PREVALENCE OF ERECTILE DYSFUNCTION AMONG PATIENTS ATTENDING HIV CLINICS IN DAR ES SALAAM, TANZANIA

Eliasa A. Mkongo (MD)

A dissertation submitted in partial fulfilment of the requirements for award of the degree of Masters of Medicine in Surgery of the Muhimbili University of Health and Allied Sciences

Muhimbili University of Health and Allied Sciences

November, 2009

CERTIFICATION

The undersigned certifies that they have read and hereby recommend for acceptance a dissertation entitled **"Prevalence of Erectile Dysfunction among Patients attending HIV Clinics in Dar-es-salaam, Tanzania."** Submitted in partial fulfilment of the requirement for the degree of Master of General Surgery of the Muhimbili University of Health and Allied Science

Dr Kategile

.....

Dr. A. Kategile MD, MMED, MSC UROLOGY-Supervisor
Lecturer at MUHAS.

.....

Prof. Sidney C Yongolo MD,MMED,MSC UROLOGY-Co-Supervisor.
Senior Lecturer and Consultant Urologist at MUHAS.

Date: 30/11/09

DECLARATION AND COPYRIGHT

I, **Eliasa A. Mkongo,** declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature _____

Eliasa A Mkongo.

This dissertation is copyright material protected under the Berne Convention, the Copyright Act 1999 and other international and national enactments, in that behalf, on intellectual property. It may not be reproduced by any means, in full or in part, except for short extracts in fair dealings, for research or private study, critical scholarly review or discourse with an acknowledgement, without the written permission of the Directorate of Postgraduate Studies, on behalf of both the author and the Muhimbili University of Health and Allied Sciences.

ACKNOWLEDGEMENTS

It is a pleasure to acknowledge my sense of gratitude to the teaching faculty and members of staff of the surgery department at MUHAS. However, I hope that I will be pardoned for singling out few upon whom I called most frequently for help.

First, I am greatly indebted to my supervisor, Dr. A. Kategile whose generous guidance and whole-hearted co-operation contributed to the successful completion of this study.

I am also indebted the co-supervisor, Prof. Sidney Yongolo for his advice, inputs and critique throughout this work. I admire your integrity, your professionalism, your commitment to excellence, your sincere desire to make a difference, and above all wisdom and your love for life.

I would like to thank the Head of department Prof Naboth Andefich Almasi Mbembati, who has been providing continuous encouragement. Thanks for your boundless energy, your beautiful spirit, and your dedication to educate.

Special thanks to the post graduate coordinator and my teacher the late Prof M.R Aziz.It is a honour to be taught by you. Your eagle eye and attention to detail, tireless efforts, and your commitment to excellence are awesome.

I am equally indebted to my teacher Dr Mabula Mchembe and all lecturers and members of staff in the department of Surgery for your support. Thank you for being models of vision, purpose, and passion. Special thanks to the Chief Medical Officer, Dr Deo Mutasiwa for being very instrumental during my struggle to join the course. He always listened and has been very supportive all through. I am grateful to the office of the RMO in Dar es Salaam, the DMOs of Ilala, Temeke and Kinondoni and In-charges of the CTC visited for allowing me to conduct my study in their facilities.

I am particularly thankful to the Ministry of Health and Social Welfare for financial support which enabled to undertake this study without which, this work would not have been possible.

Special thanks are also due to my research assistants Margaret, Mwanahawa, Mrs Lushaka, Mziray and Robert for their excellent field assistance during data collection. I owe debt of gratitude to all interviewees for their enthusiasm and willingness to respond to a number of questions as regards to erectile dysfunction. Many thanks to Tuzye Edwin and Dr Grace Maghembe Mugisha for data entry, cleaning and analysis. There could be nothing more honourable than to wrap up these acknowledgements with my sincere appreciation to my beloved father, mother, brothers, sisters and friends for continuous encouragement and prayers throughout the duration of this study.

DEDICATION

This work is affectionately dedicated to my beloved mother Joyce Kazyeba Mkongo and to all people who have ever dared to step out of the dominant culture of resignation and mediocrity and endeavour to create difference in medical field. I honour and salute you!

ABSTRACT

Background: Erectile dysfunction (ED) is defined as the inability to attain and maintain an erection for satisfactory sexual performance. As many as 7 out of 10 men with HIV have erectile dysfunction. There is a significant challenge in treating HIV-positive patients who seeks restoration of their normal sexual function.

Objective: To determine the prevalence of erectile dysfunction and associated factors among HIV patients.

Methods: The study was conducted within municipal CTC's in Dar es Salaam. It was conducted for six months July 2008 to January 2009.This was a cross-sectional study. The study population included HIV positive males attending selected public CTC aged 20 – 49 years. Sampling was done by simple random technique. Structured questionnaires were used to collect the required information which was processed using Epi info. Tables, graphs and charts were used to present the gathered information. Erectile dysfunction was measured using the 5-item Sexual Health Inventory for Men (SHIM) and categorized as mild, moderate, severe and normal erectile function.

Results: A total of 252 male respondents were recruited in the study, aged between 18 - 49 years. The prevalence of erectile dysfunction was found to be 80.9% ranging from mild to severe. Categorically, 17.4% had mild ED, 36.1% had moderate ED and 27.4% had severe ED while 19.0% had normal erectile function. About 90% of the respondents had age between 30-49 years. Over 70% had CD4 cell count between 200 – 499 cell counts per mm^3 of blood. Age and CD4 cell count were found to be associated with increased severity of erectile dysfunction. From this study it was also found that there was no difference among married couples compared to other groups of marital status.

Conclusion: It is clear that sexual dysfunction is a common problem among HIV infected men. This study shows that, the prevalence and severity increased with low

CD4 cell count, and marital status was not associated with increase prevalence and severity of ED. Therefore, with an ageing HIV positive population, erectile dysfunction may become a significant health problem.

TABLE OF CONTENTS

CERTIFICATION II

DECLARATION AND COPYRIGHT III

ACKNOWLEDGEMENTS IV

DEDICATION VI

ABSTRACT VII

TABLE OF CONTENTS IX

LIST OF TABLES XIII

LIST OF FIGURES XIV

ABBREVIATIONS AND ACRONYMS XV

CHAPTER ONE 1

1.0 INTRODUCTION 1

1.1 Background 1

1.2 Historical aspects 4

1.3 Anatomy of the penis 5

1.3.1 Blood supply 8

1.3.2 Nerve supply 10

1.4 PHYSIOLOGY OF PENILE ERECTION 11

CHAPTER TWO LITERATURE REVIEW 15

2.2 Problem Statement 19

2.3 Rationale of the Study **20**

2.4 Objectives **21**
2.4.1 Broad Objective 21
2.4.2 Specific Objectives 21

CHAPTER THREE **22**

3.0 METHODOLODY **22**

3.1 Study Design **22**

3.2 Study Area **22**

3.3 Target Population **23**
3.3.1 Inclusion Criteria 23
3.3.2 Exclusion Criteria 23

3.4 Sample Size and Sampling Technique **23**
3.4.1 Sample Size 23
3.4.2 Sampling Technique 23

3.5 Data Collection Technique and Tools **24**

3.6 Recruitment and Training of Research Assistants **25**

3.7 Pre-testing of the questionnaire **25**

3.8 Administration of Questionnaires **25**

3.9 Data Processing and Analysis **25**

3.10 Ethical Considerations **26**

3.11 Definition of Terms **27**

CHAPTER FOUR **28**

4.0 RESULTS **28**

4.1 Prevalence of Erectile Dysfunction **28**

4.2 Socio-demographic Characteristics 28
4.3 Severity of Erectile Dysfunction..... .29
4.4 Prevalence of Erectile Dysfunction by Age Group 30
4.5 Prevalence of Erectile Dysfunction by Marital Status..... 31
4.6 Distribution of CD4 Cell Count among Study Participants..... 31
4.7 Prevalence of Erectile Dysfunction by CD4 Cell Count..... 32

CHAPTER FIVE 33

5.0 DISCUSSION..... 33
5.1 Introduction 33
5.2 Baseline Characteristics of Respondents..... 33
5.3 Prevalence and Severity of Erectile Dysfunction..... 34
5.4 Prevalence of Erectile Dysfunction by Age 34
5.5 Prevalence of Erectile Dysfunction by Marital Status 35
5.6 Prevalence of Erectile Dysfunction by CD4 Cell Count..... 35
5.7 Limitations of the Study..... 36

CHAPTER SIX..... 37

6.0 CONCLUSION AND RECOMMENDATIONS 37
6.1 Conclusion..... 37
6.2 Recommendations..... 38

REFERENCES 39
APPENDIX 1: INFORMED CONSENT FORM (ENGLISH VERSION) 44
APPENDIX 2: INFORMED CONSENT FORM (KISWAHILI VERSION)..... 46
APPENDIX 3: QUESTIONNAIRE (ENGLISH VERSION) 48

APPENDIX 4: QUESTIONNAIRE (KISWAHILI VERSION)..... 50

LIST OF TABLES

Table 1	**Socio-demographic characteristics of the study population**	**29**
Table 2	**Prevalence of erectile dysfunction by age group**	**30**
Table 3	**Prevalence of Erectile Dysfunction by Marital Status**	**31**
Table 4	**Distribution of CD4 cell count among study participants**	**31**
Table 5	**Prevalence of Erectile dysfunction by CD4 cell count**	**32**

LIST OF FIGURES

Plate I	**The penile shaft with different layers**	**5**
Plate II	**Cross section of the penile shaft**	**6**
Plate III	**Blood supply of the penis**	**9**
Plate IV	**Venous return of the penis**	**10**
Figure 1	**Prevalence of erectile dysfunction**	**30**

ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral Therapy
ARV	Antiretroviral
CNS	Central Nervous System
CTC	Care and Treatment Centre
CVA	Cerebro-Vascular Accident
DM	Diabetes Mellitus
DMO	District Medical Officer
ED	Erectile Dysfunction
HAART	Highly Active Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
IDC	Infectious Disease Clinic
KS	Kaposi's Sarcoma
LFTs	Liver Function Tests
LSD	Low Sexual Desire
MUHAS	Muhimbili University of Health and Allied Sciences
NACP	National AIDS Control Program
NHL	Non-Hodgkin's Lymphoma
OIs	Opportunistic Infections
PLHIV	People Living with HIV
RBG	Random Blood Glucose
RMO	Regional Medical Officer
SHIM	Sexual Health Inventory for Men
TDHS	Tanzania Demographic Health Survey
THIS	Tanzania HIV Indicator Survey
UTI	Urinary Tract Infections
WHO	World Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

It is estimated that, more than 40 million people world wide are now living with HIV. Sub-Saharan Africa is the worlds severely affected region; data shows that with only 10% of the world's population, it harbours about two thirds of the global total number of people living with HIV and AIDS [1].

In Tanzania, the first cases of AIDS were reported in the year 1983 in Kagera region, thereafter, the epidemic has spread rapidly to all districts and communities affecting all sectors of the society. With a national prevalence of 5.6%, this translates to 2 million Tanzanians living with HIV, the most affected age group being 15-49 years[2]. It is also reported that women are more affected than men i.e. 8% vs. 6%; however, there is a wide regional variation [3].

Erectile dysfunction (ED) is defined as the inability to attain and maintain an erection for satisfactory sexual performance[4].

Erectile dysfunction increases with age. According to the Massachusetts Male aging study, which surveyed 1709 men, the prevalence of complete erectile dysfunction is approximately 5% in 40-year-old men and increases to 15% in 70-year-old men[5]

As many as 7 out of 10 men with HIV have erectile dysfunction[6]. There is a significant challenge in treating HIV-positive patients who seeks restoration of their normal sexual function.

HIV infection has been linked to sexual dysfunction. This can be explained by interactions between the reproductive system with the immune system, the endocrine , the neuroendocrine system and vascular system[7]. HIV infection is also associated with a significant psychological impact, and furthermore long-term antiretroviral therapy may have a negative psychological effect on the sexual experience.

There are several causes of ED grouped as

- Neurological
- Vascular
- Endocrine
- Systemic
- Pharmacological
- Psychological

Neurologically, reflex erections are mediated by the afferent fibers of the pudendal nerve and efferent fibers of the parasympathetic outflow (S2-S4). Psychogenic erections are initiated via cerebral centers. Specific neurologic diseases that may cause impotence may be congenital or acquired. These include Cerebrovascular Accident (CVA), Nutritional/Vitamin deficiencies, Alzheimer's disease and multiple sclerosis.

Vascular causes of impotence include cardiac disorders (e.g. angina syndromes,), aortoiliac disease (e.g. atherosclerosis, thromboembolic phenomena) as well as abnormal venous drainage.

Endocrine causes include but they are not limited to hypogonadism, testicular feminizing syndrome, hyperprolactinaemia, pituitary tumors, Diabetes, hypothyroidism and Addison's disease.

Impotence is a common and often unsuspected complication of many therapeutic and illicit drugs. Major drug groups that may cause sexual dysfunction are: Tranquillizers, antidepressants, antianxiety agents, anticholinergics and antihypertensives.

Up to 50% of the cases of ED are related to psychogenic factors and therefore, establishing an organic cause of the ED is important in choosing appropriate therapy. Factors that indicate a psychogenic cause include selective erectile dysfunction (i.e. episodic dysfunction with normal nocturnal erections), sudden onset of sexual dysfunction associated with anxiety or external stress (e.g. HIV), affect disturbances (anger, anxiety, guilt, fear) and patients convinced of an organic cause.[8]

Many classification systems for ED have been proposed. Some are related or based on diabetes, iatrogenic causes and traumatic causes. Some are related to the neurovascular mechanism of the erectile process i.e.

a) failure to initiate (neurogenic)
b) failure to fill the carvenosum (arterial) or
c) failure to occlude the venous drainage.

The diagnostic approach to patients with ED depends on the patient's and partner's goal, and the patient's age, general health and medical condition. The first level consists of detailed history and psychosexual history, physical examination, and hormonal and other basic tests e.g. LFT.

ED can be assessed in several ways. Many male sexual function profiles and ED questionnaires have been developed. The Sexual Health Inventory for Men (SHIM) is the most widely used Self Administered Questionnaire. It has five questions and the total score is obtained by the sum of the individual scores for each question.

It addresses and quantifies five domains: erectile function, orgasmic function, sexual desire, intercourse satisfaction and overall satisfaction. The lowest score is 5 and the highest is 25.

1.2 Historical aspects

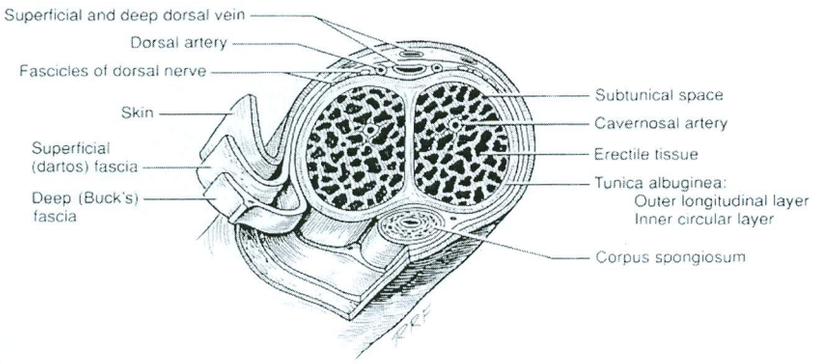
Erectile dysfunction (ED) was described way back from about 2000 BC on the Egyptian papyrus. Two types were described: natural impotence ("the man is incapable of accomplishing the sex act") and supernatural impotence (from evil charms and spells) [9]. Later, The Father of Medicine (Hippocrates) described many cases of male impotence among the rich inhabitants of Scythia and concluded that too much horseback riding was the cause. (The poor were not affected because they travelled by foot.) [9]

The current understanding of the erectile physiology was elaborated between 1980s and 1990s. In addition to the role of smooth muscle in regulating arterial and venous flow, the three-dimensional structure of the tunica albuginea and its role in venous occlusion have been elucidated. An important breakthrough in the understanding of the neural control is the identification of nitric oxide (NO) as the major neurotransmitter for erection and of phosphodiesterases (PDEs) in returning the penis to a flaccid state [9]. The role of endothelium in regulating smooth muscle tone and the intercellular link by means of gap junctions has also been uncovered. In pathophysiology, the changes of the smooth muscle, endothelium, and fibroelastic framework with diabetes, atherosclerosis, and aging have also been identified [9,10,11,12].

1.3 Anatomy of the Penis

The penis is a pendulous organ suspended from the front and sides of the pubic arch and containing the greater part of the urethra. In the flaccid condition it is cylindrical in shape, but when erect assumes the form of a triangular prism with rounded angles, one side of the prism forming the dorsum. It is composed of three cylindrical masses of cavernous tissue bound together by fibrous tissue and covered with skin(plate I). Two of the masses are lateral, and are known as the corpora cavernosa penis; the third is median, and is termed the corpus cavernosum urethræ [13].

Plate I: The penile shaft with different layers.

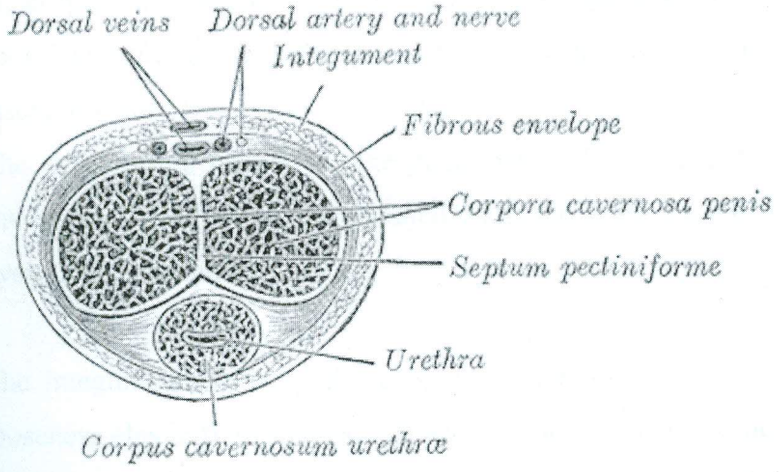


The Corpora Cavernosa Penis form the greater part of the sustance of the penis. For their anterior three-fourths they lie in intimate apposition with one another, but behind they diverge in the form of two tapering processes, known as the crura, which are firmly connected to the rami of the pubic arch. Traced from behind forward, each crus begins by a blunt-pointed process in front of the tuberosity of the ischium. Just before it meets its fellow it presents a slight enlargement, named by Kobelt the bulb of the corpus cavernosum penis. Beyond this point the crus undergoes a constriction and merges into the corpus cavernosum proper, which retains a uniform diameter to its anterior end. Each

corpus cavernosum penis ends abruptly in a rounded extremity some distance from the point of the penis [13].

The Corpus Cavernosum Urethræ (*corpus spongiosum*) contains the urethra. Behind, it is expanded to form the urethral bulb, and lies in apposition with the inferior fascia of the urogenital diaphragm, from which it receives a fibrous investment. The urethra enters the bulb nearer to the upper than to the lower surface. On the latter there is a median sulcus, from which a thin fibrous septum projects into the substance of the bulb and divides it imperfectly into two lateral lobes or hemispheres [13].

Plate II: Showing the cross section of the penile shaft



The portion of the corpus cavernosum urethræ in front of the bulb lies in a groove on the under surface of the conjoined corpora cavernosa penis. It is cylindrical in form and tapers slightly from behind forward. Its anterior end is expanded in the form of an obtuse cone, flattened from above downward. This expansion, termed the glans penis, is moulded on the rounded ends of the corpora cavernosa penis, extending further on their upper than on their lower surfaces. At the summit of the glans is the slit-like vertical external urethral orifice [13].

The circumference of the base of the glans forms a rounded projecting border, the corona glandis, overhanging a deep retroglandular sulcus behind which is the neck of the penis [13].

For descriptive purposes it is convenient to divide the penis into three regions: the root, the body, and the extremity [13].

The body (*corpus penis*) extends from the root to the ends of the corpora cavernosa penis, and in it these corpora cavernosa are intimately bound to one another. A shallow groove which marks their junction on the upper surface lodges the deep dorsal vein of the penis, while a deeper and wider groove between them on the under surface contains the corpus cavernosum urethræ. The body is ensheathed by fascia, which is continuous above with the fascia of Scarpa, and below with the dartos tunic of the scrotum and the fascia of Colles [13].

The extremity is formed by the glans penis, the expanded anterior end of the corpus cavernosum urethræ. It is separated from the body by the constricted neck, which is overhung by the corona glandis [13].

The integument covering the penis is remarkable for its thinness, its dark color, its looseness elasticity of connection with the deeper parts of the organ, and its absence of adipose tissue. At the root of the penis it is continuous with that over the pubes, scrotum, and perineum. At the neck it leaves the surface and becomes folded upon itself to form the prepuce or foreskin [13].

The internal layer of the prepuce is directly continuous, along the line of the neck, with the integument over the glans. Immediately behind the external urethral orifice it forms a small secondary reduplication, attached along the bottom of a depressed median raphé, which extends from the meatus to the neck; this fold is termed the frenulum of the prepuce. The integument covering the glans is continuous with the urethral mucous

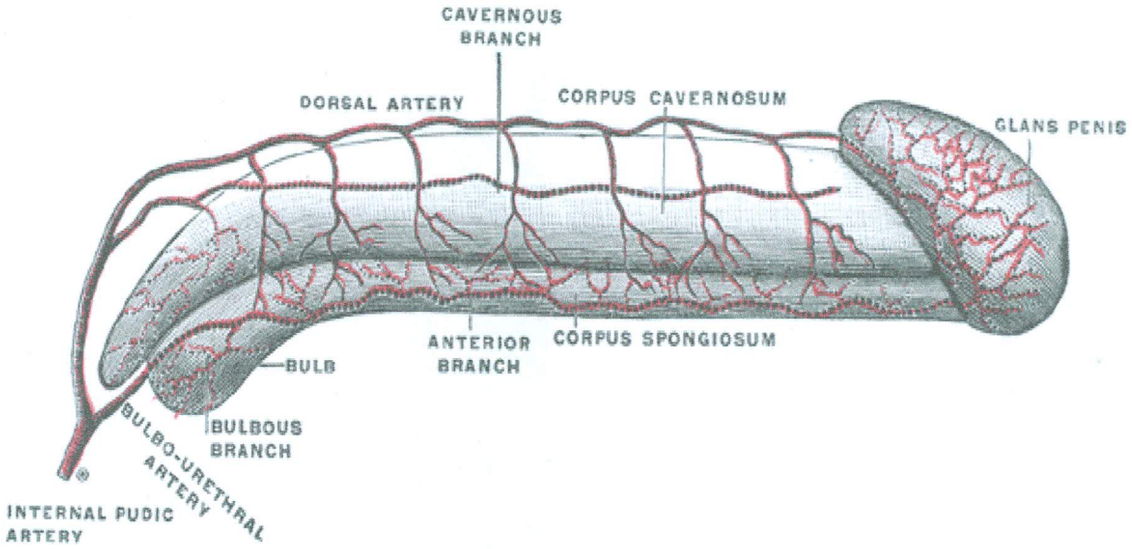
membrane at the orifice; it is devoid of hairs, but projecting from its free surface are a number of small, highly sensitive papillæ. Scattered glands on the corona, neck, glans and inner layer of the prepuce, the preputial glands, have been described. They secrete a sebaceous material of very peculiar odor, which probably contains casein, and readily undergoes decomposition; when mixed with discarded epithelial cells it is called smegma [13]

The prepuce covers a variable amount of the glans, and is separated from it by a potential sac—the preputial sac—which presents two shallow fossæ, one on either side of the frenulum [13].

1.3.1 Blood supply

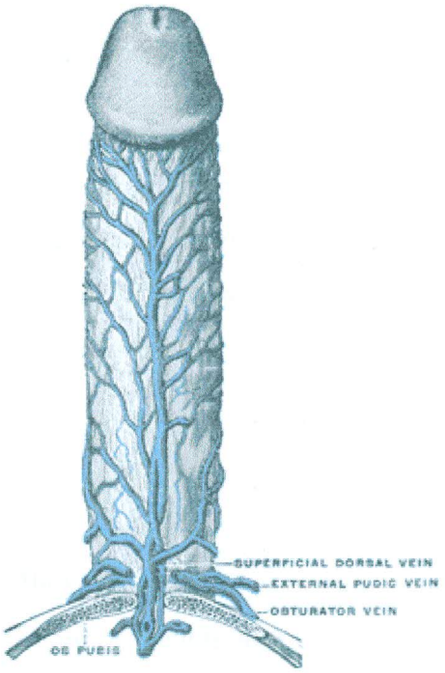
The arteries bringing the blood to the cavernous spaces are the deep arteries of the penis and branches from the dorsal arteries of the penis, which perforate the fibrous capsule, along the upper surface, especially near the forepart of the organ. On entering the cavernous structure the arteries divide into branches, which are supported and enclosed by the trabeculæ. Some of these arteries end in a capillary net-work, the branches of which open directly into the cavernous spaces; others assume a tendril-like appearance, and form convoluted and somewhat dilated vessels, which were named by Müller helicine arteries. They open into the spaces, and from them are also given off small capillary branches to supply the trabecular structure. They are bound down in the spaces by fine fibrous processes, and are most abundant in the back part of the corpora cavernosa[13]

Plate III: Showing the blood supply of the penis.



The blood from the cavernous spaces is returned by a series of vessels, some of which emerge in considerable numbers from the base of the glans penis and converge on the dorsum of the organ to form the deep dorsal vein; others pass out on the upper surface of the corpora cavernosa and join the same vein; some emerge from the under surface of the corpora cavernosa penis and receiving branches from the corpus cavernosum urethræ, wind around the sides of the penis to end in the deep dorsal vein; but the greater number pass out at the root of the penis and join the prostatic plexus [13].

Plate IV: Showing the venous return of the penile shaft.



1.3.2 Nerve supply

The innervation of the penis is both autonomic (sympathetic and parasympathetic) and somatic (sensory and motor). This is from the pudendal nerve and pelvic autonomic plexuses. From the neurons in the spinal cord and peripheral ganglia, the sympathetic and parasympathetic nerves merge to form the cavernous nerves, which enter the corpora cavernosa and corpus spongiosum to effect the neurovascular events during erection and detumescence. The somatic nerves are primarily responsible for sensation and the contraction of the bulbocavernosus and ischiocavernosus muscles[14].

Autonomic Pathways

The sympathetic pathway originates from the 11th thoracic to the 2nd lumbar spinal segments and passes through the white rami to the sympathetic chain ganglia. Some fibers then travel through the lumbar splanchnic nerves to the inferior mesenteric and

superior hypogastric plexuses, from which fibers travel in the hypogastric nerves to the pelvic plexus. In humans, the T10 to T12 segments are most often the origin of the sympathetic fibers, and the chain ganglia cells projecting to the penis are located in the sacral and caudal ganglia[14]

The parasympathetic pathway arises from neurons in the intermediolateral cell columns of the second, third, and fourth sacral spinal cord segments. The preganglionic fibers pass in the pelvic nerves to the pelvic plexus, where they are joined by the sympathetic nerves from the superior hypogastric plexus[14].

1.4 Physiology of Penile erection

Erection involves the integration of neural and vascular functions. In essence, an erection occurs when blood flow to the penis exceeds flow out of the penis. The cavernosal arteries supply blood to the corpora cavernosa of the penis (through the pudendal artery); the emissary veins running through the tunica albuginea allow drainage.

During erection, relaxation of trabecular smooth muscle results in increased blood flow to the corpora cavernosa and expansion of the sinusoids therein. This distension causes mechanical compression of the emissary veins, which impedes their ability to drain blood and thereby results in penile rigidity [14]

Penile blood flow is controlled by the autonomic erection centre, which provides parasympathetic (S2–S4) and sympathetic (T12–L2) input to the pelvic plexus including the cavernous nerves that innervate the cavernosal arteries and trabecular smooth muscle.[8] These nerves are responsible for the delivery of high local concentration of nitric oxide to the trabecular smooth muscles, which results in relaxation [15,16]

Nitric oxide diffuses across the smooth-muscle membrane and activates guanylate cyclase to produce cyclic guanosine monophosphate (cGMP); the biochemical cascade that ensues results in altered potassium and calcium ion channel permeability; ultimately, the decrease in cytosolic calcium concentration causes smooth muscle relaxation and increased regional blood flow [17,18] Phosphodiesterase enzymes (PDEs) regulate this pathway by inactivating cGMP, which results in elevated cytosolic calcium concentrations and smooth-muscle contraction. PDE type 5 is the most important isoenzyme in the corpora cavernosa.[19,20,21].

The somatic motor nerve supply arises from the sacral spinal cord, whose fibers join the pudendal nerve innervating the bulbocavernosus and ischiocavernosus muscles, active during ejaculation and climax. Adrenergic stimulation is responsible for cavernous smooth-muscle contraction and detumescence.

Cholinergic nerves may contribute to the erectile process through adrenergic inhibition as well as by causing release of nitric oxide from the endothelium.[22]

Three mechanisms trigger these vascular changes: psychogenic, reflexogenic and centrally originated (nocturnal erections).

Psychogenic erections occur through stimulatory pathways (e.g., sound, smell, sight and touch) that travel from the spinal erection centres (T11–L2 and S2–S4) and induce a dopaminergic initiation of erection from the medial pre-optic area[23]

Reflexogenic erections, induced by direct genital stimulation, send ascending messages to the central erection centres and direct messages to the autonomic nuclei, which explain residual erectile activity in patients with upper spinal cord injuries.

Nocturnal erections, initiated in the pontine reticular formation and amygdalae, are seen during REM sleep and are believed to be caused by a relative decrease in sympathetic inhibition with augmentation of the pro-erectile centres.

Despite considerable recent experimentation in animal models and human volunteers, information on the central pathways of erection remains cursory at best [24]. It is known that androgens play a predominantly modulating role by their effect on libido and sexual behaviour. Testosterone enhances sexual interest and the frequency of sexual acts; it increases the frequency of nocturnal erections but does not effect reflexogenic or psychogenic erections [25]

PATHOPHYSIOLOGY OF PENILE ERECTION:

Numerous factors can disrupt the normal physiologic mechanisms involved in erection. Most cases of erectile dysfunction were thought to be psychologically based, but it is now understood that most have an organic cause, especially in older patients. In about 40% of men over 50 years old, the primary cause of erectile dysfunction is related to atherosclerotic disease [26]. In this respect, risk factors are similar to those of cardiovascular disease. However, erectile dysfunction may also be related to psychological, neurological, hormonal, pharmacological and end organ (penile) factors.
With respect to neurological causes, involvement of any nerve group, either central or peripheral, may lead to erectile dysfunction. Cerebral diseases lead to decreased sexual interest, possibly through over-inhibition of spinal centres. Among patients with spinal cord injury, 95% of those who have upper motor neuron lesions are capable of reflexogenic erections, 25% of patients who have lower motor neuron lesions are capable of psychogenic erections, and more than 90% of patients who have incomplete lesions of either kind retain their erectile function. [27]Direct injury to the cavernosal nerve and blood supply commonly occurs during therapy for prostate cancer; erectile dysfunction is present to some extent in 80% of patients so treated, whether by surgery or external beam radiation therapy [28]

Almost all antihypertensive medications have been implicated in erectile dysfunction [29]. The mechanisms vary from central-acting sympatholytics, depression of libido as well as

higher blood pressure requirement to achieve erection in atherosclerotic patients taking diuretics and vasodilators. The role of smoking in causing erectile dysfunction remains a source of controversy. A recent consensus group analysis failed to document a direct link to erectile dysfunction. However, smoking seems to amplify other risk factors, such as hypertension and coronary artery disease [30]

Martin-Morales and colleagues [31] have shown an increased risk of erectile dysfunction among smokers (odds ratio [OR] 2.5). Systemic diseases are also associated with erectile dysfunction. This is often multifactorial, as in diabetes and renal failure.[32] Given the role of androgens in the physiology of erections, it is not surprising that many hypogonadal men do not experience erectile dysfunction per se. Low serum testosterone levels may be primary or secondary to another condition, such as hyperprolactinemia or hypothyroidism. Regardless of the mechanism, the result is primarily a loss of libido, although many hypogonadal men retain their ability to obtain erections [33]

CHAPTER TWO LITERATURE REVIEW

In people infected with the human immunodeficiency virus (HIV) both the CD4 T-cell count and the viral load are used to monitor disease progression to Acquired Immunodeficiency Syndrome (AIDS). CD4 cell counts of <500/ mm^3 are associated with occurrence of opportunistic infections and certain malignancies, so-called 'AIDS-defining' conditions[34]

Highly active antiretroviral therapy, using combinations of ARV drugs, can improve considerably the prognosis of people who are HIV-positive, but such therapy is not yet widely available in many developing countries[34]. People with AIDS are predisposed to urinary tract infection (UTI) by uncommon bacteria and pathogens, e.g. fungi, parasites and viruses, hence causing lower urinary tract symptoms which is then associated with ED. Treatment should be culture-specific and long-term, because there is a tendency to recurrence of infection with multiple organisms and resistant isolates[34].

Voiding dysfunction in patients with AIDS is usually a result of neurological complications caused by opportunistic infections, and has a poor prognosis. Of patients with AIDS, 30-50% develops cancer, especially Kaposi's sarcoma (KS) and non-Hodgkin's lymphoma (NHL). Kaposi Sarcoma may involve any urogenital organ, but is usually part of systemic disease. NHL may involve the kidneys, testes and retroperitoneal lymph nodes[34].

HIV-associated nephropathy may occur in 10-30% of patients, and often leads to renal failure. Another common problem is Testicular atrophy which might lead to infertility, ED and decreased libido [34].

Sexual dysfunction is a common problem in HIV patients affecting both organic and psychological function of a human being. A number of studies have been conducted in developed countries and very few in developing countries. Those in developed countries are mainly from gay men. A study conducted by Cove and Petrak found that, out of 78 outpatient HIV-seropositive gay male service users, 69% reported one or more sexual problems. Erectile dysfunction was reported by 38% rising to 51% in the context of trying to use condoms. Loss of interest in sex was reported by 41% and 24% experienced delayed ejaculation. One of the factors mentioned in this study to be associated with sexual problems was low CD4 T-cell counts (i.e. < 200)[35].

Another study has shown the prevalence of ED to be as high as 74%. In this study which was conducted in Philadelphia other factors such as age, CD4 cell count, history of opportunistic infections, HAART use and serum testosterone levels were found to be associated with ED although the association was not statistically significant [36].

Similarly in a study done in Singapore among the general population, the findings revealed that, about 51% of respondents reported some degree of erectile dysfunction. Of these, 23.2% had mild ED, 8.8% had moderate ED and 19.3% had severe ED. In this study it was noticed that the prevalence and severity of ED increased with old age. For instance, the prevalence of ED increased from 42.8% for men in their forties to 77.4% in their sixties. Again the prevalence of severe ED increased from 9.1% in men in their forties to 43.5% in their sixties and 77.0% in those aged 70 and above. When adjusted for all confounding factors, age above 50 years was the single most significant risk factor on multivariate analysis[37].

Other important risk factors pointed out in the study included Indian ethnic group, lower household income, physical inactivity, diabetes mellitus and cardiac diseases. Although the study did not look at HIV, the diseases found to be associated with ED are generally considered as debilitating in which HIV would have been inclusive [37].

In another study done to establish the prevalence of sexual dysfunction amongst HIV-positive men and to determine the factors associated with dysfunction, a cross-sectional study was conducted in seven European HIV treatment centres. Sexual function was evaluated by the participant self-completion of a questionnaire based on the International Index of Erectile Function (IIEF). 33% had moderate/severe erectile dysfunction (EDF) and 24% had moderate to severe impairment of sexual desire. Variables significantly associated with EDF in multivariable analysis were older age (greater than 40 years), heterosexual status, non-alcohol drinking status, depression, antidepressants, psychotropic medications and duration of ARV therapy. Low sexual desire (LSD) was associated with older age (greater than 40 years), depression and black African ethnicity. The study also established that, low sexual desire (LSD) and ED are common in both ARV naïve and ARV experienced HIV-positive individuals, in this case ED and LSD were found to be associated with long duration of ARV treatment, with a significantly increased risk of dysfunction in the quartile with the longest period of exposure.[38]

Erectile dysfunction was associated with long duration of ARV treatment, with a significantly increased risk of dysfunction in the quartile with the longest period of exposure.[38]

No significant association was seen with specific classes of anti-retroviral. Older age, and depression were the variables most consistently associated with both ED and LSD. [34, 38]

In a cross-sectional study done in Italy, which evaluated the prevalence and factors associated with sexual dysfunction in a cohort of HIV-infected adult men, evaluation tools included: the International Index of Erectile Function (erectile dysfunction [ED], desire, orgasm, intercourse satisfaction, overall satisfaction), the Assessment of Body Change and Distress (body image satisfaction), the Medical Outcomes Study HIV Health Survey (mental and physical health-related quality of life), and plasma free and total testosterone level (hypogonadism).

Among the 336 patients reporting sexual activities in the 4 weeks before, 94 (29.6%) had mild, 30 (9.4%) moderate and 34 (10.1%) severe dysfunction. The authors concluded that body image and mental health but not HAART or hypogonadism were associated with sexual function domains[39].

A study was done at the Agha Khan hospital in Nairobi, Kenya to determine the frequency of sexual dysfunction in patients with HIV infection and relate it to the presence of autonomic dysfunction and CD4 count. Decreased libido occurred at all CD4 counts (< 50- > 1000) and was present in all those with CD4 < 200. It was concluded that decreased libido is common in native African patients with HIV infection and occurs at all CD4 counts. Erectile dysfunction occurred more frequently in cases than in controls and appeared to be associated with autonomic neuropathy[40].

Similarly in the UK, Erectile dysfunction and a low level of sexual desire were reported in HIV-infected men. A study was done aiming at evaluating the nature of sexual dysfunction in patients referred to a HIV-sexual dysfunction clinic, and identify the possible aetiological factors. 72/82 patients reported erectile dysfunction, 30/82 low sexual desire and 6/82 retarded ejaculation. Reports of depression (21/72), peripheral neuropathy (6/72), lipodystrophy (15/72) and NNRTI-use (37/72) were correlated with erectile dysfunction. Therefore, the authors stated that depression, peripheral neuropathy, lipodystrophy and antiretroviral use, with or without elevated oestradiol levels, were possible aetiological factors in HIV-associated male sexual dysfunction[41]

2.2 Problem Statement

Erectile dysfunction is common among HIV-infected men; however, it often is undiagnosed unless the healthcare provider specifically asks a patient about possible symptoms. Obviously this is a conversation that many patients feel uncomfortable about initiating due to stigma and because it touches somebody's personal life.

A study by Nancy Crum and colleagues from the Naval Medical Centre in San Diego, Califonia, found that 17 (26%) of 65 HIV-infected men reported symptoms of erectile dysfunction, but only 3 (18%) of the 17 were actually taking prescription medicine for this problem [10].

In addition to its wide spread prevalence, erectile dysfunction has been found to impact significantly on interpersonal functioning and overall quality of life in both women and men including but not limited to stress, depression, divorce, poor performance at work and other psychological problems.

To date, studies conducted in developed countries to establish the prevalence of ED and associated factors suggest a high prevalence and different factors including low level of CD4 cell count, HIV/AIDS, and combination therapy to be associated with high prevalence and severity of ED.

Older age, heterosexual status, depression, use of anti-depressants and long use of ARV have also been implicated. It is noted that there is differing opinion on the associated factors contributing to ED among HIV patients as noted in the available literature[6,8]

Little is known in Tanzania on the prevalence and associated factors as far as erectile dysfunction is concerned among HIV patients. How ever in Tanzania a study done by YM Kapona and CS Yongolo on assessing male erectile dysfunction as seen in Dar-es – Salaam city over a period of three years January 2001 to December 2003, 4060 patients were seen at reproductive health clinic out of these two hundred and three patients had

erectile dysfunction (5%) [54]. Therefore, the purpose of this study is to uncover the magnitude of erectile dysfunction and factors influencing ED among HIV patients. The findings of this study will be used by implementers, practioners and PLHIV to address matters related to sexual function among PLHIV including hitting upon safer sex messages.

2.3 Rationale of the Study

Erectile dysfunction seems to be a common problem among PLHIV but yet we don't know the magnitude and associated factors. Helping HIV infected men suffering from ED will have a significant implication to themselves, their partners and the community at large.

Although there are many other problems facing PLHIV, ED is a significant problem that needs to be assessed. This is because many men would not be able to openly discuss their sexual problems.

With the expansion of Care and Treatment Clinics for HIV and introduction of ARVs, people with HIV disease will live longer "healthier" and thus sexual problems may become a priority as it is believed that erectile function contributes to the good quality of life in men, including those living with HIV/AIDS.

There is also a limited literature available about ED in PLHIV, both on or off ARVs. This study will be an entry point to allow further research in this area.

This study was designed to determine the prevalence of erectile dysfunction and associated factors among male patients attending HIV clinics in Dar es Salaam, Tanzania. It is envisaged that the findings from this study will establish and bring to awareness the associated factors in our patients and suggest possible interventions.

MUHIMBILI MEDICAL UNIVERSITY COLLEGE
LIBRARY
DSM.

2.4 Objectives

2.4.1 Broad Objective

To determine the prevalence of erectile dysfunction and associated factors among HIV positive male patients attending CTC in Dar es Salaam

2.4.2 Specific Objectives

1. To determine the prevalence of erectile dysfunction among HIV positive male patients attending CTC in Dar es Salaam
2. To determine association between socio-demographic characteristics and ED among HIV positive male patients attending CTC in Dar es Salaam
3. To determine the association between CD4 cell count and ED among HIV positive male patients attending CTC in Dar es Salaam

MUHIMBILI MEDICAL UNIVERSITY COLLEGE
LIBRARY
DSM.

CHAPTER THREE

3.0 METHODOLODY

3.1 Study Design

This was a cross-sectional study design and was conducted from July 2008 to January 2009.

3.2 Study Area

The study was conducted in Dar es Salaam City. Dar es Salaam has three municipalities namely Ilala, Kinondoni and Temeke. It has a population of about 4 million people with an annual growth rate of 4.3 %. The higher growing rate and easy accessibility for immigrants and other economic activities have exposed Dar es Salaam to increasing number of people infected with HIV and AIDS cases. According to a recent Report (Ministry of Health, 2004), Dar es Salaam Region had 26,818 AIDS cases by the year 2003, ranking second in the country.

Dar es Salaam was chosen purposeful, as it was the region with highest number of CTC in Tanzania owned by both private and government. There were 28 CTC's which were located in both urban and peri-urban areas of Dar es Salaam. The region constitutes ¼ of all patients enrolled in the CTC in the country whose patients differ significantly in terms of socio-economic and socio-demographic characteristics [2].

Private health facilities have less than 10% of the total patients attending CTC in Dar es Salaam and therefore the study was conducted in public facilities because of their large number of patients and the likelihood of getting permission to conduct the study.



3.3 Target Population

HIV positive males attending selected public CTC aged 20 – 49 years. The study included both patients coming in the morning and afternoon shifts.

3.3.1 Inclusion Criteria

Male patients aged 20- 49 years attending CTC in Dar es Salaam. These were people either married or had a "stable partner" and not on ARVs, i.e. a patient who had a partner for not less than six months.

3.3.2 Exclusion Criteria

All HIV/AIDS Stage IV patients who normally are critically ill, those aged less than 18 years and those above 49 years, refusal to participate by the patient and presence of hypertension or diabetes or both.

3.4 Sample Size and Sampling Technique

3.4.1 Sample Size

This was conveniently all HIV positive male patients who attended CTC clinics on the study period and met the inclusion criteria.

3.4.2 Sampling Technique

Participants were recruited using a multistage sampling technique.

In the first stage, simple random sampling by ballot method was performed to obtain the health facilities. After listing all the public facilities from each district, balloting was done to obtain two facilities from Ilala district, these were Amana and IDC, two from Temeke district, these were Temeke district hospital and Mbagala health centre and two

from Kinondoni district, and these were Mwananyamala district hospital and Sinza health centre.

Thereafter study participants at respective sites were recruited consecutively after meeting the inclusion criteria and consenting to participate in the study. At the completion of data collection, the distribution of the patients was: - Ilala 109 (43.2%), Kinondoni 80(31.9%) and Temeke 63(24.9%).

Case notes were checked for CD4 cell count and recorded in the questionnaire. In case the participant did not show up on the day of interview or refused to participate in the study, the number was compensated on the following day.

3.5 Data Collection Technique and Tools

Eligible patients were informed about the study and requested to participate. A verbal consent was given by the patient, and then questionnaires were administered by research assistants.

Each questionnaire collected information on socio-demographic characteristics, CD4 cell count, history of Diabetic mellitus and Hypertension and SHIM-5 scores.

SHIM-5 scores were classified as 21-25 points as normal EF, 16-20 points mild ED, 11-15 points moderate ED and ≤ 10 points severe ED.

Variables

Dependent Variables

The dependent variable was erectile dysfunction; it was categorized into normal, mild, moderate and severe depending on the SHIM-5 scores.

Independent Variables

These included levels of CD4 cell count categorized into <200 cells/mm3, 200-499 cells/mm3 and ≥500 cells/mm3. Others were socio-demographic characteristics such as age, level of education and marital status.

3.6 Recruitment and Training of Research Assistants

The PI trained five research assistants with form four and a diploma in nursing who had experience in research, with an assistance of facility medical officer in charge. The training was done for one day and emphasis was on understanding the aim of the study and meaning of each question in the questionnaire so as to ensure consistency in data collection. Each research assistant was allocated a different clinic from her place of work. The aim was to reduce bias since they might know the patients they routinely attend. The patients may be more free to discuss their sexual problem with someone new to them.

3.7 Pre-testing of the questionnaire

The pilot testing of the questionnaire was carried out at IDC CTC, which was not among the selected for the study. The tool was pre-tested to 15 interviewees. Following the pre-testing exercise the questionnaire were revised accordingly.

3.8 Administration of Questionnaires

The questionnaires were administered in a room with enough privacy at the CTC. Each interviewee was asked to give a verbal consent. Those who gave consent were interviewed. The purpose of the study was explained to each eligible individual attending the CTC. Issues of confidentiality and anonymity were also explained to consenting eligible individuals. At the end of the each interview, raised questions related erectile dysfunction by interviewees were responded accordingly.

3.9 Data Processing and Analysis

A template for data entry was developed, all filled questionnaires were given identification numbers, coding was done for open ended questions and data was entered into Epi info version 6 and data cleaning was performed. Cross tabulation, frequencies,

prevalence, means were computed for defined independent and dependent variables to obtain tables of results. MS-Excel was used to plot charts.

3.10 Ethical Considerations

Ethical clearance for conducting the research was sought and obtained from the Research Ethics Committee of the Muhimbili University of Health and Allied Sciences.

Before carrying out the study permission was obtained from the relevant authorities. A letter of introduction from the Director of Research and Publication was presented to the City Authority, Municipal Authority and Municipal Medical Officers of Health. These introduced us to the In-charges of the selected CTC. At the CTC the study objective was explained to the staff.

Participation was voluntary after explaining the aim of the study and benefits of the study to the participants, there were no risks or penalty for those who refused to participate. Participants were given the right to withdrawal from the interview any time during the process.

All participants were given adequate information on the research before the interview; verbal consent was obtained from the respondents. Only participants who consented for the interview were interviewed.

Questionnaires were kept anonymous, the information given was treated confidentially and research assistants were trained to maintain confidentiality.
Those found to have ED were counselled and advised to attend urology clinics for further workup and treatment.

3.11 Definition of Terms

In our study:-

A cohabiting person: will be one who is not married but has a stable partner, for not less than 6 months whether they are living together or not.

CHAPTER FOUR

4.0 RESULTS

4.1 Prevalence of Erectile Dysfunction

A total of 252 males were enrolled into the study from July 2008-Jan 2009.
Among them, 48 (19.1%) had normal sexual function according to the SHIM-5 score while 204 had erectile dysfunction (80.9%).
Of these, 44 (21.6%) had mild ED, 91 (44.6%) had moderate ED and 69 (33.8%) had severe ED.

4.2 Socio-demographic Characteristics

The socio-demographic characteristics of respondents are summarized in table 1 below. All respondents approached agreed to participate in the study. As a result, a total of 252 respondents participated in the study of which 43.2% came from Ilala district, 31.9% and 24.9% from Kinondoni and Temeke districts respectively. About 80% had age above 30 years; the mean age was 36.9 years (Std 7.2). Study participants were all males of which about 43.2% were married, and 56.8% were cohabiting.

Nearly 75% had not gone beyond primary education with 23.7% never attended formal education and 52.6% had attended primary education. The rest had secondary and post secondary education.

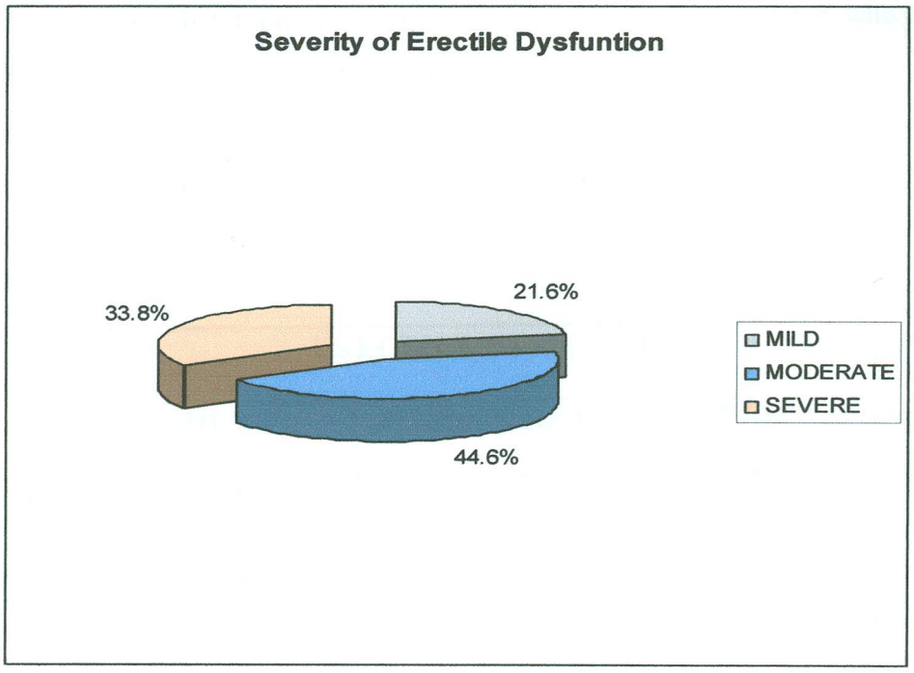
Table 1: Socio-demographic characteristics of the study population (n=252)

Socio-demographic characteristics		Number	Percentage
Age	20-29 years	47	18.7
	30-39 years	104	41.3
	40-49 years	101	40.0
Marital status	Married	109	43.2
	Cohabiting	143	56.8
Education	None	61	23.7
	Primary	133	52.6
	Secondary	45	18.4
	Post-secondary	13	5.3

4.3 Severity of Erectile Dysfunction

Figure 1 show the distribution of erectile dysfunction ranging from mild to severe. Categorically, 21.6% had mild ED, 44.6% had moderate ED and 33.8% had severe ED.

Figure 1: Severity of erectile dysfunction



4.4 Severity of Erectile Dysfunction by Age Group

Table 2 below shows that the prevalence of erectile dysfunction was not increasing by age group.

Table 2: Severity of erectile dysfunction according by age (n=204)

Age in years	ERECTILE DYSFUNCTION			TOTAL
	MILD	MODERATE	SEVERE	
20-29	8 (20.5%)	18 (46.2%)	13 (33.3%)	39 (19.1%)
30-39	22 (27.8%)	30 (38.0%)	27 (34.2%)	79 (38.7%)
40-49	14 (16.3%)	43 (50.0%)	29 (33.7%)	86 (42.2%)
TOTAL	**44 (21.6%)**	**91 (44.6%)**	**69 (33.8%)**	**204 (100%)**

4.5 Severity of Erectile Dysfunction by Marital Status

Table 3 shows that there was no difference in ED among those who were married compared to those who were cohabiting.

Table 3: Severity of Erectile Dysfunction by Marital Status (n =204)

Marital Status	ERECTILE DYSFUNCTION			TOTAL
	MILD	MODERATE	SEVERE	
Married	16 (17.8%)	43 (47.8%)	31 (34.4%)	90 (100%)
Co-habiting	28 (24.5%)	48 (42.1%)	38 (33.4%)	114 (100%)
TOTAL	**44 (21.6%)**	**91 (44.6%)**	**69 (33.8%)**	**204 (100%)**

4.6 Distribution of CD4 Cell Count among Study Participants

Table 4 show that over 70% of study participants had CD4 cell count between 200 – 499 cells/mm^3 and 3.6% CD4 cell count below 200 cells/mm^3.

Table 4: Distribution of CD4 cell count among study participants (n =252)

CD4 cell count (per mm3)	Frequency	Percentage
< 200	9	3.6
200-499	180	71.4
≥ 500	63	25.0
Total	**252**	**100**

4.7 Severity of Erectile Dysfunction by CD4 Cell Count

Table 5 shows that majority of patients had CD4 cell count between 200 – 499 cells/mm^3. Among those in the severe category, ED was increasing progressively with decreasing CD4 cell count.

Table 5: Prevalence of Erectile dysfunction by CD4 cell count (n =204)

CD4 cell count (per mm3)	ERECTILE DYSFUNCTION			TOTAL
	MILD	MODERATE	SEVERE	
Below 200	2 (22.2%)	2 (22.2%)	5 (55.6%)	9
200 – 499	27 (17.4%)	73 (47.1%)	55 (35.5%)	155
≥ 500	15 (37.5%)	16 (40.0%)	9 (22.5%)	40
TOTAL	**44 (21.6%)**	**91 (44.6%)**	**69 (33.8%)**	**204**

CHAPTER FIVE

5.0 DISCUSSION

5.1 Introduction

For many years, efforts to look at factors affecting sexual function among men have primarily targeted people with chronic illnesses such as diabetics, hypertensive, people with mental illnesses etc. Nevertheless, erectile dysfunction has been found to impact significantly on interpersonal functioning and overall quality of life in both women and men including but not limited to stress, depression, divorce, poor performance at work and other psychological problems. HIV is one of the chronic illnesses which is currently posing a big challenge as far as sexual and reproductive health problems are concerned, and there fore, it is equally important to look at factors associated with ED among HIV patients so that proper management can be instituted in order to improve the quality of life of PLHIV [32, 38, 55].

This study has tried to address some of such factors that may influence sexual dysfunction among PLHIV and the respondents have provided information which may be used to address needs as far as ED is concerned.

5.2 Baseline Characteristics of Respondents

All participants were male due to the nature of the study. Majority of patients were aged above 30 years of age with a mean age of 36.9 years, these findings were again consistent with the National HIV/AIDS Indicator survey of 2005 [3] which showed that the most affected age with HIV is 20-49 years, with a mean age of 36.5 years. The reason is that, this age group constitutes a period of maximum sexual actuality. Age more than 40years is associated with ED.[5] Therefore the age of the study population is meaningful as it eliminates age as a source of ED. Furthermore, care and treatment services are not youth friendly in terms of confidentiality, administration and staffing hence they do not attract young people.

Over 75% of participants had primary education and below. Since education level plays an important role in determining the socio-economic status of an individual, these findings imply that public facilities are mostly utilized by people with low socio-economic status. Those with high status possibly use other private facilities of which majority of refused to give permission for the study. Stigma may also play an important role here since people with high status would not like other people to know their HIV serostatus so as to protect their image in the community.[3]

5.3 Prevalence and Severity of Erectile Dysfunction

About 81% of respondents had erectile dysfunction ranging from mild, moderate to severe. These findings were slightly higher compared to a study done by Ande et al in Philadelphia which found the prevalence to be 74% [53].

The difference could be explained by the difference in the two study populations, the study in Philadelphia was conducted among homosexuals while this study was conducted in heterosexual men. However, both studies suggest the prevalence of ED to be high. From this study it is also clear that majority of patients had mild to moderate symptoms which means if diagnosed early and managed properly, many of our patients will not progress to a severe stage.

5.4 Prevalence of Erectile Dysfunction by Age

In this study, the severity of ED was not increasing with age. This is in contrast to a study done by Asboe et al [38] which showed age of more than 45 yrs was found to be statistically associated with increased risk of ED.

Another study by Tan J et al in Singapore found that the prevalence of ED among males increased from 42% in their 40s to 77% in their sixties. Their findings could be explained by the fact that old age is associated with decreased testosterone levels but also older males are prone to vascular diseases, hypertension, arteriosclerosis and at

times diabetes, all these conditions can contribute to ED[47,48,49]. In our study, such patients were excluded and therefore this could not be possibly observed.

5.5 Prevalence of Erectile Dysfunction by Marital Status

In this study, it was observed that there was no difference in ED among those who were married and those who were cohabiting. However, in another study by Chew K et al, the prevalence of ED among married couples was found to be higher (38%) and the findings were statistically significant [35,48]. The difference could be due to a large sample size in the Australian study compared to our study, and also due to the large proportion of married men. Stage of HIV could be the other contributing factor to the type of ED.

5.6 Prevalence of Erectile Dysfunction by CD4 Cell Count

From this study it was found that over 70% of study participants had CD4 cell count between 200-499 cells/mm^3. This could be explained by the nature of this study. The study was looking at ED among HIV patients who have not started using ARV, according to Tanzania Care and Treatment guidelines for HIV, these are normally with high CD4 count and hence they are on follow-up for disease progression[52].

It was also found that the prevalence and severity of ED especially for those in the severe category, increased with decreasing CD4 cell count. In contrast, a study conducted by Ande et al [53] found that CD4 count was not statistically associated with ED among HIV positive patients attending an HIV clinic in Philadelphia.

5.7 Limitations of the Study

- These might have emanated from possible unnoticed biases from data collection tools and research assistants through their own understanding which might have influenced responses through interviewer bias.
- Since Erectile Dysfunction is an embarrassment condition for men and there is a possibility of some of the patients giving false answers.
- Erectile dysfunction among PLHIV is a new concept; therefore references were mainly from published literature or in reports accessible from websites.
- A large proportion of literature focuses on gay men in Europe, USA and Australia and very few from developing countries. This limits the extent to which such literature can be applied to Tanzania and other developing countries where different factors may influence erectile dysfunction.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Erectile dysfunction is common among HIV infected men; however, it is often undiagnosed unless the health care provider specifically asks the patient about possible symptoms.

The study found that ED is a significant problem among male patients with HIV. Among those with severe dysfunction, ED was found to be increasing with decreasing CD4 cell counts.

Being married was not found to be associated with a high prevalence or increased severity of ED.

Due to the expansion of Care and Treatment activities for PLHIV, there is a possibility of increasing the ageing population of HIV infected men and hence, ED may become a significant health problem.

6.2 Recommendations

The following recommendations are made based on the findings of this study:

- New strategies in addressing ED problems tailored to PLHIV should be developed and implemented e.g. giving ARVs at CD4 counts $\leq$ 500 mm^3 (instead of 200) to capture the problem of ED early. However, patients with CD4 count of above 500 mm^3 should be evaluated for ED and treated accordingly.
- Health workers should acknowledge the natural desire of PLHIV to be sexually active and be sexually satisfied.
- CD4 count as a single factor might not predict ED properly; there is a need to conduct more research
- An analytical study design with a bigger sample size is recommended to compare PLHIV using ARV and those not using and the influence of other factors such as depression, alcohol, socioeconomic status etc on a multivariate analysis model.

REFERENCES

1. UNAIDS. Practical Guidelines for Intensifying HIV Prevention: Towards Universal Access. UNAIDS; 2007

2. National Bureau of Statistics. Tanzania Health Information Management System. 2008. NBS; 2008

3. Tanzania Commission for AIDS (TACAIDS). Tanzania HIV/AIDS Indicator Survey 2003-04 Report No 20. TACAIDS; 2005.

4. NIH consensus development panel on impotence; Impotence. JAMA 1993, 270: 83-90

5. Johannes CB, Araujo AB, Feldman HA. Incidence of Erectile Dysfunction in Men 40 to 69 years old: Longitudenal results from the Massachusetts Male Aging Study. J Urol 2000, 163: 460,

6. Byers M; Erectile dysfunction: Hard facts and Treatment Options; British Columbia Persons with AIDS Society; 2000

7. Heyns CF, Fisher M; The urological management of Patients with AIDS; BJU Int. 2005; 95(5):709-16

8. Carrier S, Brock G, Kour NW, Lue TF. Pathophysiology of erectile dysfunction. Urology.1993, 42(4):468-81

9. Broderick GA. Evidence based assessment of erectile dysfunction. Int J Impotence Res. 1998, 10: 564-573

10. Rosen RC. Sexual function assessment in male physiological and self report measures. Int J Impotence Res1998, 10: 559-563

11. Anderson BL, Brofin B. Is there a reliable and valid self-reported measure of sexual function? Arch Sex Behav. 1988, 17:509-525
12. Conte HR. Development and use of self-report technique for assessing sexual functioning; A review and critique. Arch Sex Behav. 1983, 12:555-576
13. Gray H. Anatomy of the Human Body. 38th Edition. Philadelphia. 2000, pg 783-785
14. Lue TF. Erectile dysfunction. N Engl J Med 2000; 342:1802-13.
15. Andersson KE, Wagner G. Physiology of penile erections [review]. Physiol Rev 1995; 75:191-236.
16. Burnett AL. Nitric oxide in the penis: physiology and pathology. J Urol 1997; 157:320-4.
17. Lincoln TM. Cyclic GMP and mechanisms of vasodilation. Pharmacol Ther 1989;41:479-502.
18. Sáenz de Tejada I. Molecular mechanisms for the regulation of penile smooth muscle contractility. Int J Impot Res 2000;12(Suppl 4):S34-8.
19. Stief CG, Uckert S, Becker AJ, Truss MC, Jonas U. The effect of the specific phosphodiesterase (PDE) inhibitors on human and rabbit cavernous tissue in vitro and in vivo. J Urol 1998; 159(4):1390-3.
20. Bancroft J, Wu FCW. Changes in erectile responsiveness during androgen replacement therapy. Arch Sex Behav 1983; 12:59-66.
21. Kwan M, Greenleaf WJ, Mann J, Crapo L, Davidson JM. The nature of androgen action on male sexuality: a combined laboratory/self-reported study on hypogonadal men. J Clin Endocrinol Metab 1983;57(3):557-62.
22. Saenz de Tejada I, Blanco R, Goldstein I, Azadzoi K, de las Morenas A, Krane RJ, et al. Cholinergic neurotransmission in human corpus cavernosum. Response of isolated tissue. Am J Physiol 1988; 254(3 Pt 2):H459-67.

23. Rampin O, Giuliano F. Brain control of penile erection. J Urol 2001;19(1):1-8.
24. Giuliano F, Allard J. Apomorphine SL (Uprima): preclinical and clinical experiences learned from the first central nervous system-acting ED drug [review]. Int J Impot Res 2002;14(Suppl 1):S53-6.
25. Mulligan T, Schmitt B. Testosterone for erectile failure. J Intern Med 1993;8: 517-21.
26. Kaiser FE, Viosca SP, Morley JE, Mooradian AD, Davis SS, Korenman SG. Impotence and aging: clinical and hormonal factors. J Am Geriatr Soc 1988; 36:511-9.
27. Bors E, Comar AE. Neurological urology: physiology of micturition, its neurological disorders and sequelae. Baltimore: University Park Press; 1971.
28. Siegel T, Moul JW, Spevak M, Alvord G, Costabile RA. The development of erectile dysfunction in men treated for prostate cancer. J Urol 2001;165:430-5.
29. Brock GB, Lue TF. Drug-induced sexual dysfunction: an update. Drug Safety 1993;8:414-26.
30. McVary KT, Carrier S, Wessells H; Subcommittee on Smoking and Erectile Dysfunction Socioeconomic Committee, Sexual Medicine Society of North America. Smoking and erectile dysfunction: evidence based analysis. J Urol 2001; 166(5):1624-32.
31. Martin-Morales A, Sanchez-Cruz JJ, Saenz de Tejada I, Rodriguez-Vela L, Jiminez-Cruz JF, Burgos-Rodriguez R. Prevalence and independent risk factors for erectile dysfunction in Spain: results of the epidemiologia de la disfuncion erectila masculina study. J Urol 2001; 166:569-74.
32. Romeo JH, Seftel AD, Madhun ZT, Aron DC. Sexual function in men with diabetes type 2: association with glycemic control. J Urol 2000;163:788-91.
33. Nickel JC, Morales A, Condra M, Fenemore J, Surridge DH. Endocrine dysfunction in impotence: incidence, significance, and cost-effective screening. J Urol 1984;132(1):40-3.

34. Heyns CF, Fisher M; The urological management of Patients with AIDS; *BJU Int*. 2005.; 95(5):709-16

35. Cove J, Petrak J; Factors associated with sexual problems in HIV positive gay men; *Int. J STD AIDS* 2004; 15(11): 732-6

36. Ende A; Erectile Dysfunction in an Urban HIV-Positive Population; *AIDS Patient Care and STDs.* 2006; 20(2): 75-78

37. Wong M et al; Erectile dysfunction in Singapore: prevalence and its associated factors--a population-based study; *Singapore Med J* 2004; 44(1):20-6

38. Asboe D, Catalan J, Mandalia S, Dedes N, Florence E, Schrooten W, Noestlinger C, Colebunders R; Sexual dysfunction in HIV-positive men is multi-factorial: a study of prevalence and associated factors; *AIDS Care.* 2007; 19(8):955-65

39. Guaraldi G, Luzi K, Murri R, Granata A, De Paola M, Orlando G, Squillace N, Malmusi D, Carani C, Comelli D, Esposito R, Martinez E. Sexual dysfunction in HIV-infected men: role of antiretroviral therapy, hypogonadism and lipodystrophy. Antivir Ther. 2007;12(7):1059-65.

40. Rogstad KE, Shah R, Tesfaladet G, Abdullah M, Jushuf IA; Sexual dysfunction in patients with HIV infection and its association with autonomic neuropathy and CD4 count. International Conference on AIDS. Int Conf AIDS. 1998; 12: 545

41. Richardson D, Lamba,H, Bell C, GoldmeierD; Sexual Dysfunction in HIV - Infected Men: A Cohort Analysis. BHIVA. 2004;10: 15-17

42. Tanzania Commission for AIDS (TACAIDS). Follow-up to the Declaration of Commitment on HIV/AIDS (UNGASS). TACAIDS, 2003

43. Way LW, Doherty GM; Current Surgical Diagnosis and Treatment; 11th Edition: 1082-3; *Mc Graw Hill*, 2003.

44. Nancy C et al; Conf Retrovir Opportunistic Infections 2006; 13: 5-8

45. Dar es salaam City Council. City Profile for Dar es Salaam United Republic of Tanzania. 2007

46. Kirkwood B, Sterne J. Essential Medical Statistics. 2nd Edition. Blackwell 2003.

47. Austin et al; Erectile Dysfunction among homosexual Australian men. J Public Health, 1997; 21(7):762-6

48. Chew K et al; Male erectile dysfunction: its prevalence in Western Australia and associated socio-demographic factors. J Sex Med 2008; 5(1):60-9

49. Thiong et al; Comparison of prevalence between self reported erectile dysfunction and erectile dysfunction defined by five-item International Index of Erectile Function in Taiwanese men older than 40 years. Urology; 2007; 69(4): 743-7

50. Austin et al; Sexual Practices in a broad cross-sectional sample of Sydney gay men. J Public health.1990; 19(5):345-7

51. Erectile dysfunction in an urban HIV positive population, AIDS Patient Care STDs. 2006; 20(2): 75-8

52. Ministry of Health Tanzania. The National HIV/AIDS Care and Treatment Plan 2000-2008. MoH, 2003.

53. Tindall B et al, Sexual dysfunction in advanced HIV disease, AIDS Care; 1994;6(1): 105-7

54. Kapona YM, Yongolo CS. Male Erectile Dysfunction as seen in Dar-es-salaam City. Tanzania Medical Journal. 2005; 20(2): 4-5

55. Vinik AI, Richardson DW: Erectile dysfunction in diabetes. Clinical Diabetes 1996; 14:111-20,

APPENDICES

APPENDIX 1: INFORMED CONSENT FORM (English Version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
DIRECTORATE OF RESEARCH AND PUBLICATIONS, MUHAS
CONSENT FORM

CODE NO _____

CONSENT TO PARTICIPATE IN THE STUDY ON ERECTILE DYSFUNCTION IN HIV PATIENTS IN DAR-ES-SALAAM, IN 2008

Greetings,

My name is Dr Eliasa Mkongo.

I am a postgraduate student at Surgical Department in MUHAS.

PURPOSE OF THE STUDY:

The study seeks to determine erectile dysfunction in HIV patients in Dar-es-salaam

WHAT THE PARTICIPATION INVOLVES:

If you agree to participate in the study, you will be interviewed, and a detailed clinical history regarding your illness will be requested and a thorough physical examination will be done.

CONFIDENTIALITY:

The information you give in this research be treated great confidentially. All information collected on questionnaires will be entered into computer with an identification number. The information will be used only for the purpose of this research alone.

RIGHT TO WITHDRAW AND ALTERNATIVES:

Taking part in this study is completely your choice .If you choose not participate in the study, you will continue to receive all services that you would normally get from the clinic.

BENEFITS:

If you agree to take part in this study, and if you have erectile dysfunction, you will receive professional advice on how to deal with the situation.

RISKS:

There are no any risks in participating in this study.

Who to contact:

If you have any question about the study, you should contact Dr E. Mkongo, Telephone no. 0784450044

If you have questions about your rights as participant, you may contact Prof E. Lyamuya, Chairman of College Research and Publication Committee. P.O.BOX **65001 Dar es Salaam, Tel 2150302-6**

Do you have any questions?

Signature

Do you agree?

Participant agrees…….. Participant does NOT agree……

I …… have read the content of this form.

My questions have been answered. I agree to participate in this study

Signature participant……

Signature witness……..

Date of signed consent……

APPENDIX 2: INFORMED CONSENT FORM (KISWAHILI VERSION)

KUKUBALI KUSHIRIKI KWENYE UTAFITI

NAMBA YA SIRI _____

KUKUBALI KUSHIRIKI KATIKA UTAFITI WA UPUNGUFU WA NGUVU ZA KIUME KWA WAGONJWA WA VVU, DAR-ES-SALAAM 2008

Salaaam,

Mimi naitwa Dr Eliasa Mkongo.

Ni mwanafunzi wa uzamili katika idara ya upasuaji, chuo kikuu cha tiba na sayansi za afya Muhimbili.

MADHUMUNI YA UTAFITI:

Kuchunguza tatizo la upungufu wa nguvu za kiume kwa wagonjwa wa VVU.

JINSI YA KUSHIRIKI:

Kama utakubali kushiriki ,utafanyiwa usaili na kuulizwa maswali kuhusu historia ya ugonjwa wako na kufanyiwa uchunguzi wa mwili.

USIRI:

Taarifa zote utakazotoa kwenye utafiti huu zitatunzwa kwa usiri mkubwa. Taarifa zitakazokusanywa zitaingizwa kwenye kompyuta, zikiwa katika namba ya siri. Taarifa zitatumika kwa ajili ya utafiti huu tu.

HAKI YA KUJITOA KWENYE UTAFITI:

Kushiriki kwenye utafiti ni hiari yako.

Kama utachagua kutoshiriki,utaendelea kupata huduma za afya kama kutoka hospitalini kama hapo awali.

FAIDA:

Iwapo utakubali kushiriki katika utafiti huu na iwapo una tatizo la upungufu wa nguvu za kiume, utaweza kupata ushauri wa kitaalamu jinsi ya kukabiliana na tatizo hili.

ATHARI:

Hakuna athari zozote utakazozipata kutokana na ushiriki huu.

Nani wa kuwasiliana nae?

Endapo unahitaji kupata maelezo yoyote kuhusu utafiti,wasiliana na Dr E. Mkongo, simu namba 0784450044, na kuhusu haki za mshiriki wasiliana na Prof E. Lyamuya, Mwenyekiti wa kamati ya utafiti P. O. Box 651001,Dar es Salaam, simu 2150302-6.

Una maswali?

Je unakubali kushiriki kwenye utafiti? (weka alama)

Ndiyo..... Hapana.....

Mimi ....., nimeelezwa/nimesoma maelezo

Haya. Maswali yangu yamejibiwa.

Nimekubali kushiriki kwenye utafiti huu

Sahihi ya mgonjwa .....

Sahihi ya ndugu/shahidi .....

Sahihi ya Mtafiti ..... .

Tarehe.....

APPENDIX 3: QUESTIONNAIRE (English Version)

ERECTILE DYSFUNCTION AMONG HIV PATIENTS IN DAR ES SALAAM

A: IDENTIFICATION

Code No _____

Date of Interview ____ / ____ /2008

Name of interviewer .....

Name of CTC ..... Municipality.....

B: BACKGROUND DATA

1. Age_____
2. Level of Education_____
3. Marital status
   a) Married
   b) Single
   c) Stable partner for not less than six month
   d) Separated
   e) Others specify _____
4. Date enrolled to the Clinic ____/____/_____
5. Are you on ARVs?
   (a) Yes ..... (b) No .....
6. If yes, date of starting ARVs ____/____/_____
7. CD4 count _____
   1= Below 200 per mL, 2=200-499 per mL, 3= above 500 per mL
8. Are you hypertensive? (a) Yes (b) No
9. Are you Diabetic? (a) Yes (b) No

C: ERECTILE DYSFUNCTION

SHIM-5 scoring system

	Score				
Over the past six months:	1	2	3	4	5
How do you rate your confidence that you could get and keep an erection?	Very low	Low	Moderate	High	Very high
When you had erections with sexual stimulation, how often were your erections hard enough for penetration?	Almost never or never	Much less than half the time	About half the time	Much more than half the time	Almost always or always
During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?	Almost never or never	Much less than half the time	About half the time	Much more than half the time	Almost always or always
During sexual intercourse how difficult was it to maintain your erection to the completion of intercourse?	Extremely difficult	Very difficult	Difficult	Slightly difficult	Not difficult
When you attempted sexual intercourse, how often was it satisfactory for you?	Almost never or never	Much less than half the time	About half the time	Much more than half the time	Almost always or always
The IIEF-5 score is the sum of questions 1 to 5. The lowest score is 5 and the highest score 25.					

THANK YOU

APPENDIX 4: QUESTIONNAIRE (Kiswahili Version)

UPUNGUFU WA NGUVU ZA KIUME KWA WAISHIO NA VIRUSI VYA UKIMWI

A: UTAMBULISHO

Msimbo _____

Tarehe ya Usaili ____ / ____ /2008

Jina la Msaili .....

Jina la Kliniki ..... Manispaa .....

B: TAARIFA BINAFSI

1. Umri.....
2. Kiwango cha elimu.....
3. Taarifa za mahusiano ya kimapenzi
    a) Umeoa.....
    b) Sijaoa.....
    c) Naishi na Mwenza kwa muda usiopungua miezi sita .....
    d) Tumetengana.....
    e) Mengineyo (elezea) .....
4. Tarehe ya kujiunga na Kliniki .....
5. Unatumia dawa za kupunguza makali ya VVU (ARVs)?
    (a) Ndio ..... (b) Hapana .....
6. Kama ndiyo, tarehe uliyoanza kutumia .....
7. CD4 count.....
    1 = Chini ya mia mbili {200}ml, 2 = Kati ya 200- 499/ml, 3 = Zaidi ya 500/mil
8. Unaugua shinikizo la damu
    (a) Ndiyo ..... (b) Hapana.....
9. Unaugua Kisukari?
    (a) Ndiyo..... (b) Hapana.....

C: UPUNGUFU WA NGUVU ZA KIUME

SWAHILI VERTION OF THE ABRIDGE 5 TIMES OF IIED

TAFSIRI YA MASWALA MATANO YALIYONUKULIWA KUTOKA KWENYE MASWALI YA KIMATAIFA YA UPUNGUFU WA NGUVU ZA KIUME.

Katika kipindi cha miezi sita iliyopita: Unajilinganisha vipi kwamba ulijiamini kuwa una uwezo wa kusimamisha uume wako na kudumisha kuendeleza mdingo huo?	Kiasi kidogo sana 1	Kiasi kidogo 2	Kiasi 3	Kiasi kikubwa 4	Kiasi kikubwa sana 5
Wakati uume wako umesimama kufuatia hamasa kutoka kwa mwenzi wako: Ni mara ngapi mdindo huo ulikuwezesha (ulikuwa na nguvu ya kutosha) kumuingilia mwenzi wako?	Karibu haikuwezekana Haikuwezaekana 1	Mara chache chini ya nusu ya mara nilizojaribu 2	Mara nyingi ni nusu ya mara zote nilizojaribu 3	Nilifanikiwa mara nyingi zaidi ya nusu nilizojaribu 4	Karibu mara zote nilifanikiwa 5
Wakati wa tendo lenyewe (ngono): Ni mara ngapi uliweza kudumisha mdindo (kuendelea kusimama) baada ya kumuingilia mwenzi wako?	Karibu haikuwezekana/Haikuwezekana a 1	Mara chache chini ya nusu ya mara nilizojaribu 2	Mara nyingi ni nusu ya mara zote nilizojaribu 3	Nilifanikiwa mara nyingi zaidi ya nusu nilizojaribu 4	Karibu mara zote nilifanikiwa 5
Wakati tendo la ndoa(ngono): je ilikuwa ni vigumu kiasi gain kudumisha uume uliosimama (mdindo) hadi mwisho wa tendo?	Ni vigumu kupiat kiasi 1	Ni vigumu sana 2	Ni vigumu 3	Ni vigumu kiasi 4	Hakuna ugumu 5
Ulipojaribu kufanya ngono (tendo la ndoa), ni mara ngapi umeridhika na tendo hilo	Karibu haikuwezekana /Haikuwezekana	Mara chache chini ya nusu mara nilizojaribu 2	Mara nyingi ni nusu ya mara zote nilizojaribu 3	Nilifanikiwa mara nyingi zaidi ya nusu nilizojaribu 4	Karibu mara zote nilifanikiwa 5

Erectile dysfunction score is the sum of the individual responses to the five items. Thus, the score can range from 5 to 25, severity categorization of ED: Score 5-10, severe ED; Score 11-15, Moderate ED; Score 16-20, mild ED; Score 21-25, normal (no ED).

AHSANTE

MEDTHS
RC 889
.M54
2009