divorced (Table 4B).

Table 4C.

Demographic data of STD patients on the basis of occupation.

Occupation	Number	%	Male		Female	
			Number	%	Number	%
Prostitutes	69	15.4	-	-	69	100
Daily laborers	68	15.1	45	66.2	23	33.8
Govt.employees	59	13.1	44	74.6	15	25.4
Students	52	11.6	35	67.3	17	32.7
Housewives	43	9.6	-	-	43	100
Dep.on families relatives	42	9.4	23	54.8	19	45.2
Housemaids/ser.	25	5.6	-	-	25	100
Soldiers	31	6.9	31	100	-	-
Merchants	27	6	24	88.9	3	11.1
Tella/Tej sel.	11	2.4	7	63.6	4	36.4
Drivers	7	1.6	7	100	-	-
Male bar workers	9	2	9	100	-	-
Others	6	1.3	6	100	-	-
Total	449	100	231	51.4	218	48.6

On the bases of occupation, prostitutes (15%), daily laborers (15%), government employees (13%), students (12%), housewives (10%) and those dependent on families/relatives (9%) made up about 75% of the sample. Of the above groups males and females made up 44% and 56% respectively (Table 4C).

Out of 449 serum specimens, 97 were positive for ***Treponema pallidum*** antibody (syphilis) both by the RPR and TPHA tests giving a seroreactivity of 21.6%. Seroprevalence of syphilis on the basis of age (5A), sex (5B), marital status (5C) and occupation (5D) of the STD patients are shown in Tables 5A-5D.

Table 5A.

Seroprevalence of syphilis among STD patients on the basis of age

Age groups (yrs)	Number tested	RPR + and TPHA +	
		Number	Percentage
<15	2	-	-
a. 15-19	114	23	20.17
b. 20-24	122	28	22.95
c. 25-29	82	24	29.26
d. 30-34	71	12	16.9
e. 35-39	20	4	20.0
f. 40-44	9	2	22.22
g. >45	29	4	13.79
Total	449	97	21.6

Even though the highest prevalence was observed in the age groups of 25-29 years old, there was no statistically significant difference ($P>0.05$) between the age groups when a,b,c,d were compared with each other and when those above the age of 30 and below the age of 30 were compared (Table 5A).

Table 5B.

Seroprevalence of syphilis among STD patients on the basis of sex

Sex	Number tested	RPR † and TPHA †	
		Number	Percentage
Male	231	45	19.48
Female	218	52	23.85
Total	449	97	21.6

Even though seroprevalence was slightly higher in the case of females (23.8%) than males (19%). The difference was not statistically significant (P>0.05) (Table 5B).

Table 5C.

Seroprevalence of syphilis among STD patients on the basis of marital status.

Marital status	Number tested	RPR † TPHA †	
		Number	Percentage
Single	328	77	23.47
Married	93	14	15.05
Divorced	28	6	21.42
Total	449	97	21.6

Marital status was not associated with an increase in susceptiblilty to syphilis ($P>0.05$) that is there was no significant difference in the acquiring of syphilis among singles, married and divorced (Table 5C).

Table 5D.

Seroprevalence of syphilis among STD patients on the bases of occupation

Occupation	Number tested	RPR + and TPHA +	
		Number	Percentage
Prostitutes	69	22	31.88
Daily laborers	68	17	25.00
Govt.employees	59	14	23.72
Students	52	10	19.72
Dependent on families/relatives	42	9	21.42
Housemaids/servant	25	3	12.00
Merchants	27	5	18.51
Soldiers	31	8	25.88
Tella/Tej sellers	11	2	18.18
Drivers	7	1	14.28
Male bar workers	9	1	11.11
House wives	43	5	11.62
Others	6	-	-
Total	449	97	21.6

On the bases of occupation, the highest prevalence was observed among prostitutes (32%), followed by soldiers (26%), daily laborers (25%), government employees (24%), and those dependent on families/relatives (22%), which made up around 72% of the seroreactive. In females, the highest prevalence was observed in prostitutes, followed by female daily laborers. In males, the highest prevalence was observed among soldiers followed by government employees and daily laborers (Table 5D).

Table 5E.

Age and sex distribution of syphilis among STD patients

Age groups	Sex					
	Male			Female		
	Number tested	Number positive	% positive	Number tested	Number positive	% positive
15-19	42	8	19	72	15	20.8
20-24	64	12	18.8	58	16	27.6
25-29	47	13	27.7	35	11	31.4
30-34	40	7	17.5	31	5	16.1
35-39	14	2	14.3	6	2	33.3
40-44	2	1	50	7	1	14.3
>45	20	2	10	9	2	22.2
Total	229	45	19.5	218	52	23.9

The highest age-specific prevalence (29%) for males and females together were found in the 25-29 age group. Of that group males and females made up 28% and 31% respectively. In males as well as in females the age groups of 15-29 years old and those above the age of 30 were compared. In both cases the prevalence of syphilis was higher in the age groups of 15-29 years old (Table 5E).

Finally the 3 groups (ANC, students, STD) were compared. There was no statistically significant ($P>0.05$) difference between students and ANC in the acquiring of syphilis. But there was a statistically significant ($P<0.05$) difference between students and STD patients as well as between STD patients and the ANC group. Significantly higher seroreactivity was observed among STD patients than either students or ANC group. The overall rate of syphilis in this study (taking together the 3 groups) was found to be 17.9%.

Table 5.1

The diagnostic accuracy of the RPR test

Study population	Disease present* A (true positive)	Disease absent* B (false positive)
Antenatal cases	26	11
Students	12	4
STD cases	97	21
Total	135	36
	C (false negative)	D (true negative)
Antenatal cases	0	163
Students	0	91
STD cases	0	331
Total	0	585
	A + C = 0+135 135	B + D + 36+585 = 621

A = TPHA positive

B = RPR positive - A (true positive)

C = Assume no false negative

D = Number tested - RPR positive

* If TPHA is positive it is assumed that the disease is present. If negative, no disease.

Table 5.1A.

Sensitivity, specificity, positive predictive value and efficiency of the three study groups for syphilis.

Study population	% of sensitivity	% of specificity	% of positive predictive value	% of efficiency
Antenatal	100	94	71	95
STD cases	100	94	82	95
Students	100	96	75	96
Total	100	94.7	76	95.3

NB.

$$\% \text{ sensitivity} = \frac{TP}{TP + FN} \times 100$$

TP = True positive

FN = False negative

$$\% \text{ specificity} = \frac{TN}{TN + FP} \times 100$$

TN = True negative

FP = False positive

$$\% \text{ positive predictive value} = \frac{TP}{TP + FP} \times 100$$

$$\% \text{ efficiency} = \frac{TP + TN}{TP+TN+FP+FN} \times 100$$

TP = diseased patient correctly classified by the test

TN = non diseased patient correctly classified by the test

FP = non diseased patient misclassified by the test

FN = diseased patient misclassified by the test

Sera negative by the RPR test were not tested by TPHA, because it remains positive for many years even after complete treatment. Since the percentage of positive predictive value obtained was less than satisfactory, the sera were further analyzed by dividing them into 3 groups : markedly reactive (+++), moderately reactive (++), and weakly reactive(+).

Table 5.1B.

The predictive value of sera reacting markedly, moderately and weakly by the RPR card test

RPR report	Markedly reactive	Moderate reactive	Weakly reactive
Number TPHA tested	71	31	69
TPHA positive	68	28	39
False positive	3	3	30
% of positive predictive value	95.7	90.3	56.5

According to this finding, a low predictive value was found only among the weak reactives (5.1B).

II. *Detection of gonococci from STD cases* :

From 233 of the STDs cases (sub group of 449), urethral (male) and endocervical swabs were taken and examined for pathogens (this is in addition to the blood samples already mentioned for the study of syphilis). The mean and median ages in the study were 24 and 20 years respectively (range 15 to 49). Demographic data of the STD patients with discharge ont eh basis of age (6A), sex (6A), marital status (6B) and occupation (6C) are shown in Tables 6A-6C.

Table 6A.

Demographic data of the STD patients with discharge on the basis of age and sex.

Age groups(yrs)	Number	%	Male		Female	
			Number	%	Number	%
15-19	53	22.7	24	45.3	29	54.7
20-24	64	27.5	26	40.6	38	59.4
25-29	47	20.2	23	49	24	51
30-34	31	13.3	18	58	13	42
35-39	17	7.3	11	64.7	6	35.3
40-44	7	3	3	42.6	4	53.7
> 45	14	6	5	35.7	9	64.3
Total	233	100	110	47.2	123	52.8

Of the total sample males and females made up 47% and 53% respectively. Patients aged 15 to 29 years made up 70% of the sample. Of that group males and females made up 46% and 54% respectively. Those above the age of 30 made up around 30% of the total. Of that group males and females made up 57% and 43% respectively (Table 6A).

Table 6B.

Demographic data of STD patients with discharge on the basis of marital status

Marital status			Male		Female	
	Number	%	Number	%	Number	%
Single	171	73.4	89	52	82	48
Married	48	20.6	18	37.5	30	62.5
Divorced	14	6	3	21.4	11	78.5
Total	233	100	110	47	123	52.9

As to the marital status, around 73% of the patients were single. Out of the above groups males and females made up 52% and 48% respectively. Among the females, 67% were single, 24% were married and 9% were divorced. In the case of males, 81% were single, 16% were married and 3% were divorced (Table 6B).

Table 6C.

Demographic data of the STD patients with discharge on the basis of occupation.

Occupation	Number Tested	%	Male Number	%	Female Number	%
Prostitutes	40	17.2	-	-	40	100
Daily laborers	32	13.7	19	59.4	13	40.6
Govt.employees	30	12.9	27	90	3	10
Housewives	26	11.2	-	-	26	100
Students	25	10.7	14	56	11	44
Dep.on families/ relatives	19	8.1	8	42.1	11	57.9
House maids/ servants	15	6.4	-	-	15	100
Merchants	10	4.3	9	90	1	10
Soldiers	15	6.4	15	100	-	-
Tella/Tej seller	5	2.1	2	40	3	60
Drivers	7	3	7	100	-	-
Male bar workers	5	2.1	5	100	-	-
Others	4	1.7	4	100	-	-
Total	233	100	110	47	123	52.9

Prostitutes (17%), followed by daily laborers (14%), government employees (13%) and housewives (11%) made up around 65% of the STD patients with discharge. Out of the above groups males and females made up 36% and 64% respectively (Table 6C).

Out of the 233 discharge specimens, 68 were positive for *Neisseria gonorrhoeae*. This accounts for 29% of the total sample examined. Of that males and females made up 69% and 31% respectively. The prevalence of gonorrhoea on the basis of age (7A), sex (7B), marital status (7C) and occupations (7D) are shown in Tables 7A-7D.

Table 7A.

Prevalence of gonorrhoea among STD patients with discharge on the basis of sex.

Age groups (yrs)	Number tested	Number	Percentage
a. 15-19	53	14	26.41
b. 20-24	64	20	31.25
c. 25-29	47	17	36.17
d. 30-34	31	9	29
e. 35-39	17	4	23.52
f. 40-44	7	2	28.57
g. >45	14	2	14.28
Total	233	68	29.18

Even though the highest prevalence was observed in the age group of 25-29 years old, no significant association was observed between the age groups and the prevalence of gonorrhoea confirmed by investigation ($P>0.05$) when a,b,c,d were compared with each other and when those above the age of 30 and below the age of 30 were compared (Table 7A).

Table 7B.

Prevalence of gonorrhoea among STD patients with discharge on the basis of sex

Sex	Number tested	Positive for gonorrhoea	
		Number	Percentage
Male	110	47	42.72
Female	123	21	17.1
Total	233	68	29.18

The difference between that of male and female patients was statistically significant ($P<0.05$), that is a significantly higher prevalence was observed in males (43%) than in females (17%). The relative Risk (RR) was 2.5 (Table 7B).

Table 7C.

The prevalence of gonorrhoea among STD patients with discharge on the basis of marital status.

Marital status	Number tested	Positive for gonorrhoea	
		Number	Percentage
Single	171	56	32.74
Married	48	9	18.75
Divorced	14	3	21.4
Total	233	68	29.18

Marital status was not associated with an increased susceptibility to gonorrhoea ($P>0.05$) that is there was no statistically significant difference in the acquiring of gonorrhoea among singles, married and divorced (Table 7C).

Table 7D.

The prevalence of gonorrhoea among STD patients with discharge on the basis of occupation

Occupation	Number tested	Positive for gonorrhoea	
		Number	Percentage
Prostiute	40	11	27.5
Daily laborers	32	12	37.5
Govt.employees	30	11	36.66
Housewives	26	2	7.69
Students	25	9	36
Dependent on families/relatives	19	8	42.12
Housemaids/servants	15	-	-
Merchants	10	4	40
Soldiers	15	8	53.33
Tella/Tej Sellers	5	1	20
Drivers	7	1	14.28
Male bar workers	5	-	-
Others	4	1	25
Total	233	68	29.18

The highest prevalence of gonorrhoea was observed among daily laborers (38%), government employees (37%) and prostitutes (28%) which made up around 60% of the positive. In the case of females the highest prevalence was observed among prostitutes (28%) while in males the highest prevalence was observed among government employees (33%) (7D).

Table 7E.

Age and sex distribution of gonorrhoea among STD patients with discharge

Age groups	Sex					
	Male			Female		
	Number tested	Number Positive	% Positive	Number tested	Number Positive	% Positive
15-19	24	6	25	29	8	27.6
20-24	26	14	53.8	38	6	15.8
25-29	23	12	52.1	24	5	20.8
30-34	18	9	50	13	1	7.7
35-39	11	3	27.3	6	1	16.7
40-44	3	1	33.3	4	-	-
> 45	5	2	40	9	-	-
Total	110	47	42.7	123	21	17.1

The highest age specific prevalence (53%) for gonorrhoea was found in males aged 20 to 24 years old. The highest age specific prevalence (28%) for females was found in the 15-19 age groups. In males as well as in females the age groups of 15-29 years old and those above the age of 30 were compared. In both cases the prevalence of gonorrhoea was higher in the age groups of 15-29 years old (Table 7E).

A) Sensitivity test : Sixty eight strains of *N. gonorrhoeae* were isolated from the 233 discharge specimens from patients with ages ranging from 15 to 49; 31% (21) from females and 69% (47) from males. All of the isolates were screened for penicillinase production, and 70.5% (48) of the isolates were found to be penicillinase producing *Neisseria gonorrhoeae* (PPNG). The remaining 29.4% (20) isolates were non-PPNG. All PPNG and non - PPNG strains were also tested for susceptibility to penicillin, tetracycline, erythromycin, ampicillin, kanamycin, trimethoprim-sulphoxazol(bactrim), ceftriaxone, and chloramphenicol.

Table 8.

Frequency of resistance of PPNG and non-PPNH strains to antimicrobials

Strain	Drugs tested	Resistant number	%
PPNG	Penicillin	48	100
(n = 48)	Ampicillin	46	95.8
	Bactrim	44	91.7
	Kanamycin	11	22.9
non-PPNG	Penicillin	5	25
(n = 20)	Ampicillin	4	20
	Bactrim	8	40
	Kanamycin	3	15

Both PPNG and non-PPNG strains were 100% sensitive to all drugs (erythromycin, tetracycline, chloramphenicol, ceftriaxone) except for penicillin, ampicillin, bactrim and kanamycin. More of the PPNG strains were resistant to penicillin, ampicillin and bactrim than the non-PPNG strains (Table 8).

Other pathogens isolated from the discharge specimens

Other pathogens isolated from the discharge specimens were ***Trichomnomas vaginalis*** (8%) and ***Candida albicans*** (4%), both of them were isolated from female patients. The list of all diseases detected from the STD patients is summarized on Table 9.

Table 9A.

Sexually transmitted diseases detected from the STD patients

Diagnosis	Number of Positive	% of positive
Connorrhoea	68	29.2
Trichonomiasis	18	8
Candidiasis	9	4
Syphilis	97	21.6
Total	192	62.8

N. gonorrhoeae was the most prevalent agent in the present study (9A).

Table 9A.1

Sexually transmitted diseases detected from female STD patients.

Diagnosis	Number of positive	% of positive
Syphilis	52	23.9
Conorrhoea	21	17.1
Trichonomiasis	18	14.6
Candidiasis	9	7.3
Total	100	62.9

Syphilis was the most frequent disease detected in the case of females (9A.1).

Table 9A.2.

Sexually transmitted diseases detected in male STD patients.

Diagnosis	Number of positive	% of positive
Gonorrhoea	47	42.7
Syphilis	45	19.5
Total	92	62.2

N.gonorrhoeae was the most frequent organism isolated in the case of males. *Candida albicans* and *Trichomonas vaginalis* were not isolated from males, in this study. (9A.2).

Table 9B.

Distribution of mixed infections with sexually transmitted diseases in STD patients

Type of mixed infections	Male	Female
	Number of positive (%)	Number of positive (%)
Conorrhoea + Syphilis	5 (2.6%)	3 (1.6%)
Conorrhoea + Trichonomiasis	-	4 (2.1%)
Syphilis + Candidiasis	-	2 (1.0 %)
Conorrhoea + Candidiasis	-	1 (0.5%)
Total	5 (2.6%)	10 (5.2%)

The prevalence of mixed infections was higher in the case of females than males (Table 9B). These agents (*N.gonorrhoeae*, *T.pallidum*, *C.albicans* and *T.vaginalis*) were found to cause single infections in 45% and 47%; in 2.6% and 5.2% as concomitant agents for double infections in males and females respectively.

Table 10.

*Risk factors for both gonorrhoea and syphilis among STD patients and students.**

Risk factors	STD patients (%)	Students (%)
1. Contact with prostitute	89.7	43.1
2. Multipartner sexual contact	80.2	95.8
3. Use of condom		
always	-	3.6
sometimes	4.9%	39.2
not at all	95%	57

* Only the sexually active students were considered.

DISCUSSION

Prevalence of syphilis among pregnant women attending clinics for antenatal care.

The most common outcome of syphilis during pregnancy is probably spontaneous abortion. In most industrialized countries, the prevalence of syphilis in pregnant women is so low that this does not cause a problem (Stray-Pederson, 1983). In developing countries congenital syphilis is a priority public health problem. Rates are 850/100,000 live births in Lusaka, and 3200/100,000 in Addis Ababa (Hira, *et al*, 1982; Perine, 1983). In most developing countries, still births caused by syphilis are a serious problem because of the high prevalence of infection in pregnant women and a lack of, or inadequate antenatal care (Stray - Pederson, 1983). In Zambia, 19% of miscarriage are attributed to syphilis. In Ethiopia pregnant women who were found to be seroreactive to syphilis were 5 times more likely to have an abortion or still births than women who were seronegative (Ratnam, 1982; Schulz, *et al.*, 1986).

The high prevalence of syphilis (13%) among pregnant women observed in this study (Table 2A) indicates the increased chance of congenital syphilis, spontaneous abortion and still births as already described in the previous studies mentioned in the above statements.

The prevalence of syphilis was significantly higher in single ($P<0.05$) than in married women (Table 2B). The frequency of sexually transmitted infection was reported to be higher among single, divorced and separated persons than among married couples (WHO , 1986). The results obtained in this study confirm those findings (Table 2B). Although the highest age-specific prevalence for syphilis was found in females aged 30 to 34 years, there was no statistically significant difference between the age groups (Table 2A).According to the report by WHO (1986), highest rates of incidence of sexually transmitted infections is observed in those 20-24 years old, followed by the 25-29 and 15-19 year age groups . The results obatained in this study were not in agreement with those findings (Table 2A). On the basis of occupation, the highest prevalence was observed among those with a very low socioeconomic status and had more than one sex partner taken together (prostitutes, daily laborers and housemaids) as compared to the housewives and government employees who are married (Table 2C).

Studies in many developing coutries have indicated seroprevalence rates of 5% to 15% syphilis amongst the pregnant women. This is higher than those in industrialized countries today, but appears to be similar to levels reported in the early part of this century (Osoba, 1981; Hira, *et al.*, 1990). The rate observed in this study is within the range of studies in many developing countries as already mentioned. The rate which is being reported in this study is not as high as the 16.9% of the

previous report from Addis Ababa, Ethiopia (Perine, 1983) or the 16.3% from Mbeya, Tanzania (Cooper Poole, 1986); but is comparable to the 11% from Gambia (Mabey, 1986). It is higher than the 8% from Lusaka, Zambia (Hira, *et al.*, 1990).

Schulz and his collaborators (1991) estimates that systematic screening and treatment of syphilis during pregnancy would be at least as cost effective in terms of child health as in the Expanded Programme for Immunization. The rate of syphilis observed in this study is sufficiently high to warrant continuous screening of pregnant women attending antenatal clinics. Routine screening is of no use if adequate treatment, follow up and treatment of partners is not done. All of these components should be integrated into routine antenatal care. Operational barriers to effective screening and treatment of all pregnant women and need to be identified and overcome (Rooney, 1992). In countries that have utilized preventive measures systematically, the congenital form of syphilis has disappeared or its incidence has stayed low. China has claimed the total eradication of congenital syphilis, and many countries in both Eastern and Western Europe (e.g. Poland and the United Kingdom), as well as Japan, have been able to reduce its incidence to very low levels. In countries where the service dealing with STDs and with maternal and child health are poorly developed, early and late cases of congenital syphilis are encountered in fairly large numbers (WHO, 1986). The latter reasoning could also be

associated with the finding of this study. Therefore, health services dealing with STDs and with maternal and child health must be strengthened to avoid the risk of complications caused by syphilis during pregnancy.

Prevalence of syphilis among students

The 11% seroreactivity observed among students indicate that the prevalence of the disease is high among the sexually active age groups in the population (Table 3B). Even though the prevalence of syphilis was slightly higher in females than in males, it was not statistically significant ($P>0.05$) (Table 3B). Although the highest age-specific prevalence both for males and females was observed in the age group of 20-24 years old, no significant association was found between the age and the prevalence of syphilis ($P>0.05$) (Table 3B and D). The seroreactivity observed in this study is considerably higher than the seroreactivity (6%) observed among nursing students in Harguesa, Somalia (Podgore and Omar, 1986).

Almost all of the sexually active students have had sex experience with more than one sex partner. However, most of them either never and/or only sometimes use protective methods against STDs (Table 10). Such cautionless sexual behavior and the inadequate knowledge of STDs as reported by Solomon (1990) in the study made among senior high school students on sexual behavior and knowledge of AIDS and other STDs, most probably made the students vulnerable to syphilis as well as to other STDs including HIV.

Prevalence of syphilis in patients attending clinics fro STDs.

Of the patients (449) attending clinics for STDs, 21% (97) seroreactivity was observed (Table 5A). Patients aged 15-29 years made up the majority of the sample (Table 4A). And it was in this age groups that the majority (77%) of the seroreactivity was observed (Table 5A). This results indicates that it is the young (15-29), the most sexually active group, who are mostly attacked by the disease. Even though the highest attack rate was observed in the age groups of 25-29 years old, no significant association was found between the age groups and the prevalence of syphilis (Table 5A). Although higher prevalence of syphilis was observed among females than males, it was not statistically significant (P>0.05) (Talbe 5B). Marital status was not also associated with increased susceptibility to syphilis. The frequency of sexually transmitted infection was reported to be higher among single, divorced, and separated persons than among married couples(WHO, 1986). The results obtained in this study did not show any significant difference between married and singles (Table 5C). On the bases of occupation, the highest prevalence of syphilis was observed among prostitutes, followed by soldiers, and daily laborers. Therefore, the highest prevalence was observed among the risk groups (51%) in terms of occupation (Table 5D).

The 21% seroreactivity found in this study among STD patients is higher than the 11% to 19% from 3 clinics in Mokadisho, Kismayo and Badoa; Somalia (Padgore and Omar, 1986) and the 13% from Mbeya, Tanzania (Cooper-Poole, 1986). The very high prevalence of syphilis observed in this study is sufficient to warrant the continuous screening of STD patients for syphilis irrespective of sign and symptoms of the patients. Similarly, the screening of all STD patients for syphilis has been suggested by Thin (1982).

When the 3 groups (ANC, students and STD cases) were compared with each other significantly higher seroreactivity was observed among the STD patients than in the other groups. The over-all rate (18%) of syphilis in this study indicates the high prevalence of syphilis and the public health importance of the disease.

The value of RPR as screening test for syphilis

Tests using RPR become negative soon after treatment where as the more specific test-TPHA remains positive for many years even after treatment. For this reasen and because of the shortage of TPHA test reagents, sera found to be negative by the RPR were not further tested by TPHA. One of the objectives of the study was to determine whether the RPR test is specific enough to allow treatment to be given or a further specific test should be done before treatment is given.

Sensitivity, specificity, positive predictive value and efficiency define the accuracy of a diagnostic test. In screening for a disease, the predictive value of a positive result is of the utmost importance (Galen, 1986). As a screening test RPR was considered sensitive. The specificity of 94% indicates that RPR is specific for syphilis in the local situation and that there are only a few false positives caused by other conditions. The predictive value of positive tests ranging from 71% among ANC to 82% in STD patients was less satisfactory (Table 5.1A). However, further analysis of the result showed that only sera reported as weak positive gave low predicative value, while strong positive and positive reactions resulted in a very satisfactory value of 96% and 90%, respectively (Table 5.1B). These results indicate that strong positive and positive can be considered as positive for syphilis, while those showing weak agglutination require retesting. The alternative methods for retesting would be a repeat after one month, to titer the serum or to retest with the TPHA test.

Prevalence of gonorrhoea in patients attending clinics for STDs.

N.gonorrhoeae, the causative agent of gonorrhoea was the most prevalent (29%) STD in the present study (Table 9A). This agrees with the results of other investigators (Habte-Gabr, 1983; Aberra, *et al.*, 1990) and with the report of the Ministry of Health (1988).

In this study a statistically significant higher prevalence of gonorrhoea was observed in males ($P<0.05$) than females. The relative risk was found to be 2.5 (Table 7B). Patients aged 15 to 29 years made up the majority of the total sample (70%) (Table 6A). It was in this age groups the majority (75%) of the positivity was observed (Table 7A). The highest age specific prevalence for males (53%) was found in the 20-24 age group while in females (28%) it was found in the 15-19 age group (Table 7E). This agrees well with the results of other investigators (Langet, 1987; CDC, 1989). These results show that the young were responsible for the large majority of cases of gonorrhoea. On the average the females were younger than the males (Table 7E). Marital status was not associated with increased susceptibility to gonorrhoea. Reports indicate that frequency of sexually transmitted infection is higher among single, divorced and separated persons than among married couples (WHO, 1986). The results obtained in this study were not in agreement with those findings (Table 7C). The highest prevalence of gonorrhoea was observed among daily laborers followed by government employees and prostitutes. Most of the government employees were males (Table 7D). It was a surprise to find a higher prevalence in government employees than in prostitutes. This findings may reflect the less efficient detection of the infection in women (WHO, 1986); this may also account for the very high difference in prevalence observed between males and females.

In Addis Ababa (Ethiopia), after the first report in 1983 by Habte-Gabr and his collaborators on the emergence of PPNG strains, its prevalence has been increasing, as in many parts of the world (Osoba, *et al.*, 1983; Obaseikin-Ebor, *et al.*, 1985; Messele and Tassew, 1987). In this study, 70% of all neisseria isolates were PPNG strains. This finding agrees with the recent report by Aberra and his collaborators in 1990. The rate of about 70% observed in this study is not as high as the isolates from Benin city, Nigeria (87%) in 1983-1984 (Obaseiki-Ebor, *et al.*, 1985) and is comprable to the isolates from Ibadan, Nigeria (>50%) (Osaba, *et al.*, 1983) and from Nairobi, Kenya (>50%) in 1984 (Owali, 1986). Both PPNG and non-PPNG were sensitive to all drugs tested except for penicillin, ampicillin, bactrim and kanamycin. More of the PPNG strains were resistant to penicillin, ampicillin and bactrim than the non-PPNG strains (Table 8). It was a surprise to find nore of the PPNG and non-PPNG strains being resistant to bactrim, the recently recommended WHO drug for N. gonorrhoeae as primary treatment .

Resistance of gonococci to multiple drugs has also been observed in this study, as has usually been previously reported by other investigators. The frequency of such multiple drug resistance in this study (79% of the strains) is significantly higher than the reports of previous investigator (Messele and Tassew, 1980; Sng, *et al.*, 1984; Aberra, *et al.*, 1990). This is a cause for serious concern in the control and treatment of gonorrhoea.

It is known that patients who usually attend government health centers in Addis Ababa are those who seek free examination and treatment services because of their low income (Solomon, 1992). In this study, also, individuals from the lowest socioeconomic status made up more than 75% of the STD patients. Around 80% of the patients have had sexual contact with more than one sex partner. Despite this, more than 95% of the patients and their partners did not use condom during sexual contact. Only 5% of the patients were using condom occassionally (Table 10). Sexually transmitted diseases including HIV are spread from infected person to their sex partners during unprotected sexual exposure (Laga, *et al.*, 1990). In general, the use of protective means aimed at both safer sex and contraception was found rather very low both in patients attending clinics for STDs and students (Table 10). This is in agreement with the report (Mengistu, *et al.*, 1990) that condoms and spermicide as contraceptives were not popular among women practicing multiple partner sexual contacts (MPSCs) in all urban areas studied. The male population in Ethiopia also rarely used condoms. This is mainly due to negative attitudes, ignorance and a lack of the product (Mulugeta, personal communication, 1990). Such un protected activity was probably one of the most important reasons that the STD patients went vulnerable to gonorrhoea, syphilis and other STD infections.

Prostitution, being an economic necessity, continues to play a significant role in the maintenance and spread of gonorrhoea

and syphilis in the developing world (Langet, 1987). According to a 1989 projection by the Surveillance and Research Division of the Department of AIDS Control, Ministry of Health, Ethiopia, the number of prostitutes in Addis Ababa was estimated to be around 7.1% of the adult female population (Mengistu, personal communication, 1992). Several studies conducted in developing countries have shown prostitutes to be the source of infection for the large majority of male patients seen at STD clinics, both in urban and semiurban areas (Langet, 1987; Araya and Benette, 1988; Piot and Laga, 1989).

In this study also more than 90% of the male patients attending clinics for STD implicated prostitutes as the source of their infection (Table 10).

In some countries where prostitution is believed to play a significant role in the transmission of STDs "Control Programs" tend to devote their resources almost exclusively to providing some measure of preventive STD diagnosis and treatment for these women. Unfortunately, such programs are often of poor technical quality, reach only a small proportion (probably less than 20%) of the total prostitute population, and have failed to achieve a demonstrable impact on STD morbidity in the community. In addition, prostitute control programs may interfere with the introduction of the STDs control measures. Health policy makers are frequently satisfied by implementing "Prostitute control", and argue that enough is being done and additional resources need not be devoted to STDs problems in the country (WHO, 1991).

Integrated preventive programs designed to decrease the risk of STD transmission in general are likely to achieve greater success than those which focus exclusively on prostitution (Mengistu, *et al.*, 1990).

Sexually transmitted diseases have been identified as important risk factors for sexually acquired HIV infections in many countries (WHO, 1989). When STDs are not present the rate of male to female transmission of HIV have been estimated to be approximately one in 500 sexual exposure (Hearst and Hulley, 1988).

Several workers have shown an association between HIV and syphilis (Quinn, *et al.*, 1987; Denis, *et al.*,1987; Simonsen, *et al.*, 1988) and a weak association between HIV positivity and gonorrhoea (Kreiss, *et al.*, 1986; Laga, *et al.*, 1990). Because of the high rates of change in sexual partners and the liklihood that sexually transmitted infections increase the average transmission probability of HIV, attenders of STD clinics are considered to be particularly at risk (Anderson and May, 1988).

Multi partner sexual contacts, contacts with prostitute, and lack of the use of condom were risk factors for both syphilis and gonorrhoea infections in this study (Table 10). The high rate of gonorrhoea and syphilis together with the risk behaviors observed in this study, may contribute to the risk of HIV infection among the patients attending clinics for STDs. This has also been confirmed by previous surveys which showed that 12% of the patients with STD in Addis Ababa to be seropositive for HIV (Hailu, *et al.*, 1991).

Conclusion and Recommondation

From the results obtained in this study, the following recommendations may be made:

1. Continuous screening for syphilis of pregnant women and patients attending clinics for sexually transmitted diseases irrespective of signs and symptoms should be carried out.
2. Special efforts must be made to control the spread of PPNG strains in Addis Ababa and in other parts of the country. These must include regular testing of gonococci isolated from various regions for their susceptibility to antibiotics and penicillinase production, and tracing the sexual partners of patients for immediate treatment.
3. Penicillin as the first line antigonococcal therapy is of very limited value in Addis Ababa. It should therfore be replaced by an effective drug which preferably could be administered as single dose. Spectinomycin is recommended.
4. Immediate actions should be directed at providing condoms and health education on regular bases in order to decrease the transmission of STD including HIV.
5. The RPR test was found to be a satisfactory screening test for syphilis in the study area. Only sera giving weak positive result must be retested.

ANNEX

QUESTIONNAIRE

1. Study number _____
2. Clinic _____
3. Age _____
4. Sex / / Male / / Female
5. Ethnic _____
6. Religion _____
7. Occupation _____
8. Marital status

   / / Single / / Married / / Divorced
9. Socio-economic status (monthly income)
10. Blood transfusion in the past or at present

    / / Yes / / No
11. Sexual contact with more than one partner

    / / Yes / / No
12. Sexual contact with a prostitute

    / / Yes / / No
13. Do you or your partner(s) use condom?

    / / Yes, always

    / / Yes, sometimes

    / / Rarely

    / / No, not at all

14. Reason for coming to the clinic _____

15. Specimen collected _____

16. Diagnosis _____

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