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Ministry of Health
DIVISION OF REPRODUCTIVE HEALTH

**DESK REVIEW: Infertility in Kenya
August 2007**

Activity: Survey on Magnitude, Causes, Management and Challenges of Infertility in Kenya

Sponsor: Government of Kenya, Ministry of Health,
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TERMS OF REFERENCE

1. Desk review for existing studies on the magnitude of infertility and common causes.
2. Undertake survey in sampled districts to collect and collate data on infertility at facility and community levels.
3. Come up with a draft report to be presented to the Ministry of Health Infertility Working Group.
4. Final Report with recommendations.
5. The duration of the consultancy should not take more than three (3) weeks.

OBJECTIVES

Broad objective:

To assess the Magnitude, Causes, Management and Challenges of infertility in Kenya and make necessary recommendations.

Specific objectives:

- (a) To document the magnitude and common causes of infertility in Kenya using secondary data analysis and literature review.
- (b) To document the existing procedures in the management of infertility in the sampled study sites.
- (c) To document Laboratory, Imaging and Clinical services at various health care delivery levels.
- (d) To identify the appropriate and cost effective referral system(s).
- (e) To identify the training needs for the different cadres of staff involved in infertility management.
- (f) To collate data on infertility at facility and community levels.
- (g) To document the status of Assisted Reproductive Technology (ART) in Kenya
- (h) To document the limitations in the management of infertility at different levels.
- (i) To make appropriate recommendations.

LIST ABBREVIATIONS

AART Advanced Assisted Reproductive Technology
 AFRO African Regional Office (of WHO)
 ATP Adenosine Triphosphate
 AIDS Acquired Immune-Deficiency Syndrome
 ART Assisted Reproductive Technology
 DRH Division of Reproductive Health
 CT Chlamydia Trachomatis
 EMRO East Mediterranean Region
 FBO Faith Based Organizations
 FP Family Planning
 GC Gonococci
 GIFT Gamete intra-fallopian transfer
 GOK Government of Kenya
 HIV Human Immuno deficiency Virus
 ICPD International Conference on Population and Development
 ICSI intracellular sperm injection
 IVF-ET Invitro Fertilization – Embryo Transfer
 KAP Knowledge Attitude and Practices
 KESAS Kenya Service Assessment Survey 2004: Maternal and Child Health, Family planning and STIs.
 KNH Kenyatta National Hospital
 KDHS Kenya Demographic Health Survey
 MOH Ministry of Health
 NGO Non Governmental organization
 PID Pelvic Inflammatory Disease
 PROST pro-nuclear stage transfer
 RH Reproductive Health
 RHP Reproductive Health Program
 RTI Reproductive tract infection
 STDs Sexually Transmitted Diseases
 STIs Sexually Transmitted Infections
 TET tubal embryo transfer
 TESATesticular sperm aspiration
 UNFPA United Nations Population Fund
 WHO World Health Organization
 ZIFT zygote intra-fallopian transfer

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1: INTRODUCTION

1.1: Definitions of infertility

Infertility has no standard definition as different interest groups look at it within the confines of their set goals and outcomes. As a result of this prevalence studies that satisfy all key players are not easy to conduct. To a clinician, it refers to the inability to conceive within one year of exposure to high risk of pregnancy in women of reproductive age (15 to 49). The definition assumes that the woman is regularly sexually active with her male partner, not on contraceptives and is non-lactating. The latter is the epidemiological definition and recommended by the World Health Organization (*Rowe et al, 2002*). On the other hand, to a demographer, infertility is defined as: "the percentage of ever-married women who are childless at the end of their reproductive life (a measure of primary infertility) and the percentage of married women who have not conceived in the previous five years (a measure of the total of secondary and primary infertility)". These measures are not able to differentiate between involuntary and voluntary childlessness and are complicated by the high levels of contraceptive use in certain regions of the world. In demographic studies five years is the cut-off period of exposure. To two people affected, infertility may mean overall childlessness regardless of whether conception and/or delivery have taken place.

In this review, the modified definition by WHO: "inability to conceive after at least 12 months of unprotected intercourse (*Rowe et al, 2002*)" is widely used. It is imperative to note that this definition is confounded by pregnancy wastage and childlessness which are not well accounted for in the statistical calculations.

Other important definitions in the context of infertility are:

Primary infertility: inability of a woman (who has had no previous pregnancy) to achieve pregnancy after one year of unprotected normal intercourse.

Secondary infertility: "a condition where a woman who has previously achieved a pregnancy, regardless of the outcome, is unable to repeat this despite cohabitation and exposure to pregnancy for a period of one year from the last delivery, or cessation of lactation or contraception or loss of pregnancy".

Recurrent pregnancy loss: "occurrence of three or more pregnancy losses prior to the 20th week of gestation".

Duration of involuntary infertility: "the number of months the couple has been having sexual intercourse without the use of any contraceptive method".

Male infertility: "inability for a man to father a child after 12 months of regular unprotected sexual intercourse. It encompasses the capacity to initiate and sustain sexual intercourse with ultimate conception. It is divided into primary and secondary: primary when a man has never impregnated a woman and secondary when he has so done previously irrespective of whether it is with the present partner and/or of the outcome of pregnancy. Men with secondary infertility, in general, have a better chance of future fertility (*Rowe et al, 2002*).

Cultural definitions of infertility are diverse and usually do not include the man in the equation (*Sekadde-Kigundu et al, 2005*).

1.2: Infertility: The paradigm shift

Infertility is a problem that affects men and women everywhere in the world. Although estimates of its prevalence are not accurate and vary from region to region, about 8% of couples experience some form of infertility during their reproductive lives, a condition that causes personal suffering and disruption to family life. When extrapolated to the global population this means that 50–80 million people probably have a problem with fertility, and that there are about two million new infertile couples per year.

The distribution of male and female causes of infertility has not been well defined both locally and globally. However, from WHO: Multicentre study: 1982–1985, the following distribution pattern was found: Male Factors: 20%, Female factors: 38%, Causal factors identified in both: 27%, and Not satisfactorily attributed to either: 15%. From this it is apparent that male related disorders of fertility, alone or in combination with female factors are present in up to approximately 34% of childless couples. However, despite the high incidence, it is observed that as a result of firmly entrenched beliefs, in most cultural settings it is the woman who is usually blamed for the couple's inability to bear children. Often this leads to a profound negative impact on women's lives: pain and suffering, stigma, isolation and frequently abandonment. Further, the approaches in scientific and clinical research have by and large inadvertently feminized infertility, hence in a sense legitimizing the traditional belief that infertility is essentially a woman's problem (*Oehninger, 1995 & 2000; Mercia Inhorn C, 1993 & 1994*).

Infertility has been a major health problem in low resource settings countries for decades. However, it is only very recently that it has received some significant measure of local and international attention from researchers and policy makers. This change of attitude towards infertility in these countries where many other health problems are the norm rather than the exception may be attributed to a number of factors (*Betsey, 1976, Ginsburg and Rapp, 1995, KDHS, 1989-2004*).

- The HIV/AIDS epidemic raised interest in other STDs. Infertility came more into the picture since Gonorrhoea and Chlamydia, common in developing countries are also the main cause of tubal-factor infertility.
- In many low resource settings, it was reported that infertility was increasingly becoming a major health problem and hence the felt need and drive by individual countries and institutions to give it the deserved attention it required.
- Reports from various third world countries indicated that women did not want to use contraceptives out of fear of becoming infertile. Family-planning policy makers and workers have therefore given significant attention to infertility.
- Women Health Activists have criticized the limited scope of health programmes for women in third world countries. These programs mainly offer contraceptive and obstetric care to limited number of women with little attention to other reproductive health problems like infertility in its broadest sense. For years, and with good success, these advocates have pleaded for integrated reproductive health care programs.
- It is therefore instructive that during the United Nations International Conference on Population and Development (ICPD), in Cairo, Egypt, in 1994, "Prevention of infertility and appropriate treatment, where feasible", was included as one of the key components of "The ICPD Reproductive Health Care Program of Action." Respective member

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RECOMMENDATIONS

From this desk review, we draw the following recommendations:

- The GOK, Ministry of Health to take the leading role in addressing management, policy and research issues. It is commendable that this survey was commissioned by the government. The spirit must be maintained.
- Expansion of research base to obtain data and evidence on various aspects as listed above under conclusions.
- Efforts should be made to standardize infertility management, though this will be clearer and more specific in the final report of the whole survey.
- STI/HIV & AIDS prevention and education strategies to include infertility as a key component
- Urgent need for ART services in some selected private and public health facilities.

countries were left to translate this policy statement into strategies and actions in-keeping with their health priorities (*UN, 1994*). In line with this resolution many African countries have interpreted and operationalised the problem of infertility in different ways. In Kenya, for example, Management of Infertility" was included as one of the key components of the Kenya National Strategy for Reproductive Health Care for the years 1997-2010 (*GOK-MOH: 1996*).

Whether seen from the demographic, epidemiological or clinical point of view, infertility is one of the major public health concerns in Kenya. However, the problem has been inadequately addressed both at policy, research and service delivery levels, mainly due to its ranking against other perceived more pressing and competing national health priorities such as the serious and prevalent diseases like HIV/AIDS, Tuberculosis, and Malaria. It may also be partly because of the perceived high fertility and population growth rates. It is also noted that data obtained from western-type health care institutions as well as from traditional health facilities suggest that Kenyans are increasingly turning to these institutions to seek the cure to this malady.

1:3: Health care delivery systems in Kenya

Health is defined here in its broad sense, being not only the absence of disease but also general mental, physical and social well-being. In this definition, the environment in which people live – including access to nutritious food, safe water, sanitation, education and social cohesion – also determines health.

In Kenya the health sector comprises the public (Government) system, with major players including the Ministry of Health (MOH) and Parastatal organizations, and the private sector, which includes private-for-profit health facilities, Non-Governmental Organizations (NGOs), and Faith-Based Organization (FBO) facilities. The public system services are provided through a network of over 4,700 health facilities countrywide, accounting for about 51 percent of all the facilities, the private sector approximately 41 percent, and others 8%.

1.3.1: The public health system

The public health system consists of the following levels of health facilities: Dispensaries, Health Centres, District Hospitals, Provincial General Hospitals and National Referral and Teaching Hospitals.

(a) Dispensaries

Dispensaries are meant to be the system's lowest organized first line of contact with patients. However, in some areas, health centres or even hospitals are effectively the first points of contact. Dispensaries provide wider coverage for preventive health measures, which is a primary goal of the health policy. They are staffed by enrolled nurses, public health technicians, and dressers (medical assistants). The enrolled nurses provide antenatal care and treatment for simple medical problems during pregnancy such as anaemia, and occasionally conduct normal deliveries. Enrolled nurses also provide basic outpatient curative care.

(b) Health Centres

The network of *health centres* provides many of the preventive and curative services, mostly adapted to local needs. They are staffed by midwives or nurses, clinical officers, and occasionally by doctors. They provide a wider range of services, such as basic curative and preventative services for adults and children, as well as reproductive health services, and minor

surgical services such as incision and drainage. They augment their service coverage with outreach services, and refer severe and complicated conditions to the appropriate level, such as the district hospital.

(c) District Hospitals

District hospitals concentrate on the delivery of health care services and generate their own expenditure plans and budget requirements based on guidelines from headquarters through the provinces. They are the first referral hospital and form an integral part of the district health system.

A district hospital should provide the following health services:

- Curative and preventive care and promotion of health of the people in the district;
- Quality clinical care by a more skilled and competent staff than those of the health centre and dispensaries;
- Treatment techniques such as surgery not available at health centres;
- Laboratory and other diagnostic techniques appropriate to the medical, surgical, and outpatient activities of the district hospital;
- Inpatient care until the patient can go home and back to the health centre;
- Training and technical supervision to health centres as well as resource centre for health centres at each district hospital;
- Twenty-four hour services;
- The following clinical services:
 - Obstetrics and gynaecology;
 - Child health;
 - Medicine;
 - Surgery, including anaesthesia;
- Accident and emergency services;
- Non-clinical support services;
- Referral services;
- Contribution to the district-wide information generation, collection planning, implementation and evaluation of health service programmes.

(d) Provincial Hospitals

The provincial level acts as an intermediary between the national central level and the districts. They oversee the implementation of health policy at the district level, maintain quality standards, and coordinate and control all district health activities. *Similar private hospitals at the provincial level include Aga Khan Hospitals in Kisumu and Mombasa.*

Provincial hospitals form a secondary level of health care for their location. They provide services to a geographically well-defined area. Provincial hospitals are an integral part of the provincial health system. They provide specialized care, involving skills and competence not available at district hospitals, which makes them the next level of referral after

CONCLUSIONS

- From this review we note that Kenya is one of the countries of the world where data on infertility is scarce and its management diverse. In this context, it can be said that the exact magnitude of various causes of infertility is poorly understood. The available facility and community based studies have significant design and methodological deficiencies that they lack the power of Generalizability. The KDHS indicates that the prevalence of infertility is falling. We also find that infections in general, and particularly STIs, play a role in the causation of infertility
- In all the studies analyzed, the perceptions, experiences and problems of infertile couples as shaped by cultural, bio-medical, institutional, political-economic, perceived/actual cause of infertility, and interpersonal forces, all as key components of a comprehensive infertility management strategy, have not been looked into to any significant degree.
- ART services are not readily available, besides being very expensive for the majority of Kenyans.
- Studies targeting preventive strategies are very scarce. There is need to address this gap,
- Preventive programs on STIs do not include infertility.

So far most of the infertility research work in Kenya has been hospital based and as in many other parts of the world, heavily focused on the female gender. (Machoki and Sekadde-Kigonde, 2005) This inadvertently reinforces the cultural construction of infertility as a female problem.

Sekadde-Kigonde et al (2005) in her study among urban community living in a slum area in the City of Nairobi {Baba Dogo (multi-ethnic with experiences drawn from the numerous tribes in Kenya)}, and a rural community in the Muranga District, (one ethnic group, Kikuyu), found that in both communities infertility was perceived from the standpoint of traditional practices and taboos such as lack of respect for the elders, curse, religious beliefs and "incompatibility of blood between the spouses". Both communities were found to have inadequate knowledge of the causes of infertility, except for the secondary and post secondary students, who tried to explain medical causes such as the relationship between STIs and blocked tubes. A category of social ills, such as use of drugs and local brews, was mentioned in both communities and the connection with infertility was related to behavioral changes in both spouses. Use of these harmful drugs was explained to lead to impotence in men and lack of interest in sex in females. Many infertile women deplored the agonies they have to bear as a result of their predicament, blame for the infertility, and being chased away from their matrimonial homes. They were isolated and labeled with insulting names.

In the discussion groups, participants mentioned derogatory terms by which infertile women were referred. In Kiswahili an infertile woman is referred to as "tasa", Kikuyu- "thaata", Luo- "lur", Akamba- "ngungu" and Luhya- "mkumba". It is important to note that all these terms were feminine and, therefore, do not make reference to men. Infertile women in the discussion groups confirmed that these terms were often applied to them. The communities used various ways to insult and intimidate them, a constant reminder of their worthlessness. The following excerpts from the participants' presentation elaborates this point:

"Yes, it is the order of the day, everywhere you go people insult you and call you a name. Even when you talk to these people nicely they call you the name. They say 'Tasa stop talking you are nothing but Tasa'. When a child wrongs you, you cannot report him/her because you have no child of your own."

Such utterances were dehumanizing, to say the least. The entire social interactions were hinged around ability to bear children. In many instances the husband appeared helpless and yielded to the demands of his relatives, especially his mother.

"They chase you out of their boma (home) telling you that you are eating food for nothing. They chase you like a dog arguing that the benefit of marrying a woman is to get a child."

From this study, it is observed that the social and cultural aspects of infertility including the traditional management have been largely ignored. Little is known about knowledge and perceptions of communities regarding definition, causes and meaning of infertility and how it is managed in traditional settings. It is known that couples and individuals affected by infertility consult traditional systems of medicine, before coming to modern health institutions. This has resulted in delays in initiating investigation for infertility that has been observed in Africa and Kenya in particular.

district hospitals. Their personnel include medical professionals such as general surgeons, general medical physicians, paediatricians, general and specialized nurses, midwives and public health staff.

Provincial hospitals should provide clinical services in the following disciplines:

- Medicine
- General surgery and anaesthesia
- Paediatrics
- Obstetrics and gynaecology
- Dental services
- Psychiatry
- Accident and emergency services
- Ear, nose and throat
- Ophthalmology
- Dermatology
- ICU (Intensive care Unit) and HDU (High Dependency Unit) services.

They should also provide the following services

- Laboratory and diagnostic techniques for referrals from the lower levels of the health care system
- Teaching and training for health care personnel such as nurses and medical officer interns
- Supervision and monitoring of district hospital activities
- Technical support to district hospitals such as specific outreach services

(e) National Referral and Teaching Hospitals

National referral hospitals are at the apex of the health care system, providing sophisticated diagnostic, therapeutic and rehabilitative services. The two national referral hospitals are Kenyatta National Hospital in Nairobi and Moi Referral and Teaching Hospital in Eldoret. *The equivalent private referral hospitals are Nairobi Hospital and Aga Khan Hospital in Nairobi.*

They are centres of excellence and provide complex health care requiring more complex technology and highly skilled personnel. They have a high concentration of resources and are relatively expensive to run. They also support the training of health workers both pre-service and in-service levels.

These hospitals have the following functions:

Health care

Referral hospitals provide complex curative tertiary care. They also provide preventive care and participate in public health programmes for the local community and local primary health care system. Referrals from the districts and provinces are ultimately received and managed at the referral hospitals. The referral hospitals have a specific role in providing information on various health problems and diseases. They provide extramural treatment alternatives to hospitalization. Such as day surgery, home care, home hospitalization and out reach services.

Quality of care

Teaching hospitals should provide leadership in setting high standards and treatment protocols. The best quality of care in the country should be at the teaching and referral hospitals.

Access to care

Patients may only have access to tertiary care through a well-developed referral system.

Research

With their concentration of resources and personnel, teaching and referral hospitals contribute in providing solutions to local and national health problems through research, as well as contributing to policy.

Teaching and training

Teaching is one of the primary functions of these hospitals. They provide both basic and post-graduate training for health professionals.

1.3.2: The private health system

The private sector operates quite independently of each other and in majority of cases have no working strong, organised link with the private hospitals. They consist of private clinics (private-for-profit health facilities), Private maternity and Nursing Homes and private hospitals at the equivalent level of District, Provincial and National referral hospitals.

(a) Private clinic

These provide mostly curative services and operated by FBO, non governmental organization, midwives/nurses, clinical officers and doctors.

(b) Private maternity and nursing homes

Private maternity homes fall under the governance of Kenya Registered Midwives Association (KRMA). Some maternity and nursing homes are run by other health professionals such as doctors and clinical officers. Working in close collaboration with the Reproductive Health and Child Health Divisions of MOH. They offer reproductive and FP services. In addition, some child welfare activities are carried out on their premises by the health staff of public health facilities.

(c) Private Equivalent of Government Provincial level Hospitals includes Aga Khan Hospitals in Kisumu and Mombasa.

(d) Private Equivalent of Government National referral and teaching hospitals

Includes The Nairobi Hospital and Aga Khan Hospitals in Nairobi.

disease and in some cases are quarantined for 6 months. The donor is made to sign a consent form regarding the law on donor responsibilities and parental rights and compensation is provided for acceptable samples.

When kept in liquid nitrogen (-170°C) sperm can survive for an average of seven years, however the rate is variable ranging from a few months to 15–20 years. Most sperm banks freeze and quarantine sperm for about six months while the donor undergoes repeated testing for sexually transmitted disease therefore do not avail fresh sperm for insemination.

In the developed countries sperm banks are available where semen is preserved and stored for use in the treatment of male infertility.

7: SOCIAL-CULTURAL ASPECTS OF INFERTILITY

The impact of infertility to the community and to a couple depends on the prevalence of infertility in that area and the socio-cultural values attached to childbearing (*Chepng'eno, et al, 2005, Friday, 1997, Leke et al, 1993*).

For many couples, the inability to bear children is a tragedy. The conflict of personal, interpersonal, cultural, social and religious expectations brings a sense of failure, loss and exclusion to those who are affected. Socially and culturally, most societies are organized such that children are necessary for care and maintenance of older parents, an assurance of continuity of the family lineage. Childless couples may be excluded from taking leading roles in important functions and events such as birthdays, christenings, confirmations and weddings.

As it were, it can be said that children are insurance for the old age and assurance of personal and lineage immortality, and the desire to procreate is as old as the human race. In the traditional African setting one important process of marriage is the payment of bride wealth by a man to the woman's family to ensure the monopoly of her conjugal rights and ownership of the offspring of the marital union. In essence a woman appears to serve as a mere tool facilitating the man's procreation and sex needs. A woman's social; status, direction in life, economic achievement, well-being and the very meaning marital life hinges around her ability to beget and rear children. The ability to beget children is therefore, seen as a true mark of womanhood and pride of a man. A childless marital union is plagued by tensions resulting from numerous man-made problems, social stigma, economics exploitations, and psychological pressure from the husband's relatives. Infertility has been observed as one of the husband's relatives. Infertility has been observed as one of the common problems for which adult women seek help from traditional healers (*Kimani, 1995*).

From a medical culture standpoint and research perspectives, infertility has been consciously and/or subconsciously constructed to discriminate against the female gender. While from a medical point of view infertility is a couple problem, in most cultural settings, it is the woman who is usually blamed for the couple's inability to bear children as a result of firmly entrenched beliefs. Often this leads to a profound negative impact on women's lives: pain and suffering, stigma, isolation and frequently abandonment. In addition, this may be further compounded by the economic and emotional burdens that are ushered in the process of diagnosis and treatment. Further, the approaches in medical care and clinical research have inadvertently feminized infertility as well as legitimized the traditional belief that infertility is essentially a woman's problem. This often leads to poor management strategies, biased outcomes, and sometimes misallocation of resources and exposure to costly and life threatening interventions. (*Whiteford and Gonzalez, 1995; Balen Et Trimbo-Kembo, 1994; Marcia Inhom, 1994; and Marcia Inhom Et Buss, 1993*).

Australian study respondents were asked their opinion regarding medical compensation for IVF treatments and more than half of them 65% thought that treatment should be offered by Medicare while only 26% thought otherwise (Ray, 1999). In the same study, nearly three quarters (74%) of the Australians said that the federal government should contribute to the cost of IVF treatment through Medicare and pharmaceutical benefit scheme.

Religious issues regarding assisted reproduction

The Roman Catholic instruction called the practice of homologous Artificial (AIM) Insemination and Gamete Intra-fallopian tube transfer (GIFT) into question when it asserted that "it sometimes occurs that a medical procedure technologically replaces the conjugal act in order to obtain a procreation which is neither its result nor its fruit. In this case the medical act is not, as it should be, at the service of the conjugal union, but rather appropriates to itself the prospective function and thus contradicts the dignity and inalienable rights of the spouses and of the child to be born (*Congregation of the Doctor of the Faith, 1987*). The ethics committee of the American Fertility Society rejected this contradiction "because it sees such interventions not as a replacement of sexual intimacy, but as its logical and technical extension. The committee believes that the instruction, in its laudable effort to avoid mechanizing marriage and procreation, has too casually accepted natural procedures as morally normative.

Like the Roman Catholic instruction, Judaism considers natural marital procedure to be morally normative, but it does not regard them to be absolute. While AIM and GIFT can be viewed as compatible with the teachings of the Roman Catholic and Judaism, their permissibility is much more strongly noted in the latter.

Kenya has a large majority of the population in the Roman Catholic faith and their beliefs are deeply rooted in the church doctrine. This has a significant effect on their lifestyle and many of them have been noted to reject even modern family planning methods. There has not however been much discussion about assisted reproduction in Kenya but this issue is likely to raise eyebrows among the Catholic faithful.

SPERM BANK.

Sperm freezing and banking involves storing prepared sperm in liquid nitrogen for the purpose of artificial insemination, IVF or ICSI.

- Prior to chemotherapy
- Prior to radiation therapy
- Prior to surgery that may affect the ejaculatory process
- Prior to vasectomy
- Short term storage for couples when ovulation finds him out of town.
- For the men going to war.

The donors are selected using a certain criteria for example considering age, risk of HIV, education background and ability to make a commitment. The donor then undergoes a thorough screening process, which begins with a telephone conversation and at the end of the interview, the donor is asked to produce a semen sample. This undergoes the routine semen analysis and ability to withstand freezing is also tested. Screening of the donor continues with a physical examination and laboratory tests for HIV, hepatitis and other sexually transmitted diseases. The semen samples are also tested for genetic

1.4: Highlights: Kenya Service Assessment Survey 2004: Maternal and Child Health, Family Planning and STIs.

In this Government sponsored survey, and whose report has already been approved as an official document, we note two levels of commitment on the part of the Government in advancing management of infertility in Kenya to greater heights:

(a): At policy level: The MOH is committed to addressing three key policy issues:

- (i) Limited access to infertility services
- (ii) Delay in seeking health care by affected individuals and couples
- (iii) Knowledge and attitude towards infertility

(b): At service delivery level: In order to reduce the magnitude of infertility and increase access to proper investigations and management of infertile individuals and couples, the RHP is planning to:

- (i) Improve access to quality infertility services at all levels of health care delivery system.
- (ii) Promote community awareness on infertility, especially among the males
- (iii) Encourage research in all aspects of infertility

1.5: Reproductive Health Services in Kenya

Reproductive health services in Kenya are available at all levels of health care, from the community level to Kenyatta National Hospital, the highest Health and Teaching institution in the country. Health care facilities are classified as community, primary, secondary and tertiary levels.

Community level services are provided by Community Health Workers (CHWs), Community Based Distributors (CBD), Traditional Healers (THs), and Traditional Birth Attendants, (TBAs). The Primary level includes the dispensary (static or mobile) and the Health Center. The dispensary is usually staffed by at least two Enrolled Community Nurses (ECNs) while the Health Center has at least one Clinical Officer in addition to ECNs. A few Health Centers in the country which are designated as Demonstration Units are staffed and equipped to facilitate management of cases not normally handled at the primary level, and their classification is more towards secondary than primary level of care. The Secondary level usually refers to the District Hospital, Which does not have a full range of specialists in the main clinical disciplines.

Tertiary level facilities, (all provincial and teaching Hospitals), have specialists in all clinical disciplines and are equipped to deal with most clinical problems referred there.

Following the resolutions of the 1994 International Conference on Population and Development, where Kenya was represented, in 1996 the Kenya National Strategy for Reproductive Health Care for the years 1997-2010 was formulated.

The key components of this strategy are:

- Safe Motherhood, Child Survival, and Abortion Services
- Family Planning Unmet Needs
- Management of STIs and HIV/AIDS
- Promotion of Adolescent and Youth Rights
- Management of Infertility
- Gender Issues and Reproductive Rights

- Female Genital Mutilation
- Violence against women
- Promotion of Positive Sexual Health
- The Girl Child
- Other Reproductive Health Issues
 - Screening and Treatment of cancers of the Reproductive System

Important and complimentary areas include:

- promotion of the concept of Reproductive Health
- integration of services and quality of care
- identification, mobilization and allocation of resources
- reproductive health research
- monitoring and evaluation

Infertility services are mainly available at the tertiary level and at some District Hospitals which are lucky to have a Gynecologist. Some private hospitals and NGOs offer infertility services to those who can afford it. At the community level Traditional Healers are involved in the management of infertility.

Legal and ethical issues regarding assisted reproductive techniques.

While homologous artificial insemination maybe somewhat acceptable, the use of donor semen may spark a lot of religious, legal and cultural issues. The selection of donors may be difficult given these barriers. American physicians most frequently recruit physicians in training, including house officers and medical students as their donors, their ages ranging between 21-30 years (*Sanders, et al 1990*). An independent sperm bank is likely to have a more diverse group of donors. However, the attitudes of the medical group and the non-medical group among donors are remarkably similar. American donors are selected by administrators; therefore the donors reflect values of the administrators. A key characteristic sought by most administrators is the willingness of the donors to be anonymous. It is assumed that it is undesirable for the donor to know the inseminated persons and vice versa. It is further assumed that the donor wants no responsibility for his AID offspring and therefore donors are required to waive all rights to their semen. A fee is paid to the donor acknowledging the relinquishment of those rights. Hence the American donors expect and receive promises of confidentiality. Depending on the method of selection of donors, the motivation of donor participation may be primarily financial or altruistic. These motives however do not influence their concern for their AID offspring. In some studies, donors have expressed willingness to be contacted by their AID offspring. In Handerson (1985) series about 20% were willing to be contacted. In regard to managing semen donors, the 1993 guidelines of the American Fertility Society indicated that 'it is highly desirable to maintain permanent confidential records of donors including a genetic workup and other-non-identifying information, and make the anonymous record available on request to the recipient and or any resulting offspring". However no American legislative bodies have required permanent confidential medical records identifying all the parties to AID, including the (*AFS, 1993*).

Recent legislation in the United Kingdom establishes a central registry of gamete donors children derived from donated gamete will have access to non-identifying donor information in the registry. The children will even be able to learn whether they are related to a prospective marriage partner. The law nevertheless guarantees total anonymity to donors. The issue of permanents donor records could become more important as states recognize their implications for the public health especially in the control of transmissible diseases, both infectious and genetic. Most American states have accorded AID-offspring rights to child support, property and inheritance to the recipient parents. States have also enacted laws that make AID progeny the legal child of the sperm recipient and her consenting husband and no American court has held a donor financially responsible for a child conceived at an infertility clinic. The adoption act in Kenya demands that an adoption order is made in a Residents Magistrate's Court or it may be referred to the High Court in case of special circumstances (*CAP 143, 1988*). An adoption order may not be made if for example the applicant has not attained the age of 21 years, is a relative of the infant or is in a polygamous marriage. The consent of the parent or guardian must be sought or anybody who is liable by order or agreement to contribute to the maintenance of the infant. The order also requires that no payment or reward be made to the applicant in consideration of the adoption contrary to section 29 of the act (*CAP 143, 1988*).

A register known as the adopted children register is maintained by the registrar general where all adoption orders are filed. The act does not however provide any regulations regarding donation of sperm.

Regarding Medicare compensation for the treatment of infertility, most healthcare institutions do not offer any treatment concerning infertility. In Kenya for example, the healthcare institutions do not offer any treatments for infertility. In one

Intracytoplasmic sperm injection (ICSI)

In men with severe deficits in the semen quality or azoospermia as well as those in whom a previous cycle has failed, ICSI may be considered. Intracytoplasmic sperm injection (ICSI) is a new infertility issues (*Larry I. et al 2000*). It was pioneered by an assistant professor of embryology at the New York hospital – Cornell Medical Centre. It involves the injection of a single sperm directly into the egg virtually eliminating the problems and limitations found with previous treatments. Eggs are obtained as in IVF and the actual process of injecting the egg is carried out in the laboratory using a Petri dish. Before injection the cumulus cells are removed from the egg otherwise this would create a shadow that many impair viewing and jeopardize the injection with the use of ICSI. With ICSI the use of ICSI, the current fertilization rate of 65% is expected to improve (*Larry I. et al 2000*). In men with obstructive azoospermia as in congenital absence of the vas, failed vasectomy reversal and other inoperable obstructions, sperm retrieval may be done by-

- Microepididymal sperm aspiration (MESA) involving use of a microscope to get a specimen of sperm proximal to the obstruction.
- Percutaneous epididymal sperm aspiration (PESA) which involves utilizing a small needle under local anaesthesia to aspirate sperm from a part proximal to the obstruction.
- Testicular sperm biopsy (TESE) involves taking a small of testicular tissue under local anaesthesia. This is done if no sperm is obtained using the other 2 methods.

The sperm are then injected into the mature egg retrieved from the woman and the embryos are replaced 2-4 days later. The eggs are obtained either laparoscopically or through the transvaginal route.

When male infertility is not amenable to therapy, sperm from a donor may be used for IVF/CSI. The use of donor sperm raises medical, emotional, ethical and legal issues for the potential parents and the practitioner. However these procedures offer hope to male partners of infertile couples and is seen as the way forward in the failure treatment for infertility in general.

- Impotence or erectile dysfunction – there are several treatment modalities, for example :
 - a) Pharmacological- use of drugs such as Yohimbine, testosterone, prostaglandin and recently Viagra (Sildenafil).
 - b) Mechanical treatment – involves use of a vacuum erection device to pump along with a constriction ring.
 - c) Surgical therapy is very useful in patients whose erectile dysfunction is as a result of psychological causes. These patients may also benefit from pharmacologic or combination therapy.
 - d) Electro-ejaculation – use of electric current to stimulate nerves and produces an ejaculation. This is done in cases where nerves have been damaged either as a result of disease injury. The specimen obtained can then be used for IVF.

2: CAUSES OF INFERTILITY IN KENYA

Since early 1980s there have been a number of clinical surveys to evaluate the magnitude and etiology of infertility in different parts of the world. Of all these, the largest series and most comprehensive and comparable was sponsored by WHO between 1980 and 1989 in 33 centres in 25 countries of the world. Kenya was one of the countries. All participating centres used a common protocol, working definitions and data record sheets. (Rowe, 1984; WHO, 1987, Dhaliwal et al, 1991). The total database exceeded 11,000 couples, of which 851 came from four Sub-Saharan centres. The striking differences between these centres and those in western developed countries are the rates of tubal occlusion and other tubal pathology in the female partner and accessory gland infection and Varicocele in the male partner. In the developed country centres, 27% of the female partners were found to have tubal factors (occlusion, hydrosalpinges, and adhesions) attributable to past pelvic infection or salpingitis. In the African centres this figure was 64%. It should be noted that efforts were made to exclude endometriosis and pelvic tuberculosis from this group and therefore it can be reasonably assumed that the tubal pathology was caused by sexually transmitted infections (STIs).

Other smaller studies have tended to indicate that the leading cause of infertility in both sexes in the Africa region is the tubal factor due to infections, sexually transmitted infections and post-abortal sepsis being particularly common. The emergence of HIV/AIDS pandemic and its proven far-reaching implications in fertility impairment have complicated the picture. Be that as it may, one can argue that the most cost-effective approach to solving the infertility problems in Africa, Kenya included is STIs/HIV & AIDS prevention and education. Men and women should be educated on the mode of spread of infections, early symptoms and simple preventive measures such as abstinence and the use of condoms. Education is particularly important in the case of youth that are known to be a high-risk group with regard to STIs. Where these disease conditions have occurred, early proper investigations, treatment and follow-up must be emphasized. In this regard availability and easy access to anti-retroviral, antibiotics and antifungals are critical. Other confounding variables such as post-abortal sepsis, poverty, illiteracy, poor nutrition and pollution must also be given the deserved attention.

Due to the anatomical and physiological differences between men and women, besides the varying impacts socio-cultural-economic dynamics have on the two, we shall examine the available evidence on the causes of infertility in Kenya among them separately.

2.1: FEMALE FACTOR

From the WHO multicentre study: 1982-1985, the following distribution pattern of infertility was found: Male Factors: 20%, Female factors: 38%, Causal factors identified in both: 27%, and not satisfactorily attributed to either: 15%. From this it is apparent that male related disorders of fertility, alone or in combination with female factors are present in up to approximately 34% of childless couples, while in the female 51%.

From the same study it was found that endocrinological causes contributed sizeable percentages. In the females: anovulatory regular cycles: 10%, anovulatory oligomenorrhea: 9%, ovulatory oligomenorrhea: 7%, and hyperprolactinemia: 7%. In the male primary testicular failure was found in 10% of cases

Other factors include a past history of ectopic pregnancy, previous tubal surgery, infections from rupture of an appendix, pelvic tuberculosis, septic abortion and sexually transmitted infections (STIs). About half the patients with pelvic and tubal problems have not had clinical symptoms of the above factors. (Cates *et al*, 1985; WHO 1987).

Less frequent causes of infertility include tumors causing pituitary dysfunction, ovarian dysfunction and metabolic diseases. Primary infertility contributed 58% and secondary infertility 42% of all cases of infertility in Kenyatta National Hospital Gynaecology outpatient clinic (Chatfield *et al*. 1970). In the same study, using tubal insufflation tubal occlusion was diagnosed in 49% of all cases of secondary infertility.

Mati *et al*. (1987) in their study found that there was a history of exposure to STIs in 5.7% of females and 3.7% of males. Of all females evaluated, 13.3% gave a history of pelvic inflammatory disease in the past. Female factor alone was responsible in 61.9%, male factor in 12.4% of the couples, and both partners in 18.1%. The leading causes of infertility in the female were pelvic adhesions (61.3%), anovulatory problems (15.9%), hyperprolactinemia (9.9%) and ovulatory Oligomenorrhea (5.6%). There was no demonstrable cause of infertility in 20% of females and 68.6% in males. The factors related to infection of the genital tract caused male infertility in 38.4% in the males demonstrable cause, varicocele contributed 33.3%, primary idiopathic testicular failure 15.4% and sexual dysfunction 5.4%. Other findings were: that the females seeking for infertility management were younger with the age peak of 20-29 years than their male counterpart whose age-peak was 25-39 years; the duration of marriage ranged between 12 to over 84 months and that 23% of the respondents had had infertility for over 84 months. It was also found that more males (28.0%) than females (24.8%) had previously been investigated for infertility. Previous exposure to STDs in both partners was 5.7% of the couples, which could have been an underestimation because C and CT tend to be asymptomatic especially in the females. History of PID as reported in 13.3% of females. This is contrary to the clinical and radiological findings, which showed that 61.3% of the females had pelvic adhesions and bilateral tubal occlusion. This shows that clinical history above does not conclusively predict the rate of tubal factor infertility. There was no demonstrable cause for infertility in 7.6% of the couples. Female factor alone was responsible in 61.9%, male factor in 12.4% of the couples and both partners were implicated in 18.1% of them. Hence the male factor had a role in the aetiology of infertility in 30% of these couples. There was no demonstrable cause of infertility in 20.0% of females and 68.6% of males. The leading causes of infertility in the female were pelvic adhesions and bilateral tubal occlusion (61.3%) followed by anovulatory problems (15.9%), hyperprolactinemia (9.9%), ovulatory Oligomenorrhea (5.6%) and others (5.6% -sexual dysfunction, acquired uterine and cervical abnormalities, congenital abnormalities, amenorrhea with high FSH).

The main STI pathogens, which have been isolated from women in Kenya, are Neiseria Gonorrhoea and Chlamydia Trachomatis (Okello. 1982). These are pathogens presumed to be contributing to infections of the genital tract in the patients and efforts should be directed at prevention of these diseases through effective diagnostic and curative services being made available particularly in rural areas.

Genital tract tuberculosis as a cause of infertility is perhaps very low but nonetheless should be considered in the Kenyan population (Ochiel, 1980). Between Jan 1974 - Dec 1978, Ochiel assessed the prevalence of genital tuberculosis in 1511 patients admitted with various forms of tuberculosis, 1.3% had genital tuberculosis. During the same period, 0.113% of patients (n=1145) admitted and investigated for infertility in the gynaecological wards 1.3% had genital tuberculosis. The results showed that there were no demonstrable causes for infertility in 7.6% of the couples. A female factor alone was responsible in 61.9% of the couples, a male factor in 12.4% and both partners were implicated in the remaining 18.1%.

- Reproductive abnormalities in the wife.
- Irregular ovulation.
- Sperm antibodies in the husband's semen
- Ineffectiveness of the semen.
- Discontinuation of the program.

In other studies using frozen donor semen the major factors noted to affected pregnancy rates were:

- Age of the recipient-recipients aged more than 30 years was noted to have lower pregnancy rates.
- Cycle pattern-regular cycles were associated with higher pregnancy rates.
- Use of Clomiphene citrate-this was found to improve the pregnancy rate.
- Cervical score-pregnancy rates in those with a peak cervical score of less than less than 7 was significantly lower than those with a score of greater than 7.
- Donor semen-in both initial and post-thaw sperm the pregnancy rates were noted to be similar.

Intrauterine insemination may however be associated with very painful uterine cramps, which are due to effect of the prostaglandin content of human semen.

In vitro fertilization and embryo transfer (IVF-ET)

This involves the union of the sperm oocyte in the laboratory and later transfer of the embryo into the patient's uterus. The eggs are obtained either laparoscopically or transvaginally under ultrasound guidance and semen is obtained by masturbation. This method is suitable for any form of infertility provided implantation is expected to occur. It is particularly useful for severe male factor infertility but the pregnancy rates are higher for sperm counts greater than 10 million per ml and motility of 30% and above. The first resulting from IVF occurred in June 1978 and since then thousands of children have been born throughout the world as a result of this procedure. Two of the most important measures of success of an IVF program the number and rate of pregnancies achieved. In one study at Boston's Beth Israel hospital, the outcome of 65 consecutive pregnancies achieved by IVF was: (John Yeh. *et al*, 1990)

- Total number of infants born - 38
- Multiple gestation - 17%
- Premature deliveries - 24%
- C/section rate - 45%
- Perinatal mortality rate - 26.3 per 1000.

However, this technique is still not available locally. IVF-ET was initially developed for the treatment of women with severe tubal disease but subsequently has been applied in other situations such as antisperm antibodies, endometriosis, oligospermia and unexplained infertility. Pregnancy rates resulting from IVF treatment are steadily increasing in the last 10 years but they vary depending on the expertise of the centre from 25-40%. A complete IVF cycle takes approximately 6-8 weeks because it involves concomitant use of hormones for stimulation of ovulation.

Assisted Reproductive Techniques.

In those men with poor semen analysis whose conditions are not treatable, assisted reproductive techniques (ART) have played a significant role. Even men with no sperm in the ejaculate may be able to have some living sperm procured from them through other methods and achieve a pregnancy using ART (Lang et al, 2000).

Several of these techniques are recognized:

Intrauterine insemination (IUI)

This is defined as the deposition of prepared spermatozoa within the uterine cavity or within the fallopian tube. Hunter (1728-1793) first carried it out after sucking up with quill semen ejaculated into a jar by a man with hypospadias. This way, he managed to make the man's wife man pregnant. Later advances of this method have been made with the help of new technology. IUI is currently widely practiced in the developed countries as well as in South Africa and India. In Kenya however, only a few practitioners have carried out this procedure but success rates are not known. This method is indicated in cases such as;

- Impaired semen quality
- Cervical hostility.
- Failure of semen transport.
- Unexplained infertility
- Endometriosis.
- Azoospermia – where donor semen is used

Failure of deposition of sperm within the female genital tract due to anatomical lesions of the male such as hypospadias is not an indication of IUI, because intracervical insemination may be equally effectively. Sex selection is also possible in which case the X and Y-chromosomes bearing sperm are separated. Insemination is done close to ovulation hence increasing the chances of fertilization. This mode of treatment of infertile couples is widely used with reported pregnancy rates ranging from 5–66% per cycle (*David G. et al 1980*). Prognostic variables include the age of the woman, female basal follicle stimulating hormone estimation, the duration of infertility and sperm quality. Artificial insemination by donor semen (AID) is an effective method of treating male infertility with cumulative pregnancy rates of 46–51% at 6 months (*Mathews, 1979*), it is reasonable to suggest that female partners of infertile males would conceive at a rate similar to that of the normal population if provided with adequate semen assuming the absence of other infertility factors. Hence the success rate in the patients may approach that of natural fertilization. In a study among physicians practicing artificial insemination within United States, the method was noted to be common with 23% of the respondents performing the inseminations on more than 10 patients per month while 25% inseminated fewer than one woman per month. The most active practices were carried out by a university group and birth rates in the order of 3–150 babies born annually were reported by various practitioners (*Sanders, et al 1990*). Whether or not frozen sperm was used did not seem to affect the conception rate. Albrecht et al discussing factors that influence the success of artificial insemination in a series of 124 married females reported a cumulative rate of conception of about 85.1% at the end of 1 year and an average fecundability rate of 15% (Albrecht B.H. et al 1982). Factors that have been noted to affect pregnancy rates among females undergoing artificial insemination are;

In the males with demonstrable cause, varicocele contributed 33.3%, primary idiopathic testicular failure; 15.4%, sexual dysfunction; 7.4%, accessory glands infection; 11%, and others; 5.4%.

Abortions and fertility

As a cause of pelvic infection, infertility becomes important in any infertility discourse. In a review of abortions at Kenyatta National Hospital, Aggarwal et al (1982) found that among a group of 14–24 years abortion patients, 16% of them had sepsis. Of all these patients with sepsis, only 9.8% admitted interference with the pregnancy. In this septic abortion group 38.4% were anemic, 15.1% were in shock while 17% needed blood transfusion. *Khehar et al (1969)*, in a review of septic abortion found a rate of 23.6% of sepsis in patients presenting with abortion.

In a prospective descriptive study to determine morbidity pattern among patients presenting with incomplete abortion at Kenyatta National Hospital, *Wanyoro (2001)* found that 17.8% (n=352) of the patients admitted induction of abortion, 68.4% of the patients had some complications. It was found that 42.8% were clinically pale. When assessed for degree of blood loss using a packed cell volume, 53.3% were mildly anaemic, 24.3% moderately anaemic and 22.4% severely anaemic. However, only 18 of the severely anaemic patients got blood, septic incomplete abortion was found in 26% of the patients with incomplete abortion. Genital injury was found in 18.4% of all patients and injuries ranged from cervical, vaginal lacerations to uterine perforation and gut injury. The commonest injuries were cervical laceration (79.6%). These injuries were commonest among patients who had reported induced abortion (46.3%). Mortality was low 2 out of 352 (0.6%). One of those who died had induced abortion while another was suspected to have induced abortion.

Post-abort sepsis was commonest in the patients aged between 20 and 29 of years with the prevalence of 61.4%.

In a prospective descriptive study in Kiambu District Hospital, *Murage (2001)* found that 90% of teenagers with incomplete abortion (n=162) had prior knowledge of contraception though only 12.9% had any prior use of contraceptives. This figure rose to 34.4% after post-abort counseling and provision of contraceptives. The oral contraceptive pill was the most preferred method (61% of acceptors), followed by condoms (21.1%), Injectables (8.7%), Natural FP method (5.2%) and IUCD (3.5%).

Elsewhere incomplete abortion has also been shown to be a major contributor to maternal morbidity (*Unuigbe, 1988*). In a 13 year review of maternal mortality at the university college of Benin teaching hospital abortion was found to be amongst the three major causes of maternal mortality. It was shown that a total of 35.2% of all abortions were induced with the young inexperienced school girl being the main victim and these accounting for 91.2% of the deaths. The complications noted in this series of maternal deaths were sepsis including tetanus, septicemia, peritonitis, pelvic abscess, endotoxic shock, hemorrhage and injuries to vital organs (*Unuigbe, 1988*). In Egypt a study done in the hospitals showed that abortion accounted for 19% of all admissions and 37% of the patients had incomplete abortion. It was also shown that 14% these patients presented with excessive vaginal bleeding while 5% showed signs of sepsis and 1% had genital trauma (*Huntington D 1989*).

The impact of tropical diseases on female reproductive health

Tropical and sub-tropical climate favor the growth and the development of many disease causative agents leading to many parasitic and vector borne diseases such as malaria, tripanosomiasis, Schistosomiasis and filariasis have got either direct or indirect effects on reproductive endocrine dysfunction. Trypanosome infection influences reproductive function in their

mammalian host's leading to sterility, menstrual disorders, premature births, still births and high abortions rates have been reported in infected women. The tripanosomiasis affect on reproduction in animals has been shown to be devastating leading to everlasting ovarian dysfunction including extensive fibroids, decreased primordial to secondary follicles and absence of corpus luteum. Hormonal changes in such animals are characterized by decreased progesterone and 17- β -oestradiol concentration (Mutayoba, 1998). The male reproductive aspects are also comprised with marked reduction in spermatogenesis and testosterone levels.

Human Schistosomiasis

Human Schistosomiasis may produce a variety of lesions in any part of the body including the male and female genital organs (Herman *et al*, 1993). Infertility has been described to be possible consequences of Schistosomiasis resulting from egg deposition in the female genital tract such as the fallopian tubes, ovaries, uterus, cervix and vagina. Fallopian and ovarian Schistosomiasis may lead to infertility, secondary bacterial infection, ectopic pregnancy, pre-term deliveries and fetal damage.

The impact of chronic Schistosomiasis on female reproductive hormones is controversial. Some researchers believe it depresses the reproductive hormonal levels whereas others believe it has no influence. *Khisa et al(1999)*, for his M.Med Thesis, looked at this in Machakos Hospital in Kenya and found that there was high incidence of amenorrhea (21.9%) in the women who were infected with Schistosomiasis compared to uninfected women (0%). Menstrual disturbances were also higher in infected group (68.8%) versus 34.4%. Pre-term deliveries were more common in infected patients (3.1%) and none were noted in the uninfected group. Miscarriages were higher in infected group (12.5%) and none in the uninfected group. The mean hormonal levels of progesterone and oestrogen were significantly depressed ($p < 0.05$) in the infected group while Prolactin levels were significantly elevated in the infected group (28%) versus 15.6% in the uninfected group. It was concluded that Schistosomiasis may cause menstrual disturbances such as amenorrhea, anovulation and possibly hyperprolactinemia leading to reduced fertility in patients infected with Schistosomiasis.

Malaria

Malaria remains as a major environmental factor causing serious pregnancy complications whose incidence and severity depend on gestational age, parity and the level of malaria endemicity. Anaemia has been reported as one of the leading causes of maternal mortality in Kenya, (*Kirumbi et al, 1998*) with its associated complications such abortion, premature births, low birth weight, still-birth, high Perinatal mortality and significant maternal deaths.

- Access to services especially in Kenya which is almost non existence. Giwa-Osagie (2005) in his review on management of infertility and ethical issues: Currently trends in Sub-Saharan Africa indicate that only a handful of countries are offering these services and that these countries should now move to improving success rates.
- Shortage of gametes especially in sperm banking
- Multiple gestations
- Ethical and cultural issues
- Balance between preventive and curative
- Professional challenges
- Transparency
- Public trust in science
- Self regulation
- Surveillance
- The children rights
- Social challenges
- Consumer as partners and not passive recipients

In Kenya to our knowledge, only one centre owned by Dr. Noreh has succeeded in having two live births as result of ART. The Nairobi Fertility Enhancement Centre, whose pioneers for a long time have been working closely with centres outside Kenya for their patients requiring IVF-ET, will soon be opened.

The debate on ART after the 1st babies were announced in Kenya from Dr. Noreh's clinic created challenges to the providers and the Ministry of Health (MOH). To this end the MOH is currently addressing these challenges. The Kenyan situation is challenging with high fertility rates and maternal mortality rates, HIV infections and need to provision of ARVs. One is left to wonder how government with limited health budget can face this challenge and incorporate ART into the government health institutions. In private, the cost per cycle is estimated to range between 200-400,000 Kenya shillings.,

The questions to ask in case of Kenya are:

- Can the government afford this?
- How much is the patient willing to contribute and particularly for a poor peasant infertile couple in a rural area?
- Where should these centres be located?
- What type of the services should be provided?
- What mechanism should be put in place to identify potential clients for IVF?
- What type of training should the providers undergo and where?
- Is the private sector to provide these services for the time being
- Can we create a donor/private/ Drug companies driven program of ART services in Kenya?
- Is prevention better than cure policy to reduce the number of couples requiring these services in Kenya?
- Is the high prevalence of HIV infection deterrent to ART provision in Kenya?

Perhaps once all these questions are answered by the MOH policy makers and technocrats, with participation of other interested parties, then we shall be in a better position to address the provision of ART services in Kenya.

- Explore the perceptions, experiences and problems of infertile couples as shaped by cultural, bio-medical, institutional, and interpersonal forces.
- Explore local beliefs and practices that may contribute to infertility; establish the help seeking behaviour of infertile couples and the psychosocial implications of infertility.
- Assess the service provider attitude towards infertile couples. Assess the impact of environmental pollution on human fertility.

6: ASSISTED REPRODUCTIVE TECHNOLOGY

The last quarter of the 20th century has witnessed several major advances in reproductive medicine. One of the most widely publicized celebrated and, even controversial medical landmark in this area was the birth, in 1978, of the first human baby resulting from in vitro fertilization (IVF). Since then IVF has become a routine and widely accepted treatment for infertility. However, IVF is but one of the many procedures in the increasingly complex and sophisticated field of biomedicine known as assisted reproduction. Since 1978, nearly one million babies have been born worldwide as the results as assisted reproductive technology (ART) of one form or another. It has been estimated that in some European countries up to five per cent of all births are now due to ART. It is clear that ART has made a significant impact on the lives of many infertile and sub fertile couples.

However, it has also been the source of great disappointment to those couples whom ART has proven unsuccessful and to many more infertile people around the world who have no access to these technologies. In the past decade, developments in the field of ART have intensified the hopes and the wishes of infertile people to resolve their infertility and have resulted in an increasingly demand for each services in both developed and developing countries (Vayena et al, 2002; Oehninger, 1992).

The current ART methods target both the males and females. For the females, these included induction of ovulation, assisted hatching in vitro fertilization and trans-cervical embryo transfer, gamete intra-fallopian transfer, gamete and embryo cry preservation, oocyte and embryo donation and gestational surrogacy and assisted insemination (artificial insemination) using sperm from either a woman's partner or sperm donor. While in the male intracellular sperm injection (ICSI) has revolutionizes the treatment of Oligozoospermia.

The challenges in provision of ART are numerous and include the following:

Health services challenges when introducing the ART services in mainstream medical practice/care services particularly in resource poor setting. Three such challenges face health administrators and policy makers: deciding on what resources which can be allocated for ART services; defining who can access such service and have access to such services and striking the right balance between investment in prevention and care (Giwa-Osagie (2005), Friday, 1996).

- ✱ Equitable allocation of resources. Infertility is not a disease since it does not threaten life or endanger physical health. However the couple suffer in their own ways since WHO defines health as "not merely the absence of disease or infirmity. It is a state of complete physical, mental and social well-being". The physical and psychological burden the infertile couples are willing to go through and financial cost couples are willing to pay if they can afford it, attest to high ranking of infertility a perceived burden of disease.

2.2: MALE FACTOR

According to *Mat et al (1987)*, male factor had a role in the aetiology of infertility in 30% of couples evaluated (n=105 couples). There was no demonstrable cause in 68.8%, while varicocele contributed 12.4%. Others were: male accessory gland infection (9.5%), primary testicular failure (5.7%), obstructive azoospermia (2.8%), and sexual dysfunction (2.8%), partial obstruction of the genital tract (1.9%), abnormal sperm morphology (0.9%) and suspected immunologic factor (0.9%). In the males with demonstrable cause, varicocele contributed 33.3% followed by primary idiopathic testicular failure (15.4%), sexual dysfunction (7.4%) and others (not specified - 5.4%).

In a number of occasions, and even with exhaustive enquiries and investigations, the clinician is not able to come up with an obvious cause of infertility (*unexplained infertility*). Antisperm Antibodies (ASA) have been suggested as playing a key role in such cases, though their presence in the serum of men of known fertility has cast doubt as to their importance. In a study on "The role of Antisperm Antibodies in infertility in Nairobi, Kenya (*Gachara et al, 1984*), antibodies were detected in 24 out of 110 couples (21.8%). These 24 couples included 18 (16.3%) in whom no other obvious cause of infertility was present. Combinations of a poor post-coital test plus a high "shaking phenomenon" were considered evidence of presence of antibodies. (MAR test, which is more specific in those cases where it is difficult to identify whether the antisperm antibodies are in the male or the female partner, was not carried out). Other possible causes of unexplained infertility include subtle abnormalities of the sperm morphology and motility (in the male), and abnormalities in mechanisms involved in follicular growth, ovulation and corpus luteum function (in the female).

In evaluating 190 azoospermia males, *Thagana et al (1987)* found that 5.3% had bilateral undescended testis (cryptorchidism), 58.9% had palpable epididymal abnormalities while 11.1% had varicocele. It was thus concluded that the commonest cause of azoospermia in KNH is obstructive lesion most likely as a consequence of urogenital infections. From Thagana's study, obstruction of the ejaculatory pathways leading to azoospermia occurred particularly at the level of the epididymis mainly the corpus and caudal ends of this organ. Of all the patients, 68.4% had previous episode of urethral discharge, significant proportion of them more than once. One-third of them gave a history of testicular pain and swelling following the urethral discharge, which would indicate that they had either Epididymo-orchitis or Epididymitis. Conclusions were made that the commonest cause of azoospermia at this institution was obstructive lesions most likely as a consequence of urogenital infection.

Eshitera et al (1984), in their study found that the incidence of asymptomatic bacteriospermia was 7.0 % in 57 men with presumed fertility problems at KNH.

Recently HIV/AIDS has been proven to play a significant role in both male and female infertility. The most commonly reported problems in men are decreased quality of erections, decreased ability to maintain an erection and absence of morning erections. Hypogonadism and diminished libido (42-67% of men) are dependent on the stage of the disease, being more prevalent among those who are symptomatic or diagnosed as having AIDS than the asymptomatic group. (*Newshan et al, 1998, Muller et al, 1998, Busingye et al, 1996, Dondero et al, 1996, Martin et al, 1992, Gresenguet et al, 1992*).

It is thought that the cause of the low testosterone in men with HIV/AIDS could be due to various factors including:

- Stress of Chronic illness suppressing Gonadotrophins Releasing Hormone (GnRH) secretion.
- The direct effect of HIV infection on the hypothalamus and pituitary gland causing suppression of luteinizing hormone (LH) secretion.

- Damage to the hypothalamus and pituitary gland by opportunistic infections e.g. Toxoplasmosis and Tuberculosis.
- Alterations in testosterone binding proteins. Sex hormone binding globulin (SHBG) and Testosterone binding may be increased in HIV positive men by up to 40% (*Martin et al, 1992*). *Busingye (1996)*, in his study demonstrated that the mean serum testosterone was lower in the HIV positive group than in the controls. Hypogonadism was also commoner in the cases. Diminished libido and impotence were also more prevalent in the HIV positive group.
- Testicular Changes: The most prevalent AIDS associated disorder is testicular atrophy leading to abnormal spermatogenesis, sometimes as high as 60% as compares to those HIV negative. The cause of this is unknown and is characterized by a decrease in spermatogenesis and maturation arrest usually at the Spermatocyte stage. Peritubular interstitial fibrosis and tubular basement membrane hyalinization are also common. In some cases Sertoli cells may exist in the seminiferous tubules without spermatogenetic cells. (*Busingye et al, 1996, De Paepe et al, 1989, Chabon, et al 1987*).
- Testicular damage by secondary opportunistic infections or cancers.

On the whole changes in the semen parameters are observed and they range from abnormal spermatozoa morphology, leucocytospermia, significantly higher percentage of cytoplasmic droplet forms and immature germ cells, as a result of failure of epididymal function and or stress, to oligozoospermia, azoospermia and asthenozoospermia.

The impact of tropical diseases on male reproductive health

The impact of tropical diseases on human reproductive health has been evaluated and several studies have shown that some of the parasitic and vector borne diseases such as, Bancroftian Microfilariasis, Leprosy, tripanosomiasis, tuberculosis and Schistosomiasis have either direct or indirect effects on reproductive function in man. These effects range from gross pathological lesions to reproductive endocrine dysfunction (*Mutayomba et al, 1988, Rogo et al, 1985*). In Kenya, Hydrocele secondary to Bancroftian Microfilariasis, which is a common condition in tropical coastal areas, was shown to be associated with reduced fertility in affected men. The quality of semen was generally poor with low sperm count and motility, many cases exhibiting azoospermia. The hormonal profiles were also abnormal with high levels of the gonadotropins indicating primary testicular failure (*Rogo et al, 1985*). In the Kenyan study, semen quality was affected in both patients with Leparomatous and tuberculoid leprosy though Leparomatous leprosy patients with a history of erythema nodosum leprosum (ENL) were more adversely affected. Azoospermia was found in 11 out of 30 patients and the majority had abnormal hormonal profile as shown by high levels of gonadotrophins.

The presence of varicocele has been said to influence sperm concentration, morphology and motility, although the mechanism involved is not clearly understood. In the WHO multicentre study, varicocele was diagnosed in 20 per cent of males in the African centres compared to 10% in developed countries. The study confirmed that varicocele should be considered as a factor potentially influencing fertility in men. In the same study, azoospermia was diagnosed in 11 per cent of the males. The majority of these gave a history of genital-urinary infection. (*Rowe, 1984 Et 2002; WHO, 1987; Dhaliwal, 1991*).

Unlike in the high resource countries, artificial insemination programs, (AIM & AID) are not established in most infertility clinics in Africa. The constraints attributed to this are many and varied, and they include, financial, legal, religious and technical. In most of these countries recruitment of donors might be difficult to get because of cultural norms associated with masturbation and semen donation. Further, fear of transmission of HIV infection poses an added constraint to the use of fresh donor semen.

The need and high demand for centres of excellence for ART in Africa is there. However, the major challenge in the establishment of economically tenable and viable ART centres, lies in the hands of infertility-country-specific training and treatment priorities, and of course, and more importantly, the financial implications thereof.

The review paper raises a wide ranging issues and suggestions/recommendations. Some of these include:

- Infertility management without reliable laboratory backup can be very frustrating both to the patient and the clinician. It is imperative therefore that infertility services must build in endocrine laboratories with stablished strict quality assurance programmes.
- Although the health facilities might be more accessible many patients cannot afford them as the cost of living and unemployment rate continues to rise. In this regard specific policies and programmes for poverty eradication, reduction of illiteracy rate, establishment and improvement of social amenities, reduction of unemployment rate and better public education and communication systems, must be put in place.
- Establishment and institutionalization of country-specific preventive and treatment policies and protocols for all the infectious diseases that affect fertility at all levels of health care delivery systems.
- Although the success rate of tubal surgery is low, the prominence of tubal disease calls for establishment of centres of excellence for open and endoscopic microsurgical techniques. Indeed this will be a much cheaper alternative to ART.
- Whereas it is noted that ART treatments are complex, resource-demanding and expensive, time is ripe for African countries to break these barriers and start providing the service in few selected centres of excellence.
- Just like female infertility, male infertility remains a major health problem in Africa and there is need to redefine the current management policies, practices and programs in an effort to provide an all inclusive infertility treatment package. Key to this are: Education/Training curricula and institutions/country specific management policies and protocols.
- Establishment of mechanisms for infertility data collection, storage, analysis and utilization in all institutions managing infertility.
- Establishment of referral and linkages systems within and without individual countries.
- Currently, infertility is highly "feminised" at all levels of care, research and management. Mechanisms should be put in place to reverse this trend.
- The exact magnitude, distribution and impact of male infertility in sstowards addressing this anomaly, the following researchable areas should be considered:
 - Establish the magnitude of endocrine, genetic, infective, metabolic, psychological, iatrogenic and idiopathic causes of male infertility in the Sub-Saharan Africa.

Combination of Testosterone undecanoate with Tamoxifen citrate in the treatment of men with idiopathic Oligozoospermia has been used with good results. (Dimitrios AA, et al, 1997).

The presence of a varicocele can be corrected surgically by ligation. Various surgical techniques are available such as:-

- Scrotal repair
- Inguinal repair
- Sub- Inguinal repair

Laparoscopic varicocele repair is a viable alternative to open surgical repair. Postoperative pregnancy rates are seen ranging from 25–50%. (Larry I. et al 2000). Although some studies have shown no difference between treated and untreated groups, ligation of a varicocele is offered as empiric treatment when no other cause has been identified. The effect of varicocele on the levels of reactive oxygen species (ROS) has showed that Varicocelectomy reduces the ROS radicals significantly. In another study the sperm density and total number of motile sperm increased from 2.3 million/ml to 16.3 and 3.4 million to 22.3 respectively and 55% of the men achieved pregnancies 9.2 months after Varicocelectomy. (Ogura K. et al 2001)

Finally, adoption as an option for parenthood remains largely unacceptable in many parts of Africa, and even where there is demand, the process takes too long before a couple gets the child. Possible explanations to this include non-availability of enough children for adoption, government policies, and lack of enough orphanages and other children's homes. This is an area that requires further attention and evaluation.

5.3: Challenges of managing infertility in Kenya

Machoki (2005), in his review article on challenges of managing male infertility in Africa, noted a wide range of findings which are to a very large extent applicable to the Kenyan situation:

The leading cause of infertility in most African countries, infections, STIs/HIV & AIDS and post-abortal sepsis being particularly common. Other infections including, tropical diseases like filariasis, leprosy, schistosomiasis and tuberculosis.

It was also noted that in all these countries, the incidence of STIs, HIV/AIDS and other infectious diseases continues to rise yearly inspite of provision of treatments by the Governments and NGOs, and extensive information, education and communication programs (IEC). Poverty, high illiteracy and unemployment rates, poor social amenities and communication systems and inaccessible health facilities were major confounding variables.

The role of high quality research and management data is a well documented means of reliable evidence to offer advice on effective quality health care, policies and guidelines, infertility included. Lack of this is yet another challenge in most African countries. So far almost all available data is hospital based, and as in many other parts of the world, heavily focused on the female gender.

Infertility management without reliable laboratory backup can be very frustrating both to the patient and the clinician. The cost of infertility investigations (Chromosomal, Hormonal analysis, screening for infections, histopathology, imaging and laparoscopic) continues to pose a challenge in the management of infertility in most African countries. Although the facilities are now more available, many patients cannot afford them as the cost of living and unemployment rate continues to rise.

In a study of 152 testicular biopsies from infertile males in Nigeria (Thomas, 1990), 58 (38.2%) showed normal spermatogenic activity, while 34 (22.4%) had extensive or marked diffuse tubular atrophy associated with peri-tubular hyalinization and interstitial fibrosis. These findings suggested previous inflammatory process was probably the most common cause of primary testicular failure among the study population.

In a review covering 375 impotent men in Saudi Arabia it was found that the majority (54.9%) were of uncertain origin, probably Psychogenic, while 38.4% were secondary to complications of diabetes mellitus. Others included: primary testicular failure (1.6%), ruptured urethra (1.6%), venous leak (1.6%), hyperprolactinemia (0.8%), and fractured spine (0.5%) (Onuora et al, 1995). In a diabetic clinic at Tikur Anbessa hospital, Addis Ababa, Ethiopia, the prevalence of impotence was reported as 48.7% among 292 consecutive diabetic men attending the clinic (Seyoum, 1998).

Bacroftian Microfilariasis

Chronic debiting diseases such filariasis has been shown to influence spermatogenesis. A positive relationship between Bancroftian microfilaria and Hydrocele has been convincingly demonstrated. A study done by Rogo et al (1985) clearly showed that fertility was affected in the men with Hydrocele. The semen quality was generally poor with low sperm count and motility with many exhibiting azoospermia. The hormonal profiles were also abnormal with high levels of the Gonadotrophins indicating primary testicular failure.

3: PREVALENCE AND MAGNITUDE OF INFERTILITY IN KENYA

The problem of infertility is widespread and it affects men and women of reproductive age everywhere in the world. Although estimates of its prevalence are not precise and vary from region to region, about 8% of couples experience some form of infertility problem during their reproductive lives. When extrapolated to the global population, this means that 50-80 million people probably have a problem with fertility, a condition that causes personal suffering and disruption to social and family life. It is estimated that there are about two million new infertile couples per year, and the numbers are increasing (Rowe P.J. 2002)

In Africa, as in many other places in the world, infertility is generally considered a huge problem by the persons involved. The incidence varies enormously in each region. (Gerrits, 1997) in his studies in Africa and Asia, reported that percentages of primary and secondary infertility vary from 0.7-22.8% to 2-12% respectively.

In general it can be said that the exact magnitude and importance of infertility as a public health problem in Africa is largely poorly understood or even unknown. However, the experience of many Gynaecologists in Africa shows that 50-60% of their consultation time is taken by patients complaining of infertility, and in most referral hospitals there are long waiting lists for investigative and/or treatment procedures such as Hysterosalpingography, Laparoscopy, Semen analysis and Tubal surgery. (Friday E.O; 1997 & Mati J.K.G; 1986). This severely compromises other more pressing and life threatening reproductive health services in a country like Kenya where there are approximately 250 Obstetrician/Gynaecologists serving 27.5 million people the quality of care is severely compromised.

In their study of patterns and predictors of infertility among African women in 27 African countries, Karen and Brunette (1966), estimate national infertility prevalence in Kenya to be around 11.9%, with Western and Coast provinces having the highest rates. It is estimated that the prevalence of primary infertility is less than 5%, while secondary infertility affects more couples, and may range from 10-30% depending on the cultural settings.

Further, in the World Bank sponsored Global Burden of Disease Study approximately 12.8% of all chronic disabilities among women aged between 15-44 years is due to infertility while for men in the same age group it is 21.66% (The world Bank/WHO, 1990).

The exact magnitude and importance of infertility as a medical, social and public health problem in Africa is to a large extent poorly understood or even unknown. However, the experience of many gynaecologists in Africa is that 50-70% of their consultation time is taken up by patients complaining of infertility. In most referral hospitals there are long waiting lists for investigative and/or treatment procedures such as Laparoscopy, Tubal surgery, Hysterosalpingography, Varicocelectomy, etc. (Magona, 1998, Salli et al, 1995, Leke et al, 2005, Confino and Radwanska, 1992, Mati et al, 1987, Gates et al, 1985).

It is also noted that in Africa, the rates of infertility vary in different countries, and even within each country. Infertility levels are particularly high in sub-Saharan Africa where the number of infertile couples is as high as 20-40% in some of the countries that form the low fertility belt, stretching through many countries from Central Africa to East Africa. It intersects Cameroon, central Africa Republic, Gabon, Democratic Republic of Congo (DRC), Togo, Tanzania, Sudan and Kenya. The rates of infertility vary from 4% in Senegal through 17.2% in Cameroon and 32% in Gabon 5-6% in Rwanda. Another aspect of fertility in this low fertility belt is that some ethnic groups have higher levels of infertile women of certain age groups compared to others that, instead, have high fertility levels (Belsey, 1976).

(Testosterone depot, Bromocriptine and Sildenafil), Intracorporal Injection therapy (papaverine and prostaglandins), vascular surgery (Venous leak ligation and penile prosthesis), Vacuum devices, and sexual advice/counseling (Seyoum, 1998, Magoha 1998).

The management of male infertility factors due to spermatogenetic defects and genetic causes is limited. In most centres artificial insemination by donor sperms or husband has been the norm. However, most recently other techniques have been used such as Intracellular Sperm Injections, (ICSI), In-Vitro-Fertilization-Embryo-Transfer (IVF-ET) and Artificial Insemination by Husband (AIH).

The technique of in vitro fertilization and embryo transfer (IVF/ET) was originally introduced to cater for tubal infertility. It is ironic that in Africa where tubal problem is greatest, inadequate resources militate against employment of such techniques on a wider scale. Assisted Reproduction Technology (ART) treatments are complex and very expensive, requiring professional expertise from several disciplines as well as the integration of clinical and laboratory procedures. On the other hand, it is noted with great hopes that some African countries, notably, South Africa, Nigeria, Egypt, Ghana, and a few others, have on-going IVF/ET programmes (Oehninger et al, 1992). Kenya has recently joined these countries. Depending on their health needs and priorities, other countries in the developing world should follow these examples. It is anticipated that as more research and development are undertaken on various aspects of ART, the costs will drop significantly for more developing countries to benefit.

Management of azoospermia depends on the presence or absence of hormonal evidence of testicular failure. Patients with primary testicular failure as evidenced by high gonadotropin levels, and in particular FSH levels, are not amenable to treatment and hence will not benefit from any invasive investigations such as testicular biopsy. They may be advised to have artificial insemination by donor if the female partner is normal on investigation, or to have adoption (Thagana et al, 1987).

Patients with spermatogenic arrest have also been found to have a poor prognosis, although successful treatment has been reported in one case using human menopausal Gonadotrophins (Pryoretal 1978)

Patients with obstructive azoospermia may benefit from corrective surgery although results of epididymo-vasostomy are still poor even at best hands. Most of these patients will only benefit from artificial insemination by donor or from adoption.

About 50% of male infertility cases are treatable and appropriate therapy is associated with significant improvement in their semen analysis (Larry et al, 2000). Treatment for male infertility has however not enjoyed much familiarity but various methods are available.

Hormonal treatment-infusion of gonadotrophins releasing hormone can stimulate secretion of gonadotropin and there have been occasional reports of the usefulness of this treatment in those males who have an isolated gonadotropin deficiency. Use of Clomiphene citrate is common in patients with unexplained infertility but literature fails to substantiate increased pregnancy rates. The drawback with the use of Clomiphene citrate is its intrinsic estrogenic activity besides its dominant antiestrogenic activity when prescribed in high doses causing suppression of spermatogenesis (Wanjala et al, 1992). Tamoxifen was administered to oligospermic males in a study carried out at KNH with the resultant increase in testosterone, LH and FSH (Wanjala S, et al, 1992). As for the sperm production, Tamoxifen therapy resulted in a significant increase in both the total sperm density and sperm concentration per ml. The use of thyroid hormone in euthyroid males cannot be justified. In conclusion, hormonal treatment in infertile males does not seem to improve fertility rates beyond what occurs by chance.

Procedures like artificial insemination by husband (AIH) and donor (AID) are very infrequently undertaken in Africa. With the increasing awareness of the importance of male infertility, there is need to develop the capability to offer this form of treatment. Artificial Intrauterine Insemination, or IUI, is a process by which washed sperm are placed inside the uterus. The sperm used can be either from the husband or a donor. This insemination technique allows for the placement of the most motile sperm closer to the egg. Because the liquid in which the sperm swim (seminal plasma) is extremely irritating to the uterus, the spermatozoa must be separated from the plasma in the laboratory.

Cryopreservation of human sperm is today routinely performed to serve a number of purposes that include:

- Increasing availability of samples in donor insemination programs
- Banking sperm for men undergoing vasectomy, chemotherapy, or couples working at distant places;
- Augmenting sperm counts from oligospermic men; and most recently,
- Permitting time for screening of donor semen for HIV.

In this regard it is crucial that sperms are processed in a manner that optimizes viability. Optimal cryosurvival is dependent not only on the freezing methodology but also the cryopreservative used. Many cryopreservation buffers are available for preservation of human spermatozoa but the cryosurvival outcome for the spermatozoa in each show variations (AFS, 1990, ESHRE, 1996).

The potential donors should be screened for the following diseases: HIV- serology and PCR, VDRL, Hepatitis B., Cytomegalovirus, and inheritable chromosomal abnormalities. At the same time the semen specimen should be subjected to Gram staining and culture for *N. Gonorrhoea*, Culture for aerobic/anaerobic bacteria, Culture for *Ureaplasma* and *Mycoplasma*.

The other options for management of the male infertility due to oligozoospermia or azoospermia is limited to hormonal treatment with androgens, Gonadotrophins, Clomid, and Tamoxifen. Though this might be a relatively cheaper option for most developing countries, it is associated with low success rates (Dimitrios et al 1997, Wanjala et al, 1992).

Individuals with antisperm antibodies, the immune response may be suppressed with steroid therapy but in some, in vitro fertilization is recommended, but there are other forms of treatment recommended. (AFS, 1990, ESHRE, 1996, Ombet, et al, 1997).

- Sperm washing insemination method, in which the fresh semen from a man with the antibody is centrifuged, re-suspended in an albumin solution and then used for artificial insemination.
- Immunosuppressive therapy using methyl-prednisolone at a dose of 96 mg per day for seven days. Success rate of these methods has been claimed in the order of from 14% to 22%.
- Condoms have also been recommended, and in patients with poor post-coital tests, they are said to improve after use of condom therapy. Condoms are used 3-6 months to reduce contact of sperms with the cervix and therefore reduce antibody formation. Normal intercourse is then resumed.

In the developed countries, over the past decade or so, medical technology has advanced sufficiently to allow adequate treatment for most men with erectile dysfunction. Unfortunately, the situation is not so straightforward in the developing countries where limited economic resources, lack of equipment, inadequate social structures, lack of health facilities and poor health consciousness are common limiting factors. Treatment of erectile dysfunction depends on the cause. The treatment options range from: medical treatment

In Kenya, it can be said that infertility prevalence remains inadequately, though depending on the definition applied, it may range from 2% – 20%. The 2003 KDHS reported that 2.2% of women aged 40-49 years had not given birth to a child, which may imply primary infertility. However, secondary infertility may exist in a much larger proportion of women depending on the desired family size norms and the extent of pregnancy wastage. Questions are often raised about whether levels of infertility-primary or secondary-have risen because of sexually transmitted infections including HIV, environmental factors, or changes in sexual and reproductive behaviors. A decline may be expected with an upsurge treatment-seeking behavior and increased use of modern technologies of assisted reproduction. (KDHS, 2003).

Table 1: Trends in infertility in East Africa region

Country (years)	DHS I	DHS II	DHS III
	% Infertile No. of Women	% Infertile No. of Women	% Infertile No. of Women
Uganda (1988,1995)	5.4 612	2.3 815	
Tanzania (1992,1996,1999)	3.1 1,436	1.8 1,244	1.7
Kenya (1989,1993,1998)	2.7 907	1.9 1,071	1.8 1,162

The above table shows that overall, infertility levels have been declining in the east African region with the largest declines in the recent past. This may be due, in part, to concerted efforts toward sexually transmitted infections diagnosis and treatment as part of the campaign to deal with the HIV/AIDS pandemic in the region.

An examination of trends in infertility using the proportion of exposed women unable to conceive within one year also shows the same pattern of decline. This trend may be due to improvements and advances in treatment technology available to infertile couples such as surgical procedures, drugs and advanced assisted reproduction technologies (AART).

4: STRATEGIES TO ADDRESS PREVENTABLE CAUSES OF INFERTILITY IN KENYA

Condom use and the impact of STIs on fertility in Kenya

There are various types of infections grouped together as sexually transmitted diseases (STIs). These include Neisseria Gonorrhoea, Syphilis, Chlamydia and HIV/Aids. Some of these STIs if untreated or discovered late can lead to infertility in both men and women. Gonorrhoea and Chlamydia can cause blockage of the vas deferens in men and fallopian tubes in women. Cases of infertility are increasingly being reported at younger ages and STIs are a major contributing factor.

Condoms have been found to be effective in preventing the passage of STIs and HIV. The population at risk of STI increases rapidly as the number of young mobile adults (20 to 49 yrs) increase. Condom use, among other measures, is important in preventing STIs in order to forestall potential incidences of future infertility.

The 2003 KDHS shows that knowledge of HIV (and STD) prevention methods is widespread. Sixty one percent of women and 72% of men know that condoms can reduce the risk of contracting the HIV virus during sexual intercourse. Knowledge of prevention methods among women and men aged 15 to 19 is lower for all methods compared with people aged 20 years and above.

Higher risk sex may be defined as sex with a non-marital, non-cohabitating partner. According to the 2003 KDHS, 18% of sexually active women and 40% of sexually active men engaged in higher risk sex in the last twelve months prior to the survey. Of them, only one quarter of women 24% and half of men 47% report using condoms at the most recent occurrence of higher risk sex. Involvement in higher risk sex is highest among women and men aged 15 to 19 yrs and decreases with increasing age. Men in the 30 to 39 yrs age group indicated the lowest percentage of condom use (39%) at last higher risk sex. Those between 25 to 29 yrs showed highest use at 52%. For women aged 40 to 49 the percentage who used a condom at last higher risk sex is alarmingly low (15%). Eleven percent of married men indicated engaging in higher risk sex, of these only 45% stated they had used a condom at last high risk sex.

In terms of attitude 78% of men indicated that condoms protect against disease, 5% believe that condoms can be reused after washing, 8% believe that condoms contain the HIV virus. Rural men are slightly more likely than urban men to believe that condoms can be reused and that they contain HIV. They are also less likely to agree that condoms diminish pleasure or that they protect against disease. A larger proportion of rural than urban men feel that a woman has no right to tell a man to use a condom.

From all the surveys mentioned, it emerged that knowledge of the condom as a way of preventing STD is generally very high. However there is a gap between this knowledge and the use of the condom. It is evident that there is a big discrepancy between perception of risk and adoption of preventive measures¹.

Condom use among Long Distance Truck Drivers and their Assistants

In a World Health Organization (WHO) sponsored KAP survey regarding condom use, 361 long distance truck drivers and their assistants were interviewed. This group was picked because they are known to be at high risk of contracting STDs. Majority of the respondents were young, married, had multiple sexual partners and showed other high risk behaviour. (Sekadde-Kigundu et al, 1993).

mean concentration of the spermatozoa was $81.8+70.6 \times 10^6/\text{ml}$. About 90% of the semen specimens had more than 40% ideal forms. The ranges serum levels of FSH, LH, Prolactin and Testosterone were 0.35 –4.5 in /l 0.94–8.88ui/L 96–489 min/L and 7.87–30.87 mmol/L respectively.

Gachiri (1988) investigated the levels of Adenosine Triphosphate (ATP) in semen of fertile black African males in Kenya and found mean levels of $62.3 \times 10^{-7} \text{ mol/L}$. There was a positive correlation between ATP concentration and sperm density and sperm count. Therefore, it was recommended that ATP should also be assessed in the male partners of infertile couples in whom no cause of infertility cannot be found in either the man or the woman.

Hayanga (1984) found in retrospective study that azoospermia or oligozoospermia did not appear to be associated with hyperprolactinemia while males with Gynaecomastia did not have hyperprolactinemia. Note that the incidence of hyperprolactinemia in the females was 6.8% and was associated with amenorrhoea galactorrhea syndrome (33.3%), secondary amenorrhoea, galactorrhea and Acromegaly/diabetes 4.3% the patients had hyperprolactinemia; 29 patients (27.3%) had elevated FSH which suggested primary ovarian failure or premature menopause. He indicated that although hormonal data was useful in diagnosis and management of the patients, clinical data was inadequately provided. Sekadde-Kigundu et al (1997) found the prevalence of hyperprolactinemia in 12.8% in a rural community in Kenya.

Randomly recruited males (57) of presumably proven paternity at KNH had semen parameters analyzed and were mostly within reference ranges, the incidence of asymptomatic bacteriospermia was found to be 7%. However, no GC or T. Mycoplasma or Ureaplasma Urealyticum was recovered. The organisms grown were streptococcus varidans, and staphylococcus albus (Eshitera, 1984)

The role of antisperm antibodies was assessed in 110 couples with infertility at KNH of the total 110 patients, 24 couples were found to have positive antisperm antibodies out of the 24 couples, and 18 had no cause of infertility, hence indicating that their cause of infertility could have been due to antisperm antibodies. This study recommended that in patients with infertility, and obvious etiological factor, at least a post coital test should be done. This should be incorporated in the routine investigations in order to pick more patients with antisperm antibodies (Gachara, 1984).

With tubal disease being so prominent, cases need to be evaluated for possibility of surgical treatment. In this respect, the use of microsurgical techniques needs to be taught and made available at selected centres, Kenya included. There is scarcity of data on surgical treatment of the male partner in developing countries. However, in developed countries, open Varicocelectomy is being replaced by laparoscopic Ligation of the internal spermatic vessels in some centres (Mehan et al, 1992, Meacham et al, 1993). Endoscopic surgery for obstructive ductal diseases is also available (Mehan et al, 1992). There is need to develop facilities for diagnosis and treatment of varicocele and obstructive ductal disease, the two most common conditions prevalent in Africa.

In Nairobi, Kenya, 27 selected infertile males with Grade III varicoceles were treated with inguinal Varicocelectomy. In 18 patients (66%) there was improvement in sperm count to above 20 million/ml, in 17 (63%) active sperm motility increased to above 40%, while in 15 (55%) there was reduction in abnormal sperms to less than 30%. A pregnancy rate of 33.3% was recorded (Magoha, 1994). These findings suggested that Varicocelectomy could be effective in the management of carefully selected infertile males with varicoceles.

Treatment modalities for female infertility have undergone major advances especially in the developed world with in-vitro fertilization (IVF) currently taking a significant place. Now available locally, IVF has been shown to have increasing success rates depending on the expertise of the centres practicing this technique.

Intrauterine insemination (IUI) with or without super-ovulation has been proposed for the treatment of certain reproductive problems, including male sub-fertility, poor cervical mucus, the presence of antisperm antibodies, minimal or mild endometriosis, ovulation disorders refractory to previous attempts at ovulation and unexplained infertility (Hurst, et al 1990). Super-ovulation may be done using either Clomiphene citrate (CC) or human menopausal gonadotropin (hMG). In a sequentially assigned, observational study of 83 couples who underwent at least one treatment cycle with either CC or hMG in conjunction with IUI, 35% conceived during the study period (*Manganiello et al 1997*) The relative rate of conception for hMG versus CC was 2.08 (95% CI, 0.93 to 4.68). The relative term pregnancy rate was 2.10 (95% CI, 0.77 to 5.73) for hMG versus CC. There was no difference in the miscarriage rate for hMG versus CC. Thus both the conception rate and the term pregnancy rate were higher using hMG, compared with CC, in combination with IUI, and showed a trend toward statistical significance.

Here in Kenya, Nzau 1988 in a series of 13 menstrual cycles in 8 patients showed an ovulation rate of 76.9% and a pregnancy rate of 27.2% In Nzau study, ovulation induction with Clomiphene therapy was initiated in day 5 of the menstrual cycle and ovulation occurred from day 13–20 of the menstrual cycle. This was not in keeping with theoretical fact that in Clomiphene induced cycles ovulation occurs usually 13–15 days after initiation of Clomiphene therapy i.e. days 18–20 of the menstrual cycle if treatment is started on day 5 of the cycle as was the case, in this study. In only 5 cycles out of the 10 ovulatory cycles, did ovulation occur 13–15 days after initiation of Clomiphene therapy In this study, it was recommended that the Clomiphene therapy should be initiated earlier in the menstrual cycle (day 2 or 3) to decrease the rate of “abnormal” ovulatory cycles seen in Clomiphene induced cycles.

For effective and efficient management of endocrine causes of infertility, it is imperative that each centre sets up its own reference hormonal ranges pertaining to reproductive hormones. To this end, Karanja et al (1982) assessed the hormonal patterns during the menstrual cycles in healthy normally menstruating black Kenyan women. He found the levels of reproductive hormones (LH, FSH, PRL, P4 and E₂) to be comparable to the reported values in the world. Occasionally, the anterior pituitary is affected leading to infertility e.g. Kallman syndrome. Mwalali et al (1982) used GnRH and TRH to assess their effects in black Kenyan men. The responses were comparable to those in literature indicating that dynamic tests can be carried in this local setting to assess pituitary function and reserve especially in infertile patients suspected to have Kallman's Syndrome or hypopituitarism.

5.2: Male infertility

Thorough history taking and physical examination, coupled with Semenalysis and/or hormonal profile are the corner stone of the management of male infertility. Use of World Health Organization/HRP semen analysis manual is recommended. (Rowe2002).

Baseline studies have been carried out to assess the semen and hormonal parameters in fertile males in order to establish the reference ranges for local situations. Obwaka et al (1981 & 1982) found that the mean percentage of sperms with active progressive motility within one hour was 51.02+/-11.00%. The mean seminal volume was 2.03+/-1.37 ml and the

In a review of their spontaneous knowledge of ways to prevent STI, 83.7% of them stated condom use as one of them. There is a gap between knowledge of condoms as a method of prevention and use of condoms. The ever use among the respondents was 42.8%, use in the past two weeks was reported by 16.1% and yet most respondents claimed that they knew how it works.

In terms of attitude the respondents had a mixed opinion about the condom. Some of the reasons they gave for dislike of condoms include, they are not natural, they reduce sexual satisfaction and they are against some respondents' religious and cultural beliefs. About one in five indicated that their partners did not like them. There is a gap between knowledge of condoms as a method of prevention and use of condoms. Inaccessibility of condoms and negative attitudes about them contribute greatly to this gap.

Condom use among Men with Multiple Sexual Partners

Men with multiple sexual partners is another group at high risk of contracting STDs and HIV. According to the 2003 Kenya Demographic Health Survey (KDHS), 2% of women and 12% of men aged 15 to 49 had more than one sexual partner in the 12 months preceding the survey.

During a survey carried out among men attending an STD clinic in Nairobi, 500 men were interviewed to ascertain condom acceptability and use. Majority of the respondents were young, married and had multiple sexual partners. (*Sekadde-Kigundu et al, 1992*).

When their knowledge of ways to avoid STDs was tested, 76% of them identified condom use, 61.8% mentioned avoiding risky women. It is surprising that despite their awareness, this knowledge did not prevent them from unsafe sex practices that lead to their current infection. Over 80% percent of respondents acknowledged that they know how the condom works, however reported use was very low. Only 34.5% had ever used it, and only 6.2% had used a condom in the past two weeks.

The two main reasons that the respondents gave for disliking condoms were, that using them is unnatural and that they reduce sexual satisfaction. Men who have multiple sexual partners and do not use condoms risk contracting & infecting their partners with STDs. A lot of the times their partners are young girls and they are at risk of developing infertility in later years as a result of STDs.

Condom use among male university students

A survey to assess sexuality, knowledge, attitudes and use of condoms was carried out among a sample of 819 male undergraduate students in one of the universities in Nairobi. (*Sekadde-Kigundu et al, 1993*). Ninety one percent of the students reported having heard of the condom. Sixty percent indicated it as a way of preventing contracting AIDS, 54% of them had ever used it but only 30.1% indicated that they had used a condom in their last sexual contact. The attitude towards the condom was poor with 50% of students indicating that condoms were messy to use and 25% felt shy to collect condoms from a source. Twenty four percent would not like to be seen holding a condom by their girlfriends.

5: MANAGEMENT OF INFERTILITY

The management of infertility is limited in the AFRO and EMRO regions due to the lack of human and non-human resources, late presentation for investigation and lack of knowledge among the affected couples regarding prospects for help. On the whole, investigations are beyond the reach of many couples, more so in Sub-Saharan Africa. Despite the fact that tubal occlusion was the major cause of infertility in Sub-Saharan Africa, a review of access to assisted reproductive technologies (ART), such as IVF-ET, revealed that these were currently very limited, and mostly located in the private sector. The high cost involved in these technologies creates a barrier to their utilization, especially in low-resource countries. (Machoki and Sekadde-Kigundu, 2005).

Infertility is a medical condition that touches all aspects of a person's and/or couple's life. It affects how one feels about herself/himself/themselves, relationship with others, and generally all perspectives on life. Many studies have demonstrated that these couples suffer from various psychological and psychiatric disorders. (Gerrits 1997, Tarlatzi, et al, 1993, Kilonzo et al, 1987). It is for this reason that management strategies for Infertility should inadvertently include a component of psychological and psychiatric care.

5.1: Female infertility

Any evaluation of an infertile couple should include search for an abnormality of the uterine cavity. Intrauterine abnormalities, especially congenital abnormalities of the mullerian ducts, are relatively common and contribute to the problems of infertility, recurrent pregnancy loss and poor outcome in pregnancy (Cengiz A et al 1997). There are various methods for evaluating the uterine cavity. Hysterosalpingography (HSG) is a widely used diagnostic tool. At present, ultrasonography is a widely used diagnostic tool in the field of infertility. Transabdominal ultrasonography is used for monitoring follicular development and ovulation. However, the transvaginal probe is preferred for evaluating pelvic structures because of its better resolution capacity (Coleman et al., 1995). Hysteroscopy is the 'gold standard' in the diagnosis of intrauterine pathologies (Gilliespie and Nicholas, 1994). Sonohysterography, in which the uterine cavity is scanned while it is infused with sterile saline, was shown to be able to detect 90.3% of abnormalities of the uterine cavity, compared with other diagnostic methods (n= 62) (Cengiz A et al 1997).

Tubal and uterine factors are usually examined simultaneously. HSG and laparoscopy have been used in the investigation of the utero-tubal factor of infertility. HSG demonstrates the luminal outline of the tubes, mapping out the site of obstruction and also may detect intrauterine defects. The uterine cavity and the lumen of the fallopian tubes are outlined by aseptic instillation of contrast medium through the cervix. The contrast medium is injected slowly while fluoroscopic observation and spot films are taken.

Dye laparoscopy is performed in theatre under general anaesthesia following the method described by Steptoe (1967). Laparoscopy gives an idea of the state of the pelvic organs, the presence or absence of extratubal adhesions, masses, endometriosis and gives the feasibility of tubal surgery. Gichuhi in 1985 showed that laparoscopy was as good as HSG in diagnosis of tubal occlusion. In 140 infertile women attending the infertility clinic at Kenyatta National Hospital, 44.7% had some degree of patency by HSG and 47% by laparoscopy. Similarly, 26.2% had some degree of cornual occlusion by HSG while 31.9% by laparoscopy. Some degree of intratubal occlusion was diagnosed in 10.6% of women by HSG and 10.1% by laparoscopy, giving a substantial agreement between the two tests at the intratubal segment of the tube (kappa value = 0.75). Forty six percent had some degree of fimbrial occlusion by HSG and 51% by laparoscopy.

Nderi in 1981 reviewed 485 cases that underwent diagnostic laparoscopy at Kenyatta National Hospital in the period 1976-1979. He found that 39.6% had primary infertility, 42.1% had secondary infertility while the rest 18.3% had such indications as primary amenorrhea, secondary amenorrhea, oligomenorrhea, possible ectopic pregnancy and dyspareunia. 309 patients (63.7%) had tubal occlusion most of whom (75%) had fimbrial occlusion. The cases deemed suitable for surgery were 194, making a suitability rate of 48.9% of the total, which was higher than the 17% reported by Walton and Mati (1976). The patients for surgery were chosen from laparoscopic findings and those with minimal adhesions or moderate hydrosalpinges and peritubal adhesions were booked for surgery. Patients with tubo-ovarian masses or dense adhesions were unsuitable. The number operated in the suitable group was 61 (31.4%).

Karanja et al (1982), evaluated the value of follicle stimulating hormone (FSH), luteinizing Hormone (LH) Prolactin (PRL) assays in the etiological diagnosis of amenorrhea at KNH. Of the 40 patients with amenorrhea 17.5% had primary amenorrhea, 82.5% had secondary amenorrhea. All the patients with primary amenorrhea had normal Prolactin levels. 18.2% of the patients with secondary amenorrhea had hyperprolactinemia and 36.4% had high levels of FSH. The study concluded that a single determination of FSH in a patient, it was possible to make conclusive diagnosis in just over 50% and point to possible etiological in the rest.

On the extreme end of the spectrum is a young group of women with carcinoma of cervix who undergo irradiation and loses their fertility. Nana et al (1982) confirmed that pelvic irradiation during radiotherapy treatment of carcinoma of the cervix at KNH induced radiation menopause the patients ranged between 24 and 43 years of age.

Infertility in diabetic patients should be further studied more since Mueke et al (1998) found abnormal gonadotropin levels in 46% diabetics, 52% had abnormal menstrual cycles but only 30% of the diabetic patients who had menstrual disorders consulted a doctor as compare to 53% in normal groups. The prevalence of menstrual disorders was significantly higher in poorly controlled diabetics. It was concluded that diabetes impairs menstruation and fertility of poorly controlled.

Since 1980, various treatments have been proposed for patients suffering from distal tubal infertility (Auditbest et al 1991). Difficult choices between surgical (microsurgery/laparoscopy) treatments and in-vitro fertilization (IVF) still confront many workers. In this study, the cumulative results of both therapeutic methods for this group of patients were evaluated. From 1979 to 1990, 266 patients with distal tubal infertility were operated (group M: microsurgery, n=211; group L laparoscopy, n = 55). In group M, pathological findings were hydrosalpinges (n = 135) and incomplete distal tubal occlusion, (n = 76) and in group L hydrosalpinges (n =31) and incomplete distal tubal occlusion, (n = 24. After differing time intervals, IVF was proposed for these patients when no pregnancy occurred. The results were as follows: in group M, 35.5% intra-uterine pregnancy (IUP) and 6.6% ectopic pregnancy (EP) after fimbrioplasty versus 28.1% IUP and 11.9% EP after salpingostomy; in-group L, 16.6% IUP and 4.2 EP after fimbrioplasty versus 12.9% IUP and 6.5 % EP after salpingostomy. Following IVF, 55.7% of patients in-group M and 14.5% in-group L become pregnant. The cumulative results including both treatment techniques (surgery and IVF) show an average of 70% and 65% pregnancy rates in groups M and L respectively. The best results after surgery and throughout IVF were obtained during the first year. It was thus concluded that a short delay after surgery, averaging 6 months to 1 year, before involving patients in IVF, is very important.