PROPORTION OF PATIENTS WITH SEXUAL DYSFUNCTION AND ASSOCIATED FACTORS AMONG PATIENTS WITH PELVIC RING FRACTURES AT MUHIMBILI ORTHOPAEDIC INSTITUTE.

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By

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A Dissertation Submitted in (Partial Fulfillment of the Requirements for the Degree of Master of Medicine (Orthopedics and Traumatology) At

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October, 2024

CERTIFICATION

The undersigned certifies that they have read and hereby recommends for acceptance by the Muhimbili University of Health and Allied Sciences a dissertation entitled **"Proportion of patients with sexual dysfunction and associated factors among patients with pelvic ring fractures at Muhimbili Orthopedics Institution"** in partial fulfillment of the requirements for the degree of Master of Medicine (Orthopedics and Traumatology) of Muhimbili University of Health and Allied Sciences.

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DECLARATION AND COPYRIGHT

I, **Edward Adi-Mangka Adeb**, declare that this dissertation entitled **"Proportion of patients with sexual dysfunction and associated factors among patients with pelvic ring fractures at Muhimbili Orthopedics Institute"** is my original work and it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature……. **Date**……

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DEDICATION

I dedicate this dissertation to my precious wife and three children for making this study worthwhile.

I also dedicate this work to the Muhimbili orthopedics Institute (MOI) clinical and non-clinical staff where this research took place.

ABSTRACT

Background: Pelvic ring fractures are common orthopaedic conditions, and are associated with several complications which include sexual dysfunction as a late presentation. Even without severe injury to the urogenital structures, damage to the vascular and neurogenic tissues of the genitalia can result in Sexual dysfunction. The modifiable and non-modifiable factors associated with sexual dysfunction among patients with pelvic ring fractures have not been fully established.

Objective: This study sought to examine the proportion of patients with sexual dysfunction and associated factors among patients with pelvic ring fractures at MOI

Methodology: A quantitative cross-sectional study was carried out on 384 patients with pelvic ring fractures to examine the prevalence of sexual dysfunction and its associated factors. Data was retrieved from patients' records using a questionnaire that obtained information on, the burden of sexual dysfunction of clients treated at MOI with pelvic ring fractures, determined the prevalence of erectile dysfunction among men with pelvic ring fractures, determined the prevalence of ejaculation and orgasmic dysfunction in patients treated with pelvic ring fractures and assessed pain during sex in patients with pelvic ring fractures. Data was entered into Statistical Package for the Social Sciences (SPSS-24) cleaned and analysed to first obtain summary statistics. Comparisons of two variables was carried out by the Chi-square test. Variables with P = 0.05 was entered into a multivariate logistics Regression analysis to obtain ORs and aORs with their 95%CI. Statistical significance is set at $P < 0.05$

Result: About 71(18.5%) of participants ages ranged from 30 to 34 years and 279(72.7%) of participants were male and the average mean scores were found to be 36.52±4.15 and 16.41±1.80. The proportion of patients with sexual dysfunction was 214(76.7%) and 65(61.9%) among male and female's patient respectively. Age group [AOR: 1.0, 95% CI: 0.816 – 1.238, *p=0.002*], level of education [AOR: 1.0, 95% CI: 0.268 – 3.864, *p=0.001*], occupation [AOR: 1.1, 95% CI: 0.258 – 4.479, *p=0.01*], insurance status [AOR: 1.1, 95% CI: 0.418 – 2.700, *p=0.016*] had a statistically significant association with the sexual dysfunction among female patient with pelvic ring fractures. Also, age group below 40 years was [AOR: 0.9, 95% CI: 0.456 – 1.903, *p=0.037*], secondary level of education [AOR: 0.9, 95% CI: 0.439 – 2.145, *p=0.005*], private or national insurance status [AOR: 0.9, 95% CI:

0.389 – 2.265, *p=0.02*] had statistical significance associated with the sexual dysfunction among male patients with ring fracture ($p<0.05$).

Conclusion and Recommendation: The higher proportion of patients with sexual dysfunction among patients with pelvic ring fractures was greatly attributed to age, level of education, occupation, and health insurance among patients with pelvic ring fractures. The provision of public health education is recommended to create awareness about sexual complications of pelvic injuries to reduce the potential impact of pelvic ring fractures on sexual function.

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LIST OF ABBREVIATION

APC	Anterior-posterior compression
ED	Erectile Dysfunction
FSFI	Female Sexual Function Index
IIED	International Index of erectile Dysfunction
IRB	Institutional Review Board
MMED	Master of Medicine
MOI	Muhimbili Orthopedic Institute
MUHAS	Muhimbili University of Health and Allied Sciences
SD	Sexual dysfunction
USA	United States of America
VS	Vertical shear
WHO	World Health Organization
DSM-5	Diagnostic and Statistical Manual-5

DEFINITION OF KEY TERMS

Arousal	The state of being sexually excited.
Dyspareunia	DSM-IV-TR Defines dyspareunia as genital and pelvic pain during sex.
Ejaculation	Part of the sex cycle which involves the discharge of semen through the penis after enough sexual stimulation. The two phases of ejaculation include emission and expulsion.
Ejaculatory Dysfunction	Defined by ICD-11 as either early, late, retrograde, or no discharge of semen through the penis despite enough sexual stimulation.
Erectile dysfunction	DSM-5 Defines erectile dysfunction as the recurrent or persistent inability to achieve and maintain an erection during sexual activities with a partner.
Lubrication	Wetting of the vagina with fluid during sexual arousal.
Orgasm	The climax of the sex cycle which results in the sudden, forceful release of sexual tension.
Pelvic ring injury	Physiological damage to the pelvic ring
Penile Erection	A physiological phenomenon in which the penis becomes firm, engorged, and enlarged.
Sex cycle	According to William Masters is a four-stage model of the physiological response to sexual stimulation
Sexual desire	An emotional and motivational state characterized by an interest in sexual objects or activities.
Sexual Emission	Orgasm resulting in the release of semen through the penis, a phase of ejaculation.
Sexual satisfaction	An effective response arises from one's subjective evaluation of the positive and negative dimensions associated with one’s sexual relationship
	Diagnostic and Statistical Manual -5: The fifth version of a handbook used by healthcare professionals as an authoritative guide to the diagnosis of mental disorders.

Female Sexual Function Index: A survey that measures the sexual function of women in six different domains of desire, arousal, lubrication, orgasm, satisfaction and pain.

International Index of Erectile Dysfunction: A multi-dimensional self-report instrument for the evaluation of male sexual function.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Pelvic fractures constitute a significant and growing public health concern resulting in about 3% of all fractures of the skeletal system mostly from high energy sources which includes road traffic accidents and falls from heights (1,2). The global prevalence of pelvic fractures is 39.6 million per 100000 population in 2019 in young people who are also sexually active (3). Previous research has found fatality rates of 8-19% caused by pelvic bleeding and its associated injuries, as well as long-term consequences which include gait instability, persistent discomfort, and arthritis (2). Hence, early fixation after the injury is imminent, and stable fixation methods should be used to reduce such complications (4). Sexual dysfunction in both males and females constitutes a major worry to many people who sustain major trauma to the pelvic ring alongside urethral injuries, especially to the posterior urethra. Sexual dysfunction from pelvic injury is mostly neurological and vascular in origin with venous injuries contributing more than arterial injuries. A high incidence of genito-urinary issues has been observed after pelvic ring fractures in patients with or without genito-urinary injuries (5)**.**

Sexual dysfunction affects about 50 percent of men and 40 percent of women over the age of forty (1). Sexual function is a result of psychological, physical, or physiological stimulation controlled by parasympathetic fibers originating from sacral nerve roots 2 to 4 which come close to the prostate and rectum in their course making the sacral root nerves more vulnerable to injury in pelvic trauma or pelvic surgery

Erectile dysfunction is caused by parasympathetic nerve fibers in the corpora cavernous activated by calcium in the guanylate cyclase pathway. It is a type of sexual dysfunction that occurs at the excitement phase of the sex cycle due to the inability to develop and maintain a full erection. Erectile dysfunction can result from pelvic ring injury in a majority of patients, but there is no empirical data to establish the causal relationship between sexual dysfunction and pelvic ring injuries in Tanzania.

Injury to the cavernous nerves as well as that of the internal pudendal arteries which lie close to the pelvic bones and the posterior urethra may result in sexual dysfunction. (2, 1). Pelvic ring fractures may result in secondary orgasmic dysfunction which needs a structured approach to investigate management unlike primary orgasm dysfunction which can be managed with behavioral approaches (3)

Episodes of focal pain or chronic persistent pain syndromes may be sequelae of pelvic ring injuries or may result from the treatment of pelvic ring injuries and their associated disorders. Pain may be more localized in the urogenital and rectal areas and maybe wrongly attributed to primary psychiatric disorders. Dyspareunia affects 15-21 percent of women between the ages of 18 to 59 years annually (4). Men also experience painful sexual functions such as penile pain from a pelvic injury in lesser numbers as compared to women (5). Painful sexual intercourse has a negative impact on the other indicators of sexual function such as sexual desire, intercourse satisfaction, lubrication in women, and overall sexual satisfaction since genital and perineal pain limits sexual activities.

The long-term result of sexual dysfunction from pelvic fractures will be a low quality of life compared to the general population as a whole (6). Studies have reported that the higher the injury severity scores, the higher the morbidity, with subsequent complications including sexual dysfunction, urine incontinence, permanent pain, limb discrepancy, limping, and urogenital damage (7,8). A corresponding relationship exists between injury mechanisms and sexual dysfunction making anterior-posterior compression (APC) and vertical shear (VS) fractures the commonest causes of sexual dysfunction in both males and females as well as sexual dysfunction among patients treated with pelvic ring fractures (9). This is secondary to pelvic trauma which is a major concern in injury survivors. A recent study on the American sample population reports that Sexual dysfunction in women is more common with anteroposterior compression fractures and type B fractures (10). Therefore, sexual dysfunction in both males and females from pelvic ring trauma can either be permanent or temporary based on the recovery of function and the duration of symptoms.

Factors associated with sexual dysfunction among patients with pelvic ring factors can be categorized into modifiable and non-modifiable factors. Minimizing the usage of alcohol, smoking cessation, maintaining tight glycaemic control in diabetics, and regular exercises to maintain the level of testosterone help to manage erectile dysfunction (11). Other factors

affecting sexual performance include age, psychiatric disorders, and medical or surgical disorders. Systematic reviews related to pelvic ring injuries, established factors like age, pelvic fracture complexity, and changes in public symphysis were among the risk factors that can lead to erectile dysfunction after a major pelvic injury or fracture (12).

Sexual dysfunction from diabetes can result from poor glycemic control in both types 1 and 2 Diabetes Mellitus. Type 1 Diabetes Mellitus causes vascular, hormonal, and neurologic insults to genital end organs thus resulting in sexual dysfunction in both men and women of old age. (6). The prevalence of ED in men with diabetes is approximately three and a half times higher than that of the general population (6, 1). According to 2020 census data in the USA 34.2 million people making 10.5 percent of the total population of different ages had diabetes (7) little research has been done to assess the prevalence of sexual due to pelvic injury in patients with pre-existing Diabetes mellitus.

A study was done in a South African sample population by Gdeh et al to determine the association between pelvic injuries and erectile dysfunction and its associated factors but did not include female sexual dysfunction. Erectile dysfunction due to pelvic injury was studied again in a Madagascan sample population by Malinirina et al from 2014 to 2016 without including female sexual dysfunction. Rugambwa L. also conducted a study examining the short-term complications of pelvic injuries which were not specific to sexual complications at the Muhimbili Orthopedics Institute, in Dar es Salaam, Tanzania. Many studies in the past attributed sexual dysfunction to cigarette smoking, drinking alcohol, stroke, and diabetes mellitus with paucity of data on the association between pelvic ring fractures and sexual dysfunction (13). Therefore, this necessitates the need to conduct this study to fill the knowledge gap.

1.2 Problem Statement

Injuries that affect the genitourinary tract, the spinal cord, the pelvis, and the acetabulum as well as injury to their neurovascular supplies may result in sexual dysfunction as a long-term complication. Complications of pelvic, spine, or genitourinary surgery also cause sexual dysfunction. Sexual dysfunction secondary to pelvic trauma is a major burden to injury survivors. Few studies have been conducted in Sub-Saharan Africa and other developing countries on sexual dysfunction in females and males from pelvic injuries and its associated factors. A study was done in a South African sample population by Gdeh et al to determine the association between pelvic injuries and erectile dysfunction and its associated factors but did not include orgasmic dysfunction, disorders of sexual arousal, painful sex, and disorders of sexual desires in both males and females. Erectile dysfunction due to pelvic injury was studied again in a Madagascan sample population by Malinirina et al from 2014 to 2016 without including female sexual dysfunction and the other components of male sexual dysfunction like painful intercourse in males. Rugambwa L. also conducted a study examining the short-term complications of pelvic injuries which did not include sexual other complications at the Muhimbili Orthopedics Institute, in Dar es Salaam, Tanzania**.**

All the studies undertaken so far in Africa showed a paucity of data on the prevalence of sexual dysfunction among patients with pelvic ring fractures and their modifiable and non-modifiable factors and their neurovascular complications leading to sexual dysfunction.

In a nutshell, no study has been done which might influence sexual function in patients who sustained pelvic ring trauma at the Muhimbili Orthopedics institute in particular, which is likely to impair the treatment outcomes of patients due to a missed holistic approach. There is also limited research examining the prevalence of sexual dysfunction in adult Tanzanian patients in general with pelvic ring injuries. Moreover, there are currently no recommendations concerning how patients can manage or overcome their sexual problems from pelvic injuries in the country. There are no studies that compare sexual problems after pelvic ring injuries within the country and among other African countries. The knowledge gained from this work will be used as a stepping stone for the enhancement of sexual health from injuries in the general population. There is no available national comprehensive and representative population-based data to inform the understanding of health workers on the sexual complications of pelvic ring injuries. Finally, surgical or conservative management

of pelvic ring patients can result in sexual dysfunction as well as problems with child delivery in pregnant women. Knowledge gained from this work will help to choose the right methods of delivery in patients who sustained pelvic ring injuries. The ultimate goal is to help sexually active individuals to achieve sexual well-being in society through timely and accurate diagnosis and interdisciplinary management.

In connection with the above, the study aimed to assess the prevalence and factors associated with sexual dysfunction among men and women with pelvic ring fractures using both primary and secondary data available at Muhimbili Orthopedic Institute in Dar es Salaam, Tanzania.

1.3 Rationale

Findings from this work will be useful to clinicians at the Muhimbili Orthopedic Institute to have a clear understanding and awareness of factors associated with sexual problems which are consequences of pelvic ring fractures. The added information will also help in designing protocols to manage sexual dysfunction secondary to pelvic injuries to improve the quality of health care. Students as well as researchers will also exploit gaps in the central theme of this work for further research purposes.

1.4 Conceptual Framework

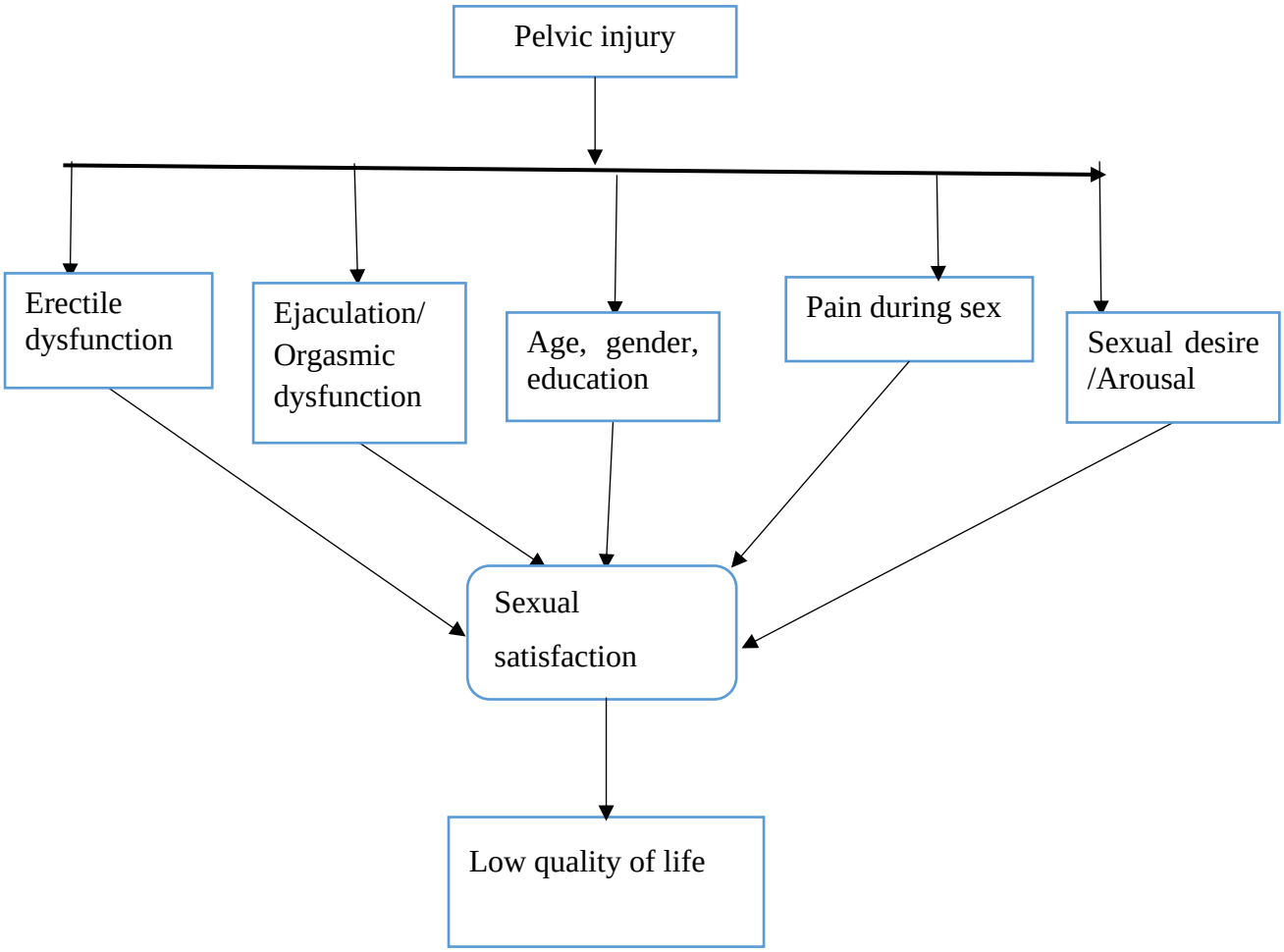


Figure 1: Conceptual framework on the prevalence of sexual dysfunction and its associated factors in pelvic ring fracture patients

Sources: Constructed by the principal investigator from the literature review.

1.4.1 Narrative of conceptual framework

Disorders of erection, ejaculation, desire, arousal, and orgasm as well as painful sexual intercourse are some of the commonest observed, reported, and validated components of sexual dysfunction worldwide with a myriad of etiologies. Trauma from road traffic injuries falls, and physical assaults, just to mention a few, causes damage to such body parts as the genitourinary organs, spine, and pelvis, and their neurovascular supply. Severe pelvic ring injuries and treatment for such injuries cause sexual dysfunction with impairment of erectile, orgasmic, ejaculatory, and arousal function as well as a sequela of a chronic painful syndrome which limits one's ability to have sex physically, thereby resulting in lower overall sexual satisfaction which results in low interpersonal relationships which will climax in a low quality of life.

1.5 Broad Research Question

What are the prevalence of sexual dysfunction and its associated factors in pelvic ring fracture patients treated at MOI from June 2018 to June 2021 MOI.

1.5.1 Specific Research Questions

i. What is the burden of sexual dysfunction of clients treated at MOI with pelvic ring fractures?
ii. What is the association between demographic factors and erectile dysfunction among men with pelvic ring fractures treated at MOI?
iii. What is the association between demographic factors, ejaculation, and orgasmic dysfunction in patients with pelvic ring fractures treated at MOI?
iv. What is the association between demographic factors and Pain during sex in patients with pelvic ring fractures treated at MOI?
v. What is the relationship between demographic factors and Sexual desire and arousal disorders in patients with pelvic ring fractures treated at MOI?

1.6 Objectives

1.6.1 Broad Objective

To determine the prevalence of sexual dysfunction and its associated factors in pelvic ring fracture patients treated at MOI from June 2018 to June 2021 using a retrospective and prospective quantitative study design.

1.6.2 Specific Objective

i. To determine the burden of sexual dysfunction of clients treated at MOI with pelvic ring fractures.
ii. To **determine** the association between demographic factors and erectile dysfunction among men with pelvic ring fractures treated at MOI.
iii. To determine the association between demographic factors, ejaculation, and orgasmic dysfunction in patients with pelvic ring fractures treated at MOI.
iv. To examine association between demographic factors and pain during sex in patients with pelvic ring fractures treated at MOI.
v. To study the relationship between demographic factors and sexual desire and arousal disorders in patients with pelvic ring fractures treated at MOI.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Demographic characteristics of Pelvic Injury Patients

A worldwide review of how pelvic fractures were managed in the past showed marginal improvements made in managing severe acute hemorrhage which resulted in high mortality rates (18). There persist high incidence rates of injuries from the pelvis in the United States of America (USA) making about 37 cases per 100,000 per person-years with the highest occurrence in people aged 15-28 years despite the tremendous effort being made towards management (19).

Age and gender play a significant role in treatment outcomes in pelvic fracture patients. Lundin *et al.*, (2021) performed a study in Sweden which revealed that males were surgically managed four times compared to females (20). Persons younger than 35 years showed a male dominance of pelvic injuries compared to females who also dominate men in persons older than 35 years (20,21). Research findings have revealed that erectile dysfunction is more common in men older than 40 years of age in about 50% world-wide due to various causes (22-24).

Older persons are more prone to sexual dysfunction after pelvic ring injuries than younger people but older osteoporotic people who develop pelvic ring fractures from trivial injuries are not mostly prone to sexual dysfunction. Women who sustain posterior pelvic ring fractures are more susceptible to sexual dysfunction due to damage to genitourinary organs (25).

Pelvic fractures are either stable or unstable. Many unstable pelvic fractures result from high-energy injuries with associated injuries to organ systems. Men with sacroiliac fractures have a high risk of sexual dysfunction whiles women with symphysis pubis injury will have high rates of sexual dysfunction independent of overt pelvic organ injuries according to research findings by Wright et al., (2006). Pain during sex in females is associated with anterior-posterior and type B-fractures as well as symphysis pubis plate fixation. A study in Turkey by Ceylan *et al.*, (2015) on the impact of pelvic injuries in men showed erectile dysfunction to be more common in Tiles B and C pelvic fractures (24,31). Another study by Fanjalalaina Ralahy *et al.*, (2019) in Madagascar involving a sample population of 48 pelvic ring injury

patients found that 33.3% of them had erectile dysfunction with type C which is the commonest fracture type (32).

The study established the relationship between erectile malfunction and instability of the disrupted pelvic ring both horizontally and vertically and depression in younger patients.

The urethra and bladder are vulnerable to injury from pelvic fractures as a result of the intimate relationship of the bony pelvis to soft tissues with a worldwide reported rate of 10% to 15% (33) with injury to the neuro-vascular systems which supply the genital organs resulting in sex activity malfunction (33,34).

No study has been done in Tanzania to investigate the relationship between pelvic ring fractures with its associated factors and sexual dysfunction which makes our research timely.

2.2 Association between demographic factors and erectile dysfunction among men with pelvic ring fractures

Sexual dysfunction constitutes any problem that prevents sexual partners from experiencing sexual satisfaction. Various degrees of sexual problems are reported annually in about 43% of women and 31% of men (35) within the various phases of the sexual response cycle. Though sexual dysfunction occurs mostly in people over 40 years because of age-related health decline, it can still occur in any age group (36). Some manifestations of sexual problems associated with men include: are poor erection during intercourse which occurs in approximately 29% of patients with pelvic ring injuries, ejaculatory delays or no ejaculation despite adequate sexual stimulation, inappropriate ejaculatory timing which may manifest as premature ejaculation (37).

About 10 to 20 million Americans have some degree of erectile dysfunction (38). Diabetes Mellitus, heart disease, hypertension, smoking, and old age have a strong negative correlation with changes in sexual function. The diagnosis of erectile dysfunction involves thorough history taking which includes a careful drug history. Organic causes like spinal cord injury cause neurological damage affecting the transmission of erotogenic nerve signals from the brain. Most organic causes of erectile dysfunction are secondary causes occurring in older people whereas psychological problems mostly cause primary erectile dysfunction in younger people (39). Wylie et al recognizes pelvic trauma and surgery as a likely cause

of erectile dysfunction but fails to attribute this to a particular mechanism of injury or a particular fracture pattern.

The erectile muscles of the penis are the left and right corpora cavernous that communicate via perforations to affect a single erectile chamber. These two muscles become the deep erectile crura by attaching to the pelvis rami. The corpora are cavernous and are supplied by the cavernosal arteries which are branches of the internal pudendal arteries which come from the internal iliac arteries. The walls of the arteries and sinusoids contain endothelial cells which produce nitric oxide, an erotogenic neurotransmitter Oxytocin stimulates erection whiles Serotonin inhibits sexual responses. Dopamine also facilitates penile erection. Erection requires the function of the autonomic and somatic nerves with the help of the limbic and hypothalamic pathways. Erectile dysfunction from neurological sources manifests as an inability to maintain or sustain an erection.

The erectile mechanism involves tactile stimulation of the penis and higher brain centers that interpret sensory stimuli causing an erotic response resulting in an erection. Nerve impulses synapse in the spinal cord to form a reflex arc with parasympathetic nerves responsible for erection. The parasympathetic nerves of the penis which are branches of spinal nerves S2-S4 cause erection (39.1). The sympathetic nerves of the penis are branches of T11 to L2 and are involved in ejaculation. Branches of the pudendal nerve from S2 to S4 form sensory innervation to the penis and scrotum.

2.3 Association between demographic factors and ejaculation in men and orgasmic dysfunction in men and women

Ejaculatory dysfunction is among the most common male sexual disorders. Ejaculatory dysfunctions vary from premature ejaculation to delayed ejaculation to anejaculation and retrograde ejaculation. Premature ejaculation occurs in 4-39 percent of men worldwide (40). Ejaculation and orgasm usually occur simultaneously even though they are different entities. Genital organs play an ejaculatory role whiles orgasm involves the whole body. Ejaculatory disorders have neurobiological etiologies and can be treated with pharmacotherapy (41). Ejaculation is perpetuated by the contraction of the urethra, vas, seminal vesicles, and prostate (42). Ejaculatory reflexes include sensory receptors and areas, afferent pathways, cerebral sensory areas, cerebral motor centers, spinal motor centers, and efferent pathways.

The combined effect of these reflexes with neurotransmitters results in serotonin inhibiting ejaculation and emission and dopamine facilitating the emission of semen and ejaculation, (40,1).

The Paraventricular nucleus and the medial preoptic nucleus of the hypothalamus secrete dopamine which sends ejaculatory enhancing signals to Dopamine- 2 receptors which are in contrast to periaqueductal gray of the midbrain which secretes serotonin which sends signals that suppress ejaculation via the paragigantocellularis of the pons (43)

Orgasm is controlled by cerebral processing of sensory nerve inputs from pelvic muscle contraction and ejection of seminal fluid. Cerebral control of orgasm originates from the nucleus paragigantocellularis of the pons and the medial preoptic area and Paraventricular Nucleus which coordinates the interpretation of erotic stimuli through a neuro-endocrine mechanism that regulates mainly testosterone function. Penile emission is a sympathetic process mediated by T10-L2 which synapses with the pelvic plexus to cause the epididymis to contract and release oxytocin. The vas deferens then move semen to the posterior urethra, the prostate, and the seminal gland then contract to express semen and the bladder neck closes.

Ejection or expulsion is by somatic innervation through the striated pelvic and perineal muscles through S2 to S4 of the perineal branch of the pudendal nerve causing the Bulbocavernosus and ischiocavernosus muscles to contract to release semen. This is manifested as absence or delayed orgasm and it is more common in women than men.

2.4 Association between demographic factors and pain associated with sex in both men and women

Some symptoms of sexual problems in women may include poor orgasm, inadequate lubrication of the vagina during sex, and poor relaxation of the vaginal muscles during sex. Some sexual dysfunction symptoms in both sexes include low interest or poor sexual desire, poor arousal, and dyspareunia which is mostly caused by the pressure effect of a displaced ramus fracture on the vaginal vault (44). Genital or perineal pain experienced before, during, or after sexual intercourse has overlapping physical or anatomic and psychosocial causes. Anatomical causes have a gradual increase in symptoms whiles psychological causes have a sudden symptom onset (45).

Dyspareunia affects more females than males (46). It affects 8-35 percent of people globally (47) and 10 to 28% of the population in a lifetime (45, 1) It affects 10 – 20 percent of sexually active American women (48). Dyspareunia is most common between the ages of 55 to 64 as well as between 16 to 24 (45, 2). Females with severe symptoms which need medical attention constitute a small group since most patients do not seek medical attention making it difficult to determine the true incidence (48, 1)

The main outcome measure for painful sex is physical pain as a result of sex for three or more months in one year plus measures of severity of symptoms (49). Dyspareunia can be classified as primary verses secondary or superficial verses deep**.** Primary dyspareunia occurs at the onset of intercourse whiles secondary dyspareunia lasts in a patient's lifetime. Superficial dyspareunia is painful intercourse at the intraoral area of the vulva and vestibule whiles deep dyspareunia is associated with disorders in the penis **(**47, 1). Identifying the pain as either deep or superficial helps to recognize its etiology (45, 1). Dyspareunia can lead to a lack of sexual desires, arousal, and interpersonal relationship problems with a negative impact on physical and mental health. There are many causes of dyspareunia but anatomic causes include pelvis floor muscle dysfunction, uterine retroversion, hymenal remnants, and pelvic organ prolapse (48, 2).

2.5 Relationship between demographic factors and sexual desire and arousal disorders

Sexual arousal disorder is characterized by difficulty in becoming physically aroused during sexual activities and occurs in both men and women. Arousal is a result of physiological and psychological stimulation resulting in Vaso congestion. Increased blood flow in men causes' erection, changes in the color of the penis, and elevation of testicles. Vaso congestion in women also leads to vaginal lubrication, clitoral tumescence, and changes in the color of the labia. This event culminates in increases in heart rate, blood pressure, respiratory rate, and muscle tone in both men and women (50).

Penile arousal and erection are mainly neurovascular and are controlled by penile muscles. Spinal nerve roots T10 to T12 are mainly sympathetic which then causes vasoconstriction and opposes genital blood flow. The Parasympathetic spinal nerve roots are from S2 to S4 and play a role in enhancing genital blood flow causing vasodilation. Sensory input for

arousal is mainly from the glans penis and is mediated by the Dorsal nerve which then travels to the pudendal nerve and then to S2-S4

Female sexual arousal disorders are very common in women of all ages with causes ranging from individual factors such as gender, stress levels, age, and beliefs about sex, the quality of relationship with one's sexual partner, and the satisfaction derived from it. Social context which includes breastfeeding or the fear of pregnancy can result in female sexual arousal disorders. Physical causes like impairment in neurovascular structures in the nervous system and genitourinary structures including pelvic ring injuries might cause female sexual arousal disorders even as researched evidence is scarce.

The clitoris which has an erectile tissue connection extending to the perineal part of the urethra responds with increased blood flow and tumescence when stimulated during sexual arousal (51). It has parasympathetic innervation from L2 to S2 lumbosacral nerve roots, sympathetic innervation from the hypogastric superior plexus, and sensory innervation from pudendal and hypogastric nerves. Damage to these nerves causes urinary and sexual dysfunction. These nerves can be damaged in injuries to the spinopelvic region resulting in problems with orgasm and arousal in women (51, 1)**.** Sexual arousal is from spinal level reflexes which are under inhibitory and excitatory control from the brain and hypothalamus (52) whereby a network of interneurons processes sensory information and generates complex patterns of activities that are distributed to autonomic and somatic efferents also physiology of female sexual. Women with sexual arousal disorders lack awareness of changes in their genital organs since they lack adequate proprioceptive feedback from their genitals to their brains (53)

A recent work done in the USA by Kenneth Maravilla in a pilot study of four women concluded that women with sexual arousal disorders at the amygdala which is responsible for sexual responses are inhibited with decreased temporal area activation. The sample size for this pilot was too small and not generalizable.

The sexual response cycle is made up of desire, arousal, orgasm, and resolution. Sexual desire is made of sexual drive, sexual motivation, and sexual wish. Sexual drive is produced by psychological, neurological, and endocrine mechanisms whereby the limbic system and the preoptic area of the anterior medial hypothalamus are probably involved. Sexual desire

disorders result in low interest in sexual activities. This affects both men and women in high prevalence though they are not being properly managed due to stigma. Statistics from the National Health and Social Life of America revealed that 32 percent of women and 15 percent of men in America lack sexual interest for many months in a year **(**50, 1).

The health and well-being of individual couples and families are fundamentally dependent on sexual health, a necessity for development (WHO). Access to comprehensive sexual information, information on risk, sex education, access to quality healthcare on sexual rehabilitation by using clinical and psychological modalities, and staying in an environment that promotes and respects individual sexuality. Will determine the ability of all genders to achieve sexual health and well-being (WHO) in the long run. Sexual competence is a sexual health indicator and will be used as a targeted preventive strategy and intervention to decrease the negative impact of pelvic injuries on sexuality (WHO).

Sexual dysfunction in women with neurological impairment due to pelvic ring fractures is not routinely and systematically assessed though it can be assessed physiologically by assessing sacral and thoracolumbar reflexes to treat and improve the quality of life of this patient population. Women with sexual dysfunction from neurological causes may still retain vaginal lubrication, orgasm, and sexual desire but may suffer from urine incontinence, pain, and spasticity which interferes with sexual activities.

Sexual satisfaction results in satisfactory relationships. It involves the positive aspects of individual sexual experience such as pleasure, positive feelings, arousal, openness on sexual matters, and orgasm. Sexual satisfaction also involves relational dimensions such as mutual relationships, romance, expression of feelings, sexual creativity, acting out desires, and frequency of sexual activity. The frequency of sex is a major indicator of sexual satisfaction as well as the duration of sexual intercourse and sexual practices. Therapy aimed at improving sexual satisfaction will help improve overall relationships (54). To conclude,
There are numerous publications in Western literature on the burden of sexual dysfunction from pelvic injuries but the same cannot be said of many Africans with hardly any available published literature from Tanzania. Many western literatures have failed to demonstrate the exact mechanism of pelvic ring injuries that can result in the various components of sexual dysfunction. There is still a weak association between the various fracture patterns and sexual dysfunction.

There was also a paucity of literature on the impact of the various treatment modalities for pelvic ring injuries and sexual dysfunction, as well as the timelines for the onset of sexual dysfunction symptoms. We hoped that our research would bridge this knowledge gap by generating relevant information.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Design of Study

A hospital based retrospective cross-sectional study of sexual dysfunction from pelvic ring fractures was undertaken among patients who attended MOI orthopedic departments from June 2018 to June 2021. All patients with pelvic ring injuries who were treated at MOI and met the inclusion criteria were included in the study. Information on sexual dysfunction secondary to pelvic ring fractures was obtained with the aid of a structured questionnaire from patients.

3.3 Study Area

The research was done at the orthopedic department of the Muhimbili Orthopedics Hospital which has a large bed capacity and serves as the main referral hospital for Tanzania.

3.4 Duration of Research

The research lasted for six months.

3.5 Research Population

The population for the study were male and female clients who received medical care at MOI and were aged 18 years and above with pelvic fractures. This comprised all those clients who attended the facility from June 2018 to June 2021 with pelvic ring fractures who met the inclusion criteria. Data from patients who received treatment within the stipulated period of the study were used. Both Tiles and Young and Bourgess classifications systems of pelvic ring fractures were used for the pelvic fractures studied.

3.6 Sampling Method

The study was done using a simple random sampling of secondary data of pelvic ring injury patients from the database of patients treated at MOI with pelvic ring injuries from June 2018 to June 2021. Data was accessed after obtaining permission from the Hospital Executive Director and after receiving ethical clearance. Two out of every three files from pelvic injury patients were randomly selected. Detailed and relevant information regarding sexual dysfunction in pelvic fracture patients which includes names, gender, age, erectile dysfunction, orgasm dysfunction, sexual desire, and pain associated with sex, were extracted from the hospital database using patients' hospital numbers.

Both electronic and paper-based clinical information of pelvic ring injury patients were obtained with a checklist in a simple random manner. Contact details of patients were obtained from their hospital records, which helped reach them by direct encounters through follow-up hospital visits six months after sustaining pelvic ring fractures or six months after being treated for pelvic ring fractures.

3.7. Inclusion criteria

The study included all patients with pelvic ring fractures who were treated at MOI from June 2018 to June 2021. Reviews were done from the case notes of all clients treated for pelvic ring injury within the period of research.

3.8 Criteria for exclusion

The study excluded patients with:

i. Pelvic ring fracture who refuses to participate in the study.
ii. Those who died from pelvic injuries a few minutes on arrival at the orthopedic department
iii. Those who had a sexual dysfunction before the pelvic ring fracture
iv. All poly -trauma patients with long term neurologic deficits
v. Patients with chronic illnesses and medical co-morbidity with sexual complications such as diabetes and hypertensive.

3.9 Sample Size Determination

Using an estimated proportion of 50% with sexual dysfunction as reported by D. Gdeh, who investigated the frequency of erectile dysfunction following pelvic fractures in a South African sample population in patients admitted to two Wits Teaching Hospitals, the single population proportion was estimated with confidence level of 95% and an error margin of 5%.

This implied that the projected size of the sample would be 384 patients. In this study, the finite formula for a sample size of proportion, adopted from the Cochrane formula and modified by Daniel WW (1999), was used as follows,

$$\boldsymbol{n = \frac{(z^2 pq)}{d^2}}$$

Where n = sample size

Z = 1.96 (95% confidence Interval)

P = 50% (Proportion of erectile dysfunction)

q = 1- p = 1- 0.50 = 0.50

d = 5% = 0.05 (95% CI)

Substituting into the formula:

$$\boldsymbol{n = \frac{(1.96)^2 (0.50 \times 0.50)}{(0.05)^2}}$$

$$\boldsymbol{n = \frac{3.8416 \times 0.25}{0.0025}}$$

$$\boldsymbol{n = \frac{0.9604}{0.0025}}$$

$$\boldsymbol{n = 384.16}$$

Therefore, in this study, the sample size was 384 patients.

3.10 Variables for the study

3.10.1 Independent

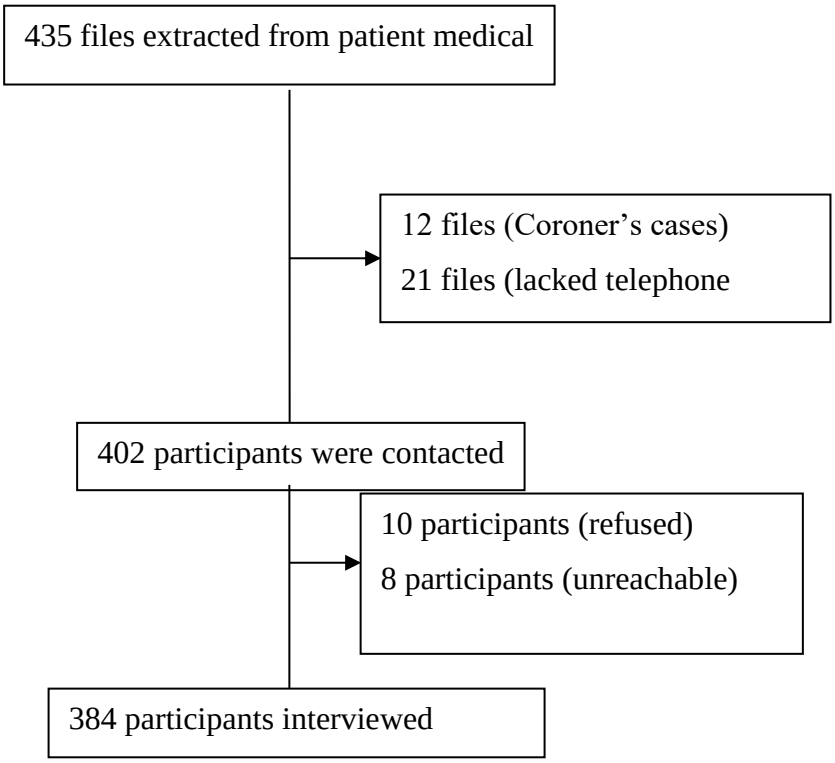
Independent variables: Age, sex, levels of education, occupation, pelvic ring injury

3.10.2 Dependent Variables

Erectile dysfunction, orgasm, and ejaculation dysfunction, dysfunction of sexual desires, sexual arousal disorders, disorders of orgasm, and painful sex

3.11 Data Collection Techniques

Figure 1: Summary of sampling technique.



File numbers and names of patients who sustained pelvic ring injuries from June 2018 to June 2021 were extracted from patient's medical records. 435 files were found and their names and file numbers were extracted from the hospital database. These particulars were used to trace patient files from the hospital database. Information such as name, age, gender, incidence of pelvic ring fractures, incidence of sexual dysfunction and phone numbers were collected from files.

From the information gathered during the study period there were 12 coroner's cases, and 21 files did not have phone numbers. These files were excluded from the study. The remaining 402 participants were contacted and informed of the purpose of the study and how it will be conducted. However, 8 participants were not reachable by phone and 10 participants refused to be declined consent and were excluded. 384 participants consented and subsequently participated in the research. The summary of the sampling technique is shown in the figure above.

Sampling tool

A questionnaire which was validated and used in South Africa at Wits Teaching Hospitals for erectile dysfunction was adapted from The International Index of Sexual Dysfunction Score as well as The Female Sexual Function Index. The questionnaire was translated from English to Swahili and from Swahili to English and administered in both languages. A translator was available to help those who could neither read nor write in either language.

The questionnaire was tested through a pilot study at MOI which revealed that an average of 12 patients with pelvic ring fractures were treated in one week. Modifications were made to the questionnaire based on the findings of the pilot study to enable proper capture of the required information to ensure validity and reliability. A research assistant with knowledge and experience in research was employed and oriented to the data collection tools and study objectives.

Patients were expected to complete the questionnaire, which included the IIEF Score, reporting on the frequency of erection, success in penile penetration, ejaculation, and sexual satisfaction for males. The Female Sexual Function Index also assessed sexual drive, arousal, and vaginal lubrication. This was also administered to female clients after it was incorporated into the questionnaire.

3.10.1 Pretesting/Piloting of Questionnaire

The questionnaire was pre-tested at MOI in May 2022 on a pilot basis, with a sample of 40 participants selected using simple random sampling. Approximately 12 patients with pelvic fractures were treated per week, and out of this number, 5 patients reported complaints of sexual dysfunction after sustaining pelvic ring injury. MOI was chosen for this purpose because it was the main referral center for patients with pelvic ring injuries in Tanzania.

The questionnaire was pre-tested to achieve several objectives: to expose its content to new forms of thinking and understanding, to evaluate the quality of answers provided by the respondents, to assess and revise the phrasing and content of questions, and to explore issues of structure and sequence of questions. Modifications were made to the questionnaire after piloting it to make it more useful, clearer, valid, and reliable

3.12 Data Processing and Analysis

There was a full compilation and orderly arrangement of all questionnaires that were administered to respondents. The data was validated for completeness, accuracy, and utility. Subsequently, the data were coded, classified and categorized, and exported to SPSS for analysis.

The sample data set was summarized using descriptive statistics to describe the averages, proportions, distribution, standard deviation, and skewness of variables. Graphical presentations of data were made through histograms, bar charts, and pie charts. Data was also presented through statistical tables. Conclusions regarding the relationships and prevalence of sexual dysfunction in pelvic ring patients and associated factors were drawn using a statistical table. Multivariate data analysis was performed using logistic regression to predict the association between age, gender, pelvic injury, erectile dysfunction, orgasmic dysfunction, and painful sexual intercourse. Interpretation of the generated information was conducted.

3.13: Ethical Considerations

Obtained ethical clearance from the Institutional Review Board of MUHAS and other relevant authorities to undertake the research. Permission to collect data was obtained from MOI and other relevant authorities. Written consent was obtained from the participants in the study after providing them with sufficient information and addressing all their concerns.

3.13.1 Consent process

Participant information sheets and consent forms were designed for each potential participant in this study. The background, rationale, and study procedures were explained to the participants in English and Swahili in the presence of a witness (a family member or study independent person). Respondents who voluntarily agreed to participate in the study were asked to sign or thumbprint the informed consent forms. A copy of the signed consent form was given to the respondent. A waiver of consent was also sought

CHAPTER FOUR

4.0 RESULT

4.1 Demographic characteristics of patients with pelvic ring fractures

A total of 384 patients with pelvic ring fractures attended an orthopedic clinic at MOI and were interviewed. About 71(18.5%) of participants were aged between 30 to 34 years. Majority of 279(72.7%) of participants were males.

The majority of 308(80.5%) of study participants had a secondary level of education, 212(55.2%) were employed and 240(62.5%) had national health insurance.

Table 1: Demographic characteristics of patients with pelvic ring fractures

Variables	Categories	Frequency (n)	Percentage (%)
Age	Below 25years	45	11.7
	25-29years	69	18.0
	30-34years	71	18.5
	35-39years	59	15.4
	40-44years	47	12.2
	45-49years	49	12.8
	50 and above	44	11.5
Sex	Male	279	72.7
	Female	105	27.3
Level of education	No formal education	24	6.3
	Primary education	52	13.5
	Secondary education	308	80.5
Occupation	Employed	212	55.2
	Self-employed	74	19.3
	Unemployed	98	25.5
Insurance status	Not insured	55	14.3
	National insurance	240	62.5
	Private insurance	89	23.2

4.2 Proportion of male patients with sexual dysfunctions among patients with pelvic ring fractures

The total average mean score was found to be 36.52±4.15 according to the International Index of Erectile Dysfunction (IIED). The results showed that the proportion of patients with sexual dysfunction was found to be 214(76.7%) among male patients with pelvic ring fractures. Also, lack of sexual satisfaction was found to be common at 192(68.8%) among the study participants **(table 2)**

Table 2: Proportion of male patients with sexual dysfunctions among patients with pelvic ring fracture at MOI

Sexual function domain	Min	Max	mean SD	Sexual dysfunction N (%)	
				Yes n (%)	No n (%)
Erectile function	9	22	14.97±2.65	177(63.4%)	102(36.6%)
Orgasm function	2	10	4.67±1.59	148(53.0%)	131(47.0%)
Sexual desire	2	9	4.37±1.32	81(29.0%)	198(71.0%)
Intercourse satisfaction	3	13	7.67±1.81	192(68.8%)	87(31.2%)
Overall satisfaction	2	9	4.83±1.52	126(45.2%)	153(54.8%)
Total score	25	47	36.52±4.15	214(76.7%)	65(23.3%)

4.3 Proportion of female patients with sexual dysfunctions among patients with pelvic ring fractures

The total average mean scores according to the Female Sexual Dysfunction Index (FSDI) were found to be 16.41±1.80 **(table 3)**. The prevalence of sexual dysfunction was found to be 65(61.9%) among female's patient with pelvic ring fractures.

Moreover, 85(81.0%) of study participants reported having problems with becoming sexually aroused during sexual activity. Also, 81(77.1%) of study participants reported a low frequency of sexual satisfaction, and 67(63.8%) had low sexual desire during sexual activities.

Table 3: Proportion of females with sexual dysfunction among patients with pelvic ring fracture treated at MOI.

Sexual function domain	Min	Max	mean SD	Sexual dysfunction N (%)	
				Yes n (%)	No n (%)
Sexual desire	1.20	4.80	2.99±0.95	67(63.8%)	38(36.2%)
Sexual arousal	1.80	4.20	2.55±0.44	85(81.0%)	20(19.0%)
Lubrication	1.20	4.80	2.44±0.45	66(62.9%)	39(37.1%)
Orgasm	2.00	5.20	3.36±0.75	55(52.4%)	50(47.6%)
Satisfaction	0.80	4.00	1.90±0.60	81(77.1%)	24(22.9%)
Pain	1.20	4.00	3.14±0.58	61(58.1%)	44(41.9%)
Total score	12.5	21.1	16.41±1.80	65(61.9%)	40(38.1%)

4.4 Association between demographic characteristics and sexual dysfunction

Pain during sexual intercourse was statistically significant with the level of education (p-Value= 0.0001). Also, the status of health insurance was statistically associated with sexual desire (p=0.029), and arousal (p=0.031). Furthermore, orgasm (p=0.02) and pain (p=0.002) during sexual intercourse were significantly related to aging.

4.5 Relationship between demographic characteristics and sexual dysfunction among female patients with pelvic ring fractures

Variable	Categories	Pain		X^2	p-Value
		Yes n (%)	**No n (%)**		
Level of education	No formal education	1(20.0%)	4(80.0%)		
	Primary education	9(75.0%)	3(25.0%)	18.452	0.0001
	Secondary education	48(67.6%)	23(32.4%)		
		Desire			
		Yes n (%)	**No n (%)**		
Insurance status	Not insured	18(78.3%)	5(21.7%)		
	National insurance	28(51.9%)	26(48.1%)	7.085	0.029
	Private insurance	21(75.0%)	7(25.0%)		
		Arousal			
		Yes n (%)	**No n (%)**		
	Not insured	21(91.3%)	2(8.7%)		
	National insurance	45(83.3%)	9(16.7%)	4.628	0.031
	Private insurance	19(67.9%)	9(32.1%)		
		Orgasm			
		Yes n (%)	**No n (%)**		
	Not insured	16(69.6%)	7(30.4%)		
	National insurance	28(51.9%)	26(48.1%)	4.654	0.093
	Private insurance	11(39.3%)	17(60.7%)		
		Orgasm			
		Yes n (%)	**No n (%)**		
Age group	Below 40years	50(70.4%)	21(29.6%)		
	Above 40years	16(47.1%)	18(52.9%)	5.375	0.020
		pain			
		Yes n (%)	**No n (%)**		
	Below 40years	34(47.9%)	37(52.1%)		
	Above 40years	27(79.4%)	7(20.6%)	9.385	0.002

4.6 Relationship between demographic characteristics and sexual dysfunction among male patients with pelvic ring fractures

There was a statistical association between the level of education and intercourse satisfaction at a p-value of 0.0022. Also, occupation was statistical significance with overall satisfaction at a p-value of 0.041 among patients with pelvic ring fractures.

Table 4: Relationship between demographic characteristics and sexual dysfunction among male patients with pelvic ring fractures

Variable	Categories	Intercourse satisfaction		X^2	p-Value
		Yes n (%)	No n (%)		
Level of education	No formal education	17(89.5%)	2(10.5%)		
	Primary education	30(75.0%)	10(25.0%)	5.253	0.022
	Secondary education	145(65.9%)	75(31.1%)		
Occupation		**Overall satisfaction**			
		Yes n (%)	**No n (%)**		
	employed	71(48.6%)	75(51.4%)		
	self-employed	19(31.1%)	42(68.9%)	6.227	**0.041**
	unemployed	36(50.0%)	36(50.0%)		

4.7 Factors associated with overall female sexual function among patients with pelvic ring fracture.

Bivariate analysis shows that age, level of education, occupation, and insurance does not have a statistical relationship with sexual dysfunction among patients with pelvic ring fractures.

On the other hand, multivariate analysis, age group [AOR: 1.0, 95% CI: 0.816 – 1.238, *p=0.002*], level of education [AOR: 1.0, 95% CI: 0.268 – 3.864, *p=0.001*], occupation [AOR: 1.1, 95% CI: 0.258 – 4.479, *p=0.01*], insurance status [AOR: 1.1, 95% CI: 0.418 – 2.700, *p=0.016*] had a statistically significant association with the sexual dysfunction among female patient with ring fracture.

Table 5: Logistic regression on demographic characteristics with overall female sexual function score with pelvic ring fractures

Variable	Categories	COR 95%CI; p-value	AOR 95%CI; p-value
Age group	Above 40years	1.0(0.435-2.340),0.984	1.0(0.816-1.238);**0.002**
	Below 40years	Ref	
Level of education	No formal education	2.5(0.397-15.749);0.329	1.0(0.268-3.864);**0.001**
	Primary education	0.8(0.233-2.984);0.779	0.6(0.099-4.258);0.201
	Secondary/college education	Ref	Ref
Occupation	Unemployed	1.2(0.297-4.687);0.813	1.1(0.258-4.479);**0.01**
	Employed and self-employed	Ref	**ref**
Insurance status	Not insured	0.6(0.225-1.802);0.395	1.1(0.418-2.700);**0.016**
	Private and National insurance	Ref	Ref

4.8 Factors associated with overall male sexual function among patients with pelvic ring fracture.

Bivariate analysis shows that age group below 40 years [AOR: 1.0, 95% CI: 0.524–2.028, *p=0.008*], a secondary level of education [AOR: 1.0, 95% CI: 0.470–2.233, *p=0.004*], and having no national health insurance [AOR: 1.1, 95% CI: 0.473– 2.608, *p=0.059*] were the significant variables to the multivariate analysis in the assessment of sexual dysfunction among male patient with pelvic ring fractures (p-value <0.25).

Multivariate analysis shows that age group below 40 years of' age [AOR: 0.9, 95% CI: 0.456 – 1.903, *p=0.037*], a secondary level of education [AOR: 0.9, 95% CI: 0.439 – 2.145, *p=0.005*], private or national insurance status [AOR: 0.9, 95% CI: 0.389 – 2.265, *p=0.02*] had a statistically significant association with the sexual dysfunction among male patients with ring fracture (p<0.05).

Table 6: Logistic regression on demographic characteristics with overall male sexual function score with pelvic ring fractures.

Variable	Categories	COR 95%CI; p-value	AOR 95%CI; p-value
Age group	Below 40years	1.0(0.524-2.028),**0.008**	0.9(0.456-1.903);**0.037**
	Above 40years	Ref	
Level of education	Primary education	0.1(0.022-1.309);0.089	5.8(0.751-45.686);0.092
	Secondary/college education	1.0(0.470-2.233);**0.004**	0.9(0.439-2.145);**0.005**
	No formal education	Ref	Ref
Occupation	Employed and self-employed	1.2(0.728-2.227);0.39	0.7(0.419-1.338);0.32
	Unemployed	Ref	**ref**
Insurance status	Private and National insurance	1.1(0.473-2.608);0.059	0.9(0.389-2.265);**0.02**
	Not insured	Ref	Ref

CHAPTER FIVE

5.0 DISCUSSION

Sexual dysfunction can have a significant impact on pelvic fracture patients. Pelvic fractures are often associated with trauma to the pelvic region which includes bones, soft tissues, and nerves (12,29). This trauma can result in various complications that may affect sexual function which is highly prevalent in lower and middle-income countries (12). This study shows the prevalence of sexual dysfunction among females is lower than the study done in Saudi Arabia.

Alternatively, this study showed the prevalence of sexual dysfunction among males was higher compared to the systematic review and meta-analysis conducted in Switzerland which is a higher-income country (30). The disparity in findings between these studies may be due to variations in socio-demographic and economic characteristics (12). Therefore, variations in socio-economic factors like income levels, education, healthcare infrastructure, health insurance coverage and social attitudes towards sexual health among countries have an impact on the reported prevalence of sexual dysfunction from pelvic ring injuries.

Factors associated with overall female sexual function among patients with pelvic ring fracture.

Multivariate analysis showed that women aged above 40 years had a positive association between sexual dysfunction and pelvic ring fractures, a finding supported by a comprehensive review of similar literature conducted in Colombia (31). Similarity can be attributed to hormonal changes above age 40 resulting in menopause. Also, age-related changes weaken the pelvic floor muscles as well as sexual functions like arousal, orgasm, and maintaining vaginal tone (32).

Additionally, lack of education showed a significant positive relationship with sexual dysfunction among females with pelvic ring fractures. The finding of this study was inconsistent with a study conducted in China which showed that higher level of knowledge was found to be a significant predictor of diagnosing pelvic floor dysfunction in reproductive-age women (33). The finding of these studies differ because individuals with less education may be less informed about the physical, emotional, and psychological aspects of sexual function, as well as the available resources and treatment options.

Analysis showed that unemployed women had higher odds of experiencing sexual dysfunction compared to employed female patients with pelvic ring fractures. The finding of our study was consistent with a study conducted in Switzerland, which found that unemployed women were 4.7 more likely of experiencing sexual dysfunction following pelvic ring fracture compared to salaried and self-employed women (34). This demonstrated that unemployed women had financial stress which affected their mental health condition and decreased sexual desire or satisfaction. Studies have shown that, financial worries about meeting basic needs, managing debts, or lack of financial independence have a great contribution to sexual dysfunction among unemployed women (35–37).

Women who were not covered by health insurance had a positive association between sexual dysfunction and pelvic ring fractures compared to those covered by private or national health insurance. This finding is consistent with a scoping review of literature that reported that the availability of health insurance was significantly associated with delays in seeking medical care resulting in hampering sexual function among female participants in India (38). The possible reasons for similarity could be due to inadequate or absence of sexual health services in the health system specifically for individuals who do not possess health insurance coverage. Therefore, the absence of dedicated sexual health clinics, and specialists may contribute to delayed medical care and compromise sexual function (39).

Factors associated with overall male sexual function among patients with pelvic ring fracture.

However, it has been seen from several studies, that older men at the age above 40 years were at a greater risk of developing erectile dysfunction (40,41). But, the finding of our study revealed male patients with pelvic ring fractures at the age below 40 years who attended an orthopedic clinic at MOI, were less likely to experience erectile dysfunction. The findings of the present study have been supported by a review of the various literature, which indicated that patients with erectile dysfunction at the age of 32 to 39 years had positive penile rehabilitation following pelvic fractures (30). Therefore, one of the possible reasons for the similarities was due to the patient at a younger age exhibiting better treatment compliance and adherence to rehabilitation protocols.

The results also show that patients with higher levels of education were less likely to develop erectile dysfunction following pelvic fractures. The present study findings differ from studies conducted in Vietnam and China, which reported that there was no statistical difference between erectile dysfunction among men and education (40,42). Variations in the study findings can be due to differences in sample size, patient characteristics, and study designs.

Men who were covered by either private or national health insurance were less likely to experience erectile dysfunction following pelvic ring fractures. This contradicted the study, which was conducted by assessing the medical file collected from the Taiwanese health insurance research database. The study indicated a higher risk of developing erectile dysfunction was 32.6 among patients with pelvic angiographic embolization in pelvic fracture patients (43). One of the possible reasons for this difference could be due to the methodological difference, demographic characteristics as well as healthcare systems and insurance coverage.

5.1 Limitations of the Study

Despite the diligence given to the discussion of the concepts, data collection, and analysis this study had its own limitations. Firstly, a cross-sectional research design was employed. However, relationships among these variables are dynamic and can change over time, and it was very difficult to establish exact causal relationships as confounding causative variables coexisted. Therefore, future research should use longitudinal data to address such relationships. Secondly, it was important to acknowledge the limitation of the sample size. This limitation posed generalizability questions in the absence of further replications and validations. Thirdly, the tools used for the research were not validated in Tanzania which serves as a research weakness. There is also lack of general population data on sexual dysfunction against which comparisons can be made in the Tanzanian context. Findings from our pilot study showed that data on pelvic injury did not usually include sexual dysfunction, and participants were usually unwilling to discuss their sexual problems with clinicians.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

It has been found that the proportion of patients with sexual dysfunction was found to be 76.7% and 61.9% among male and female patients with pelvic ring fractures respectively. The proportion of patients with sexual dysfunction was greatly attributed to age, level of education, occupation, and health coverage insurance among patients with pelvic ring fractures.

6.2 Recommendation.

The findings of the study indicated there is a high proportion of patients with sexual dysfunction among patients with pelvic fractures. The study recommended the following

6.2.1 Recommendations for a patient with pelvic fractures

i. **Education and awareness:** Patients are highly encouraged to be proactive in educating themselves about sexual health and the potential impact of pelvic ring fractures on sexual function.

ii. **Engaging in rehabilitation programs**: These programs may involve physical therapy, counseling, and specialized interventions aimed at restoring sexual function and improving quality of life. Then, engaging in a structured rehabilitation program that can help address the specific challenges associated with sexual dysfunction.

iii. **Improvements in diagnostics:** Clinicians should have an increased awareness of sexual dysfunction in pelvic ring fracture patients and ensure timely diagnosis and treatment.

iv. **Follow-up protocols**: There is the need for long-term follow- up of patients with pelvic ring fractures treated at MOI with a protocol in place to screen or diagnose sexual dysfunction

6.2.3 Recommendation for further research

i. **A longitudinal study**: further longitudinal study should be conducted in other areas in Tanzania to better understand the temporal relationship between pelvic ring fractures and the development of sexual dysfunction.

ii. **In-depth qualitative studies**: Qualitative studies should be conducted to supplement the quantitative data and gain a deeper understanding of the life experiences of patients with pelvic ring fractures and sexual dysfunction.

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APPENDICES

Muhimbili University of Health and Allied Sciences

ORTHOPAEDICS AND TRAUMATOLOGY

Appendix i: QUESTIONNAIRE

Muhimbili Orthopedic Institute (MOI)

TITLE: THE PREVALENCE OF SEXUAL DYSFUNCTION AND ASSOCIATED FACTORS AMONG PATIENTS WITH PELVIC RING FRACTURES AT MUHIMBILI ORTHOPAEDIC INSTITUTION

HOSPITAL NUMBER:

CONTACT ……..……

PHONE ……..…….

Dear Sir/Madam,

I am a final year Post Graduate Student of Muhimbili University of Health and Allied Sciences pursuing Master of Medicine in Trauma and Orthopedics Surgery. As a requirement**,** I am carrying out a dissertation on the topic: THE PREVALENCE OF SEXUAL DYSFUNCTION AND ASSOCIATED FACTORS AMONG PATIENTS WITH PELVIC RING FRACTURES AT MUHIMBILI ORTHOPAEDIC INSTITUTION. I would be grateful if you could fill the questionnaire for the study. Decision to participate or not is entirely yours. Information provided would be treated as strictly confidential. Thank you for consenting to participate in this study.

Date of Administering Questionnaire_____, Time commenced_____,

Investigator_____

PART 1: Demographic information of Respondents

Kindly tick √ the applicable box to complete this section

1. Age
   a. Below 25 [] b. 25-29 [ ] c. 30-34 [ ] d. 35-39 [ ] e. 40-44 [ ] f. 45-49 [ ] g. 50 and above [ ] h. 50 years and above

2. Gender
   a. Male [ ] b. Female [ ]

3. Highest Educational Qualification
   1. No formal education
   2. Primary education
   3. Secondary education and more
   4. Occupation

a. Employed
b. Self-employed
c. Unemployed

5. Insurance Status
   a. National insurance
   b. Private insurance
   C. Not insured

PART 2: MALE SEXUAL DYSFUNCTION

THE PAST MONTH, MARK ONCE

ASSESSMENT OF ERECTILE FUNCTION

1	Frequency of erection during sex	1. nil 2. very rare 3. rare 4. many 5. Very many
2	How strong is your erections for penetration	1. Nil 2. very weak 3. weak 4. strong 5.very strong
3	How often do you penetrate during sex	1. None 2. rarely 3. less often 4. often 5.more often
4	How long does your erection persist	1. None 2.very few 3.few 4. more 5. much more
5	Any difficulty sustaining erection	1. Nil 2.very rare 3. rare 4. more 5. much more

OVERALL SEXUAL SATISFACTION

6	Number of attempts to have sex	1.None 2.zero-two 3.three-four 4.five-six 5.seven and more
7	Satisfaction after encounter?	1. None 2. very little 3. little 4. more 5. much more
8	How much did you enjoy sex?	1. None 2.. very little 3. little 4. more 5. much more
9	Ejaculation when stimulated sexually?	1. None 2.. very little 3. little 4. more 5.much more
10	Frequency of orgasm from stimulation	1. None 2. very rare 3. rare 4. More 5. much more
11	How frequent you desire sex	1. Nil 2.much less 3. less 4. More 5. much more

12	Rate your level of feeling for sex?	1. none 2. Very low 3. Low 4. High 5. Very high
13	Tell me about your sexual fulfillment	1. None 2.very little 3. little 4. more 5. much more
14	Rate your satisfaction level on sex	1. Nil 2.very little 3.little 4.more 5.much more
15	Rate your confidence level on erection	1. None 2.Very low 3. Low 4.High 5.Very high

PART 3: FEMALE SEXUAL DYSFUCTION

Mark once

1. Sexual desires in one month

1. None
2. Very low
3. Low
4. High
5. very high

2. Recent level of desire in one month.

1. Rare
2. Very low
3. Low
4. High
5. Very high

3 Recent level of arousal in one month

1. Sometimes
2. most times
3. Always

4. Level of arousal in one month

1. None
2 Very low
3. Low
4. High
5. Very high

5. Confidence of being aroused sexually

1. None
2. Very low
3. Low
4. High
5. very high

6. One-month arousal satisfaction level

1. None
2. Very little
3. Little
4. High

7. One-month regularity of lubrication during sex

1. None
2. Very less
4. more
3. Less
5. much more

8. Problems lubricating over the past month

1. None
2. Very few
3. Few
4. Many
5. very many

9. One-month duration of lubrication till finish

1. None
2. Very minimal
3.Minimal
4. Moderate
5. maximum

10. Current rate of climax during sex

1. None
2. Very low
3. Low
4. High
5. very high

11. Challenges with orgasm in one month

12. 1. None
13. 2. very less
14. 3. Less
15. 4. More
16. 5. Much more

12. Ease of reaching orgasm within one month

1. None
2. Very low
3. Low
4. High
5. very high

13 Level of partner affection during sex in one month.

1. None
2. Very low
3. Low
4. High
5. very high

14. One-month sexual satisfaction

1. None
2. Very low
3. Low
4. High
5. very high

15. One-month pain frequency on vaginal penetration

1. Rarely
2. less often
3. Sometimes
4. most times
5. Very often

16. One-month Pain Quality on vaginal penetration

1. None
2. Very weak
3. Weak
4. Strong
5 very strong

END of Session.

Thanks for participating.

Appendix ii: Consent Form- English

CONSENT FORM TO PARTICIPATE IN THE STUDY TITLED "PROPORTION OF PATIENTS WITH SEXUAL DYSFUNCTION AND ASSOCIATED FACTORS AMONG PATIENTS WITH PELVIC RING FRACTURES AT THE MUHIMBILI ORTHOPAEDIC INSTITUTE"

Introduction: My name is Edward Adi-mangka Adeb, a graduate student at the Muhimbili University of Health and Allied sciences (MUHAS), department of Orthopedics and Traumatology, undertaking research on: Proportion of patients with sexual dysfunction and associated factors among patients with pelvic ring fractures treated at the Muhimbili Orthopedics Institute. Am **s** being supervised by Prof. Billy Thomson Haonga.

Purpose of study: the study is assessing factors associated with sexual dysfunction in patients with pelvic ring fractures treated at the Muhimbili Orthopedics Institute

Confidentiality: confidentiality and anonymity are well assured to all participants. Information gathered shall be transcribed into a computerized system with identification numbers concealing the identity of participants.

Role: Your role in this study will be to provide answers to a questionnaire which you will be given upon consent.

Benefits: Participants shall be closely followed up during and after the research to monitor any adverse health outcomes by the investigating doctor. Research findings are intended to benefit society.

Risk: This study has no known risk. Provision has been made to handle any unknown adverse outcome.

Withdrawal rights: You can withdraw from this study at any time. This will not negatively affect you in accessing healthcare at our facility. Your right to good health will still be respected even if you don't participate in this research. Your treatment will be according to the protocols of MOI.

Contacts: You can contact the principal investigator, Dr Edward Adi-mangka Adeb on mobile phone number 0778651774 to address your concerns.
Further concerns on this work should be directed to the Ethics Officer of Muhimbili University of Health and Allied Sciences (MUHAS) for amicable solutions.

NOTE: Participants are required to read and fully understand all the information provided before participating. Data collected from participants shall be used for dissertation purposes.
Signature
Agrees to participate …….
Will not participate …….

Participant signature …… Date…….

Witness signature ……. …….. .. Date…….

Investigator signature……. Date……

Appendix iii: Consent Form- Swahili

CHUO KIKUU CHA AFYA NA SAYANSI VISHIRIKA MUHIMBILI

KURUGENZI YA UTAFITI NA MACHAPISHO (MUHAS)

Nambari ya kitambulisho: _____

Idhini ya kushiriki katika utafiti.

Jina langu ni Edward Adi-mangka Adeb, mwanafunzi wa shahada ya uzamili katika Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili (MUHAS), idara ya Mifupa na Traumatology, akifanya utafiti juu ya " ***kutathmini sababu za wahusika wanaohusishwa na shida za kushindwa kufanya kazi vizuri kwa viungo vya uzazi kwa wagonjwa waliovunjika pete ya fupanyonga katika Taasisi ya Mifupa Muhimbili"*** .

Kusudi la Utafiti: Utafiti unafanywa kama utimilifu wa sehemu ya mahitaji ya Idara ya Mifupa katika Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili. Utafiti huo pia unafanywa ili " ***Kutathmini mambo yanayohusiana na matatizo ya kushindw kufany kazi vizuri kwa viunog vya uzazi kwa wagonjwa waliovunjika pete ya fupanyonga wanaotibiwa katika Taasisi ya Mifupa ya Muhimbili* ".** Kwa hiyo utafiti utaweka data za msingi kwa ajili ya utafiti zaidi na katika kuandaa mikakati ya afua zinazofaa za kuzuia.

Jinsi ya kuhusika: Mgonjwa/jamaa wanaokubali kushiriki katika utafiti huu watahitajika kutia sahihi kwenye fomu ya idhini, ikifuatiwa na mahojiano kuhusu mambo yanayohusiana na matatizo ya ngono kwa wagonjwa waliovunjika pete ya fupanyonga.

Siri: - usiri wa mshiriki utatunzwa, taarifa zote zitakazokusanywa zitaingizwa kwenye mfumo wa kompyuta wenye nambari ya utambulisho pekee bila kufichua utambulisho wa washiriki.

Wajibu wa Mshiriki: - Ukikubali kushiriki katika utafiti huu, utaulizwa maswali yanayohusu utafiti .

Manufaa: - Taarifa utakazotoa zitatusaidia kutambua mambo yanayohusiana na matatizo ya ngono kwa wagonjwa walio na mivunjiko ya pete ya fupanyonga. Kwa hivyo, matokeo ya matokeo ya utafiti yanawezesha usimamizi wa wagonjwa hawa ili kuboresha ubora wa maisha.

Hatari: - Hakuna hatari kuhusiana na utafiti huu. Walakini, mshiriki atatunzwa ikiwa kuna hatari yoyote isiyotarajiwa.

Haki ya Kujitoa: - Kushiriki ni kwa hiari. Uko huru kukataa kibali na una haki ya kujiondoa kwenye utafiti wakati wowote unaotaka. Kukataa kushiriki au kuondolewa kwa kibali hakutaathiri matibabu yako kwa njia yoyote ile na hakutahusisha upotevu wa manufaa yoyote unayostahili wala hakutakuwa na adhabu yoyote . Utatibiwa na kufuatiliwa kulingana na itifaki ya kawaida ya matibabu ya **MOI** kwa wagonjwa wote wa pete ya pelvic.

Mawasiliano zaidi/ taarifa zaidi kuhusu utafiti huu: - Ikiwa kuna jambo lolote tafadhali wasiliana na mtafiti mkuu, **Dk Edward Adi-mangka Adeb** kutoka MUHAS, SLP 65001, Dar es Salaam, nambari ya simu 0778651774**.** Ikiwa una maswali kuhusu utafiti huu unaweza kupiga simu, **Prof: Bruno Sunuya** Mwenyekiti wa (Kamati ya Utafiti na Machapisho, MUHAS. SLP 65001, Dar es Salaam-Tanzania **255 0222151596.**

Kumbuka: - Unaombwa kusoma maelezo yote hapo juu, kama yalivyotolewa na mtafiti kabla ya kuamua kushiriki katika utafiti huu. Data iliyokusanywa kutokana na ushiriki wangu itatumika kwa madhumuni ya tasnifu.

Mimi …… nimesoma yaliyomo kwenye fomu hii na kuelewa. Maswali yangu yamejibiwa. Ninakubali kushiriki katika utafiti huu.

Saini ya mshiriki ……

Saini ya mtafiti/msaidizi wa utafiti …….