GAN XINYI THE PREVALENCE OF LOWER URINARY TRACT SYMPTOMS (LUTS) AND ITS ASSOCIATED RISK FACTORS AMONG MALE UNIVERSITY STUDENTS 2024

THE PREVALENCE OF LOWER URINARY TRACT SYMPTOMS (LUTS) AND ITS ASSOCIATED RISK FACTORS AMONG MALE UNIVERSITY STUDENTS

GAN XINYI

BACHELOR OF PHYSIOTHERAPY (HONOURS)

UNIVERSITI TUNKU ABDUL RAHMAN

DECEMBER 2024

(This page is intentionally left blank.)

THE PREVALENCE OF LOWER URINARY TRACT SYMPTOMS (LUTS) AND ITS ASSOCIATED RISK FACTORS AMONG MALE UNIVERSITY STUDENTS

By

GAN XINYI

A Research project submitted to the Department of Physiotherapy,
M. Kandiah Faculty of Medicine and Health Sciences,
Universiti Tunku Abdul Rahman,
in partial fulfillment of the requirements for the degree of
Bachelor of Physiotherapy (HONOURS)

DECEMBER 2024

THE PREVALENCE OF LOWER URINARY TRACT SYMPTOMS (LUTS) AND ITS ASSOCIATED RISK FACTORS AMONG MALE UNIVERSITY STUDENTS。

Siti Hazirah binti Samsuri
Gan Xinyi
Author affiliation

1. Lecturer, Department of Physiotherapy, M. Kandiah Faculty of Medicine and Health Sciences, UTAR, Malaysia.
2. Year 3 Bachelor of Physiotherapy (Honours) student, M. Kandiah Faculty of Medicine and Health Sciences, UTAR, Malaysia.

ABSTRACT

……...

Background: Lower Urinary Tract Symptoms (LUTS) arise from dysfunction in the bladder, urinary sphincter, urethra, or prostate and include voiding and storage symptoms. While more common in adult males, LUTS can affect anyone and is linked to risk factors like obesity, hypertension, and diabetes. Early diagnosis is vital for prevention and better outcomes. However, no studies have explored the prevalence and risk factors of LUTS among male university students in Malaysia.

Objective: This study aims to determine the prevalence of Lower Urinary Tract Symptoms (LUTS) and its associated risk factors among male university students.

Methods: A self-developed questionnaire that consists of 6 sections and the International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms Module **(**ICIQ-MLUTS) was distributed to participants. The study was conducted online through Google Forms. The study used Microsoft Excel for data collection and data coding, which was followed by using SPSS version 27.0 to analyze the data collected. The significance level was set at $p < 0.05$. The Chi-Square Test was used to determine the association between LUTS and its associated risk factors.

Results: The total participants were 264 male university students. There was a total of 228 (86.4%) of participants who were concluded to have LUTS. Chi-square values of some effects were calculated to be $p<0.05$, including alcohol use, duration and amount of cigarette or vape smoke, vigorous physical activity, daily walking, and time spent sitting on a weekday.

Conclusion: This current study concluded there was a high prevalence of LUTS among male university students. The study also showed that there were significant association between LUTS and some risk factors. These findings

suggest that LUTS is prevalent in younger populations, highlighting the need for targeted interventions.

Keywords: LUTS, Associated risk factors, Male, University students

ACKNOWLEDGMENT

With the completion of this research project, I would first like to express my deepest gratitude to all the participants who spared their precious time to participate in my study. Without their participation, this research project would not be possible.

Secondly, I would like to express my gratitude to my supervisor Ms. Siti Hazirah binti Samsuri. She provided me with assistance and guidance throughout the whole process of my research project. I would like to thank for the advice and suggestions that she has provided me since my proposal presentation.

Next, I would also like to thank Ms. Premala A/P Krishnan as well as Mr. Tarun Amalnerker who are my examiners who provided me with their suggestions and feedback for improvement of my research proposal and thesis.

Other than that, I would also like to thank Dr. Muhamad Noh Zulfikri Bin Mohd Jamali, Ms. Nadia Safirah Binti Rusli and Ms. Arti a/p Vijai Kumar who helped me through the validation process of my questionnaire. They also provided me with suggestions and feedback to improve my questionnaire.

Finally, I would like to thank my family and friends for their support throughout the process of conducting this research process.

APPROVALSHEET

This Research project entitled "**THE PREVALENCE OF LOWER URINARY TRACT SYMPTOMS (LUTS) AND ITS ASSOCIATED RISK FACTORS AMONG MALE UNIVERSITY STUDENTS**" was prepared by GAN XINYI and submitted as partial fulfillment of the requirements for the degree of Bachelor of Physiotherapy (HONOURS) at Universiti Tunku Abdul Rahman.

Approved by:

(Ms. Siti Hazirah binti Samsuri) Date: 20/12/2024
Supervisor
Department of Physiotherapy
M. Kandiah Faculty of Medicine and Health Sciences
UTAR

Approved by:

(Dr. Muhammad Noh Zulfikri bin Mohd Jamali) Date: 20/12/2024
Head of Department
Department of Physiotherapy
M. Kandiah Faculty of Medicine and Health Sciences
UTAR

FACULTY OF M KANDIAH
MEDICINE AND HEALTH SCIENCES
UNIVERSITI TUNKU ABDUL RAHMAN

Date: 20/12/2024

PERMISSION SHEET

It is hereby certified that **GAN XINYI** (ID No: **22UMB00256**) has completed this Research project entitled "THE PREVALENCE OF LOWER URINARY TRACT SYMPTOMS (LUTS) AND ITS ASSOCIATED RISK FACTORS AMONG MALE UNIVERSITY STUDENTS" under the supervision of [SITI HAZIRAH BINTI SAMSURI] (Supervisor) from the Department of Physiotherapy, M. Kandiah Faculty of Medicine and Health Sciences.

Yours truly,

(GAN XINYI)

DECLARATION

I hereby declare that the Research project is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.

Name: GAN XINYI
Date: 20/12/2024

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

LUTS	Lower Urinary Tract Symptoms
ICIQ-MLUTS	International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms Module
QoL	Quality of life
PFME	Pelvic floor muscle exercise
IUS	Internal urethral sphincter
EUS	External urethral sphincter
BPH	Benign Prostatic Hypertrophy
BMI	Body Mass Index
RAAS	Renin-angiotensin-aldosterone system
UTAR	University Tunku Abdul Rahman

Chapter 1

INTRODUCTION

1.1 Chapter overview

This chapter overview provides an overview of the research project's background and the context for the entire study. This is then followed by the importance and relevance of the study, research questions, research objectives, and the operational definitions of key terms of the study.

1.2 Background of study

Lower Urinary Tract Symptoms (LUTS) impact more than half of adults, resulting in a reduction in quality of life. LUTS consists of a broad range of symptoms caused by urethral disorders and diseases, which can be classified into voiding and storage symptoms (Bauer et al., 2020). Symptoms of voiding include a weak stream, reluctance, stream splitting, terminal dribbling, and incomplete bladder emptying sensation. Acute retention of urine may occur in a severe stage. The storage symptoms are frequent urination, incontinence, and nocturia. These different symptoms have different causes; they can be an obstruction (benign prostatic obstruction, foreign body), infectious (bladder infection, inflammation of prostate), neurogenic bladder dysfunction, primary bladder pathology (overactive bladder, detrusor underactivity), malignant, diuretic causes (diabetes,

nocturia polyuria), and extra-vesical causes (distal ureteric stone) (Abdelmoteleb et al., 2016). LUTS symptoms typically appear as age advances; however, they might appear sooner if risk factors such as obesity, diabetes, and a sedentary lifestyle are present (Inbaraj et al., 2021).

The two prevalent causes of LUTS in males are bladder outlet obstruction and benign prostatic hypertrophy. Although LUTS is not a fatal disease, it has a substantial influence on a person's physical and psychological well-being. It causes changes in mental health, including anxiety, depression, and stress symptoms (Chin et al., 2017). People with LUTS are often anxious about their incontinence and frequently need to visit the toilet. They may also surround themselves with negative thinking and question self-ability in daily life.

The prevalence of LUTS is increasing within the global population, and it is notably higher among Asian males aged above 60 (Huang et al., 2022). A prevalence of 62.8% in men aged above 40 was reported in a study in 2015 (Chappele et al., 2017). African data show that 60.5% of males older than 55 in rural Uganda have moderate to severe LUTS (Bajunirwe et al., 2018). In Sweden, 18.5% of men experience moderate LUTS, and 4.8% of men severe LUTS, with 83% having at least one symptom (Andersson et al., 2004). Furthermore, LUTS was widespread among Saudi men over 40, with a prevalence of 31.7% in moderate to severe symptoms (Farhat et al., 2015).

Singapore, the nearest country to Malaysia, has a 16.5% prevalence of LUTS, according to a 2012 study (Chong et al., 2012). Recently, a study on the age group between 19 and 39 in Korea showed a prevalence of 28.7% of people having mild to severe LUTS (Kim et al., 2019).

A previous study reported the prevalence of LUTS in Malaysia among males over 40 to be 16.3%, and there was an additional 13% prevalence in the elderly aged above 60 (Mohamad Anuar et al., 2022). With the increasing prevalence of LUTS throughout the years, studies on help-seeking behavior and consequences on QoL have been established in Malaysia. The help-seeking behavior of LUTS among men in Malaysia is very low; only 41.8% of people are willing to seek help (Isa & Aziz, 2020). This may be affected by the different ethnic, beliefs, education levels, and socioeconomic levels in the multiracial populations.

1.3 Problem statement

Lower Urinary Tract Symptoms (LUTS) are a universal condition that affects adults and the elderly who have suspicious features, particularly elderly with hypertension and diabetics (Kijima et al., 2024). Individuals experiencing LUTS endure not only challenging symptoms like nocturia and urgency but also negative psychological effects, including anxiety and depression, along with financial burdens (Zhang & Xu, 2018). Therefore, it is necessary to determine the risk factors for early diagnosis of LUTS among

younger male adults. Aging, hypertension, diabetes, obesity, excessive alcohol intake, cigarette smoking, and reduced physical activity have been found to be some of the significant risk factors prevalent in LUTS among males. However, there are contradicting pieces of evidence related to the associated risk factors for LUTS, especially excessive alcohol intake and reduced physical activity. There are also fewer studies done on LUTS among younger male adults. Therefore, this study will be conducted to determine the prevalence of LUTS and its associated risk factors among male university students.

1.4 Research questions

1. What is the prevalence of Lower Urinary Tract Symptoms (LUTS) among male university students?
2. What are the prevalence of the associated risk factors for Lower Urinary Tract Symptoms (LUTS) among male university students?
3. What are the associations between the prevalence and the associated risk factors for Lower Urinary Tract Symptoms (LUTS) among male university students?

1.5 Objectives

1. To identify the prevalence of Lower Urinary Tract Symptoms (LUTS) among male university students.
2. To determine the prevalence of the associated risk factors for Lower Urinary Tract Symptoms (LUTS) among male university students.
3. To determine the association between the prevalence and the associated risk factors of Lower Urinary Tract Symptoms (LUTS) among male university students.

1.6 Hypothesis

Null hypothesis

There is no significant association between the prevalence and the associated risk factors of Lower Urinary Tract Symptoms (LUTS) among male university students.

Alternate hypothesis

There is a significant association between the prevalence and the associated risk factors of Lower Urinary Tract Symptoms (LUTS) among male university students.

1.7 Operational definitions

1. **Risk factors for Lower Urinary Tract Symptoms (LUTS) questionnaire:** A questionnaire aimed at recognising risk factors of LUTS, such as elevated blood pressure, diabetes, obesity, excessive alcohol consumption, and cigarette smoking.
2. **ICIQ-MLUTS:** It is a tool derived from the ICSmaleSF questionnaire, which will be used in my study to evaluate male LUTS and its consequences on the standard of living. It consists of thirteen items, including hesitancy, intermittency, and others.

1.8 Rationale of study

Lower Urinary Tract Symptoms (LUTS) are a universal condition that affects adults and the elderly who have suspicious features, particularly elderly with hypertension and diabetics. Therefore, it is necessary to determine the risk factors for early diagnosis of LUTS among younger male adults. Aging, hypertension, diabetes, obesity, excessive alcohol intake, cigarette smoking, and reduced physical activity have been found to be some of the significant risk factors prevalent in LUTS among males. However, there are contradicting pieces of evidence related to the associated risk factors for LUTS, especially excessive alcohol intake and reduced physical activity. There are also fewer studies done on LUTS among younger male adults. Therefore, this study will be conducted to determine the prevalence of LUTS and its associated risk factors among male university students.

The findings of this study will enable a better understanding of the prevalence of LUTS among young male adults, whereby, based on the prevalence obtained, future health promotion and prevention measures can be conducted to promote a better quality of life among this population. Suppose the prevalence and risk factors of LUTS are studied. In that case, physiotherapy awareness programs at the university level can be implemented to enhance men's health through early detection, management, and preventative measures, as the condition has been shown to affect both mental and physical health, resulting in a lower quality of life. Physiotherapy management that can be implemented includes pelvic floor muscle exercise (PFME), reverse PFME, relaxation position, and education on hygiene and timed urine.

1.9 Scope of study

The research will focus on determining the prevalence of Lower Urinary Tract Symptoms (LUTS) and its associated risk factors among male university students. The study will include undergraduate male students from Universiti Tunku Abdul Rahman, Sungai Long, with different demographic characteristics such as age, ethnicity, course of study, and year of study.

Chapter 2

REVIEW OF LITERATURE

2.1 Chapter overview

This chapter highlights past literature, such as books, journals, and articles that have been written on relevant themes. The review of various literature related to this study's topic acts as a framework to construct this research project fully.

2.2 ANATOMY OF PELVIC FLOOR

The pelvis comprises the sacrum, ileum, ischium, and pubis bones. The pelvic brim splits the pelvis into true and false pelvis. The pelvic floor is a conoidal structure that separates the pelvic cavity from the perineum at the bottom. It consists of four compartments: anterior, middle, posterior, and peritoneal. The urethra and bladder are located in the front part; the vagina and uterus in women and the prostate in men are located in the medium compartment; the anus, anal canal, sigmoid, and rectum are located in the posterior compartment; and the peritoneal compartment contains the endopelvic fascia and perineal membrane. (Bordoni et al., 2023).

There are superficial and deep muscle layers attached to the pelvic floor wall; they mainly function to support the inner organ and govern the urethral and anal constrictor or continence mechanisms and sexual function. These muscles are separated into three main muscle layers: the pelvic diaphragm, urogenital diaphragm, and superficial perineal muscle layer.

The pelvic diaphragm, the deepest layer, has the levator ani muscle and coccygeus muscles, which act as the main pelvic floor muscles. The levator ani muscle combines iliococcygeus, pubococcygeus, and puborectalis. They surround the rectum by originating from the symphysis and obturator fascia and then pass inferiorly as a sling to insert at the anococcygeal ligament, coccyx, and perineal body (Farshid & Abier, 2013). The puborectalis creates a U-shaped loop that helps maintain an angle between the rectum and anal canal, which then maintains the anal canal and urethral continence. The pubococcygeus stabilises and supports the abdominal and pelvic organs, while the iliococcygeus acts to elevate the pelvic floor and anorectal canal. Besides, they also protect the pelvic organ against increased intra-abdominal pressure. The urethra passes through a muscle gap called the urogenital hiatus located anteriorly at the pelvic floor, while the rectal hiatus posterior to it allows anal canal passage. The coccygeus muscle is a minor muscle that originates from the sacrospinous ligament and ischial spine and is inserted into the coccyx. It is placed dorsally to the levator ani. This muscle flexes the coccyx and supports the pelvic organs.

The urogenital diaphragm, also named the triangular ligament, is a muscular sheet that spans the area between the pubic symphysis and ischial tuberosities. It is situated inferior to the pelvic diaphragm and is pierced by both urinary and genital orifices. The urogenital diaphragm consists of deep, transverse perineal muscle, sphincter urethrae, and compressor urethrae. It explicitly controls urinary continence during increased intra-abdominal pressure, such as coughing or sneezing.

The lower urinary system is made up of the urinary bladder and the urethra with the two constrictors, the external and the internal urethral sphincter, to control the opening and closing of the urethra for micturition (Sam & LaGrange, 2019). Both sphincters are crucial in maintaining urinary continence. The internal urethral sphincter (IUS), formed of smooth muscles, contracts involuntarily and is placed between the bladder and the prostate in men and between the base of the proximal urethra and bladder in women. The IUS muscle regulates urine flow by contracting around the internal urethral aperture. It also assists in the ejaculation of sperm and prevents the retrograde passage of sperm into the bladder during ejaculation in men. (Peter et al., 2023). The external urethral sphincter (EUS) formed by skeletal muscle contracts voluntarily, and it is crucial to maintain the closure of the urethra during rest to prevent any voluntary voiding. The EUS is positioned at the membranous urethra level in men and the far end of the bladder in women (Jung et al., 2012). Furthermore,

the EUS in males involves the continuation of the prostate sheath and the placement of bulbourethral glands.

In sum, the detrusor muscle of the bladder receives a signal from the parasympathetic nervous system when the bladder is complete to allow micturition in an involuntary process by relaxing the IUS. Furthermore, the micturition process can be eliminated by voluntarily contracting the EUS.

2.3 DYSFUNCTION OF PELVIC FLOOR

The dysfunction of the pelvic floor is the incapability to manage the contraction and relaxation of the pelvic floor muscle as a result of hypertonic, hypotonic, or improper coordination. (Grimes & Stratton, 2023). This condition can be divided into urologic (urinary incontinence), gynecologic (dyspareunia, pelvic organ prolapse), colorectal (constipation, fecal incontinence), and general symptoms (pelvic pain). These conditions are common and can have a major effect on psychological health, sexual function, and quality of life.

Reports indicate that 16% of men may encounter pelvic floor dysfunction at some stage in their lives, with urinary incontinence being a common symptom (Thiesse, 2023). Besides, research also reveals that over 30% of males consulting healthcare professionals experience urine incontinence, although a significant number refrain from addressing these concerns owing to shame or embarrassment. Moreover, studies reveal that as many as 70% of men may experience urine incontinence post-prostate surgery, underscoring the considerable effect of surgical procedures on pelvic floor health.

Although the etiology of pelvic dysfunction has not been identified, a study has shown that colorectal symptoms are suggested to be due to maladaptive learning and injury of the sphincter, hyposensitivity, perineal laxity, and delayed colonic transit (Whitehead & Bharucha, 2010). The general

symptoms like pelvic pain may be caused by surgery, myofascial pain, and local pelvic floor infection or inflammation (Yung-Shun et al., 2011). Besides, the major issue of chronic pelvic pain in men is the sexual dysfunction. It is mostly the urogenital pain that reduces sexual desire in men, the ability to achieve orgasm, and affects ejaculation ability.

Dysfunction in different parts of the pelvic floor will lead to different issues, thus, an accurate diagnosis is needed to treat the dysfunction (Quaghebeur et al., 2021). The pelvic floor physical therapy introduced external and internal examination (Wallace et al., 2019). External examination involves palpation of the tenderness area in the lower back, piriformis muscle, abdominal viscera, and bladder, as well as rectus abdominis diastasis, ventral hernia, and groin hernia evaluation; while internal examination includes the examination of muscle tone, elasticity, tenderness point, pain, voluntary contraction and relaxation, coordination, muscle length, strength, and endurance.

After diagnosing the cause of the dysfunction, a specific treatment that involves a multidisciplinary approach must be introduced. Pelvic floor physical therapy has demonstrated efficacy as a conservative treatment. The process entails strengthening the pelvic floor muscles by exercise, which can enhance bladder control and alleviate incontinence symptoms. Furthermore, behavioural therapies like bladder training and dietary adjustments may prove advantageous. In severe cases or when conservative treatment is ineffective,

surgical intervention may be deemed necessary to rectify the anatomical anomalies.

In general, the literature on pelvic floor dysfunction in men is not as substantial as that in women.

2.4 ASSOCIATION BETWEEN PELVIC FLOOR DYSFUNCTION AND LUTS

The association between pelvic floor dysfunction and LUTS is intricate and diverse. Lower urinary tract symptoms (LUTS), bowel symptoms, sexual problems, prolapse of the pelvic organ, and pain in the genito-pelvic can be caused by pelvic floor dysfunction (Knol-de Vries & Blanker, 2022). Pelvic floor dysfunction refers to the inability to control or relax the pelvic floor muscles, which may present as hypertonicity (excessive tension) or hypotonicity (insufficient tension), affecting bladder control and voiding efficiency. LUTS are further classified as storage symptoms, voiding symptoms, and post-voiding symptoms. (D'Ancona et al., 2019). Increased urine frequency, increased daytime urinary frequency, nocturia, polyuria, bladder filling symptoms, incontinence, and hyperactive bladder are storage symptoms; while the voiding symptoms are reluctance, straining to void, decelerated stream, terminal dribbling, micturition pain, and urinary retention. Lastly, the post-voiding symptoms are feelings of incomplete emptying, pain, urinary tract infection, sexual dysfunction, and anorectal dysfunction.

Some pelvic floor muscles are engaged in sexual function, such as facilitating and maintaining erections by increasing blood supply to the penis and preventing blood from exiting the penis through the deep dorsal vein (Rosenbaum, 2007). Moreover, pelvic floor exercises, electrical stimulation, and biofeedback treatment have proved to be effective in improving sexual function

in men and women (Rosenbaum, 2007). The effectiveness of these treatments on the pelvic floor shows there is an association between the pelvic floor and post-voiding symptoms of LUTS.

Besides, male stress urinary incontinence is mainly caused by the dysfunction of the urethral sphincter complex and it may be due to other bladder conditions like destructor under or over-activity (Eric et al., 2017). Next, according to Eric et al. (2017), the sensation of urgency during bladder filling in people with urge urine incontinence is caused by the involuntary constriction of the bladder.

Their associations are significantly influenced by neuroanatomical structures and their functions. The lower urinary tract receives efferent innervation via three pathways: the parasympathetic nervous system, the sympathetic nervous system, and the somatic nervous system. The pelvic nerve in the parasympathetic nervous system stimulates detrusor muscle contraction, facilitating micturition. The hypogastric nerve in the sympathetic nervous system promotes bladder relaxation during storage by suppressing detrusor contractions. The pudendal nerve within the somatic nervous system facilitates voluntary control of the external urethral sphincter, enabling conscious urine management. The afferent impulses from the bladder are conveyed through the pelvic, hypogastric, and pudendal nerves to the spinal cord, informing the central

nervous system of bladder fullness and prompting appropriate responses. The Pontine Micturition Center, located in the brainstem, synthesizes sensory information from the bladder and modulates detrusor muscle contraction while promoting urethral sphincter relaxation. Any disruption in any of these parts can result in pelvic floor dysfunction and contribute to various LUTS. A study that looked at the link between LUTS and pelvic floor dysfunction in men discovered a probable correlation. (Vrolijks et al., 2020).

2.5 PREVALENCE OF LUTS AMONG MALES AND FEMALES

Lower Urinary Tract Symptoms (LUTS) are a prevailing urological disorder worldwide, with occurrences found in all genders but with different prevalence in different symptoms (Maserejian et al., 2013). According to Irwin et al. (2006), the most prevalent symptom is nocturia, which is reported by 48.6% of males and 54.5% of females. This study also discovered that storage symptoms outnumber voiding and post-voiding symptoms, with the latter two being more common in men.

Furthermore, LUTS is more common in males, the elderly, and the Asian population. In the study on the Asian population aged over 40, 77.8% of males and 77.3% of females have mild symptoms of LUTS (Yee et al., 2019). Nevertheless, another study shows a higher prevalence (86.8%) of individuals with mild symptoms of LUTS in three Asia countries (Chapple et al., 2017). In comparison in non-Asian nations, the prevalence of LUTS ranges from 69.8% in Poland to 75% in Brazil (Przydacz et al., 2020) (Soler et al., 2017). The moderate symptoms of men LUTS vary from 18.5% in Sweden to 40.5% in Africa, while the severe symptoms vary from 4.8% in Sweden to 20% in Africa (Andersson et al., 2004) (Bajunirwe et al., 2018). The LUTS prevalence rises with age, those aged 70 and older are more prevalent to moderate and severe LUTS than those aged 50 to 59 (Rohrmann et al., 2016).

In the young adult population, there is a study that shows a 6.0% prevalence of overactive bladder among Chinese University students aged 18 to 22, with females having a greater prevalence than males (Liang et al., 2022). Previous studies also show that LUTS are common among young female students (N et al., 2011; Oyelade & Jemilohun, 2016). However, the study on LUTS prevalence in young males aged 18-40 years old is limited. The studies available in the US and Iran show that young men also have a high LUTS prevalence (Jamzadeh et al., 2013; Beland et al., 2022; Karami et al., 2011).

In Malaysia, the prevalence of LUTS among adult males aged over 40 surged to 16.3% according to a 2022 study (Mohamad Anuar et al., 2022). Benign Prostatic Hypertrophy (BPH) is commonly associated with LUTS, especially nocturia. One study held in the hospital found that 95% of BPH patients are suffering from nocturia (Hamzah et al., 2007). In the meantime, other studies conducted among different sub-groups in Malaysia also underline the high prevalence of LUTS. Akhtar et al. (2021) discovered a high prevalence of urinary tract infections, primarily cystitis, in geriatric patients. Besides that, the study of premature ejaculation in a primary medical care shows 21.4% of men are affected (Ahmad Zamree et al., 2018). Lastly, more than half of the population with LUTS are not seeking medical intervention until comorbidities occur (Isa & Aziz, 2020).

Hence, we can see that there is limited study of the prevalence of LUTS among young males aged 18 to 40. The public's understanding and awareness of LUTS remain ambiguous, so raising the knowledge and awareness of LUTS among young males can increase seeking behavior and early intervention. As a result, this helps lessen psychological concerns such as anxiety and depression among LUTS patients, who may feel embarrassed and consider themselves a burden when LUTS occurs in public.

2.6 RISK FACTORS OF LUTS

Several unmodifiable and modifiable risk factors that can influence the incidence of Lower Urinary Tract Symptoms (LUTS) have been discovered. Unmodifiable risk factors include ageing, while modifiable risk factors include obesity, smoking, diet, hypertension, diabetes, metabolic syndrome, and tea consumption. Some factors will be further elaborated:

2.6.1 Aging

Lower urinary tract symptoms (LUTS) are a prevalent state in the aged population. The pathophysiology of LUTS in the elderly population is complex, involving concomitant medical diseases, neurological and behavioral issues, functional impairment, and environmental factors (Nishii, 2021). In general, the functional change can be said it be due to the normal aging process which may lead to metabolic diseases such as hypertension and diabetes (Maharajh et al., 2015). A Malaysian study indicated that the prevalence was 16.3% in all men aged 40 and it ascended by 13% in the elderly aged 60 and up (Mohamad Anuar et al., 2022). On another hand, a recent study in Korea also shows that 28.7% of men aged 19 to 39 years have mild to severe LUTS although there is a higher prevalence in men aged 40 and above (Kim et al., 2019). Younger men aged 18-29 were also reported to have postponed urination and weak stream higher than older men (Lui & Dorji, 2020). In addition, lifestyle factors such as smoking and excessive alcohol consumption can affect the development of LUTS, therefore lifestyle modifications can have a palliative act.

2.6.2 Hypertension

Hypertension, as defined by the World Health Organization (2020), refers to an excessive elevation of pressure within blood vessels. It has become increasingly common among teenagers and young adults, often linked to factors such as family history and obesity (Anyaegbu & Dharnidharka, 2014). The relationship between hypertension and LUTS has been widely studied, with mixed findings. For instance, a study by Hwang et al. (2013) observed a higher prevalence of LUTS in men with hypertension compared to those without. However, Gondetovi et al. (2018) reported no significant differences in LUTS severity between individuals with and without hypertension.

Hypertension is known to cause increased sympathetic nervous system activity. This heightened sympathetic tone can adversely affect bladder function, particularly by impairing the coordination between bladder contraction and relaxation of the urethral sphincter, leading to voiding-related symptoms such as hesitancy, weak stream, and incomplete emptying. Additionally, increased sympathetic nervous system activity may exacerbate overactivity of the bladder detrusor muscle, contributing to urgency and frequency.

Hypertension is also closely linked to the renin-angiotensin-aldosterone system (RAAS), a hormone system that regulates blood pressure and fluid

balance. Dysregulation of the RAAS has been implicated in bladder dysfunction, as angiotensin II, a key component of this system, may contribute to increased bladder outlet resistance and detrusor overactivity. These effects can result in the development or exacerbation of LUTS.

2.6.3 Diabetes

Diabetes has been consistently identified as a significant risk factor for lower urinary tract symptoms (LUTS), affecting the physiological, microvascular, and neurological components of the continence mechanism. The metabolic disturbances associated with diabetes can cause nerve damage, weaken the detrusor muscle, and lead to urothelial dysfunction, contributing to a range of urinary symptoms such as urgency, frequency, nocturia, and incomplete bladder emptying (Derimachkovski et al., 2014). These changes in bladder function can significantly impair the quality of life for individuals with diabetes.

A study by Qasrawi et al. (2022) highlighted the prevalence of LUTS among diabetic patients in Palestine, emphasizing the widespread nature of this issue. The findings align with earlier research by Van Den Eeden et al. (2013), which revealed that men with type 2 diabetes had a 32% higher prevalence of LUTS than those without diabetes. Besides, a study carried out in primary care health clinics in Banglore shows that 85% of the population is suffering from LUTS, with 32% of them having diabetes (Inbaraj et al., 2021).

2.6.4 Obesity

Obesity, characterized by excessive body fat accumulation, is often linked to a sedentary lifestyle and unhealthy dietary habits. It is not only a risk factor for metabolic syndrome, including conditions such as hypertension and diabetes, but also directly contributes to the development of LUTS (Aslan et al., 2019). Recent research highlights the complex interplay between obesity, metabolic health, and bladder function, offering insights into the mechanisms driving this association.

Previous research has found a connection between obesity and a higher risk of LUTS. (Penson et al., 2011). Excess abdominal fat exerts higher intra-abdominal pressure, which can compromise bladder function. This pressure may lead to bladder overactivity, increased urinary urgency, and frequency. Besides, obesity is associated with chronic low-grade inflammation, which can disrupt bladder homeostasis. Adipose tissue produces inflammatory cytokines that may affect the bladder's neuromuscular function, leading to overactive bladder (OAB) symptoms or detrusor instability.

Furthermore, men with larger waist circumferences have been found to have a higher likelihood of developing LUTS compared to those with smaller waists (Rohrmann, 2004). Viewing from another perspective, once the obesity

condition is resolved, LUTS is decreased. This can be proven by the study of Delay et al. (2016) as the erectile function of men with obesity is regained after losing weight.

2.6.5 Excessive alcohol intake

The impact of alcohol use on LUTS varies depending on the amount and frequency of consumption. A systematic review by Bradley et al. (2017) reported that moderate alcohol consumption (1 to 3 drinks per day) was associated with a reduced risk of LUTS and benign prostatic hyperplasia (BPH). The proposed mechanism includes alcohol's ability to reduce inflammation and improve vascular health in moderate doses. However, these benefits are dose-dependent and diminish with higher levels of consumption. Noh et al. (2020) observed that while heavy drinkers reported a lower risk of severe LUTS, the difference was not statistically significant. This suggests that the association may vary based on individual factors, including genetic predispositions, underlying health conditions, and drinking patterns. Other studies have identified daily alcohol consumption as a risk factor for increased LUTS prevalence. Wong et al. (2010) found that habitual drinking elevated the risk of LUTS, particularly in those consuming large quantities daily. Parsons & Im (2009) reported similar findings, emphasizing that the frequency and consistency of drinking play a crucial role in LUTS development.

Alcohol can affect LUTS in various ways, it may act as a bladder irritant, particularly when consumed in large quantities. It can increase bladder sensitivity and detrusor muscle overactivity, leading to symptoms such as urgency, frequency, and nocturia. The diuretic effect also leads to increased urinary frequency and urgency by suppressing the release of antidiuretic hormone. Excessive alcohol intake is linked to systemic inflammation and vascular dysfunction, which can negatively affect bladder and prostate health. Chronic alcohol use may impair blood flow to the pelvic organs, contributing to LUTS. Additionally, alcohol-induced oxidative stress may exacerbate urological symptoms by damaging bladder tissues.

2.6.6 Smoking and Vaping

Smoking and vaping are modifiable lifestyle factors that have been increasingly linked to the prevalence and severity of LUTS. Smoking, in particular, has been shown to impact bladder function and contribute to LUTS through various mechanisms, including vascular dysfunction, chronic inflammation, and direct irritation of the urinary tract. Vaping, though relatively newer, is also emerging as a potential risk factor due to its nicotine content and the presence of harmful additives.

A study in Japan by Kawahara et al. (2020) found that both current and former smokers had a significantly higher prevalence of LUTS compared to non-smokers, with younger male smokers showing an increased risk of nocturia,

incontinence, and higher scores on the International Prostate Symptom Score (IPSS) than their elderly counterparts. This highlights that the effects of smoking on LUTS may manifest earlier in life and worsen with age or continued smoking. Besides, research by Choo et al. (2015) showed that heavy smokers exhibited greater bladder smooth muscle tone and detrusor instability, leading to more severe storage symptoms like urgency and frequency. Interestingly, smoking appears to have an inverse relationship with nocturia. Noh et al. (2020) reported that elevated nicotine levels in smokers may increase the release of arginine vasopressin (AVP), a hormone that reduces nocturnal urine output. While this may temporarily mitigate nocturia, the long-term detrimental effects of smoking on overall bladder function outweigh this potential benefit.

Cigarette smoking contributes to systemic vascular dysfunction, which impairs blood flow to the pelvic region and bladder. This can lead to tissue hypoxia and compromise bladder health, exacerbating voiding and storage symptoms. Next, the toxins in cigarette smoke, including nicotine and tar, promote chronic inflammation in the urinary tract, which can disrupt bladder function and increase detrusor muscle overactivity.

Although vaping is often marketed as a safer alternative to smoking, its impact on LUTS is increasingly concerning due to its nicotine content and the presence of harmful additives. Similar to traditional smoking, the nicotine in e-

cigarettes can disrupt bladder function by stimulating overactive detrusor muscles and impairing bladder-emptying mechanisms. E-cigarette liquids contain flavouring agents and other chemicals that may irritate the bladder lining and contribute to LUTS. While specific studies directly linking vaping to LUTS are limited, the known effects of nicotine and chemical exposure from vaping suggest a similar risk profile to smoking. As vaping becomes more prevalent, particularly among younger populations, its potential to contribute to LUTS may become increasingly apparent.

2.6.7 Physical activity

Physical activity is increasingly recognized as a modifiable factor that may influence the prevalence and severity of lower urinary tract symptoms (LUTS). A study conducted by Park et al. (2018) in Korea found that men who engaged in prolonged sitting and low levels of physical activity were at a significantly higher risk of developing LUTS. The prolonged sedentary behaviour may contribute to pelvic floor muscle weakness and reduced blood circulation in the pelvic region, exacerbating bladder dysfunction. Research by De Nunzio et al. (2019) demonstrated a strong correlation between low physical activity levels and an increased risk of LUTS in an older Italian population. Sedentary behaviour and inadequate muscle strength, common in less active individuals, were proposed as key contributors to these findings. The age-related decline in overall health and muscle tone further compounds this issue in older adults.

Not all studies align with the notion that physical inactivity directly worsens LUTS. Mondul et al. (2020) reported no significant association between sedentary behaviour and the progression of LUTS. This inconsistency may be attributed to differences in study design, sample size, or the populations studied, as well as the potential confounding effects of other lifestyle factors.

Chapter 3

METHODS

3.1 Chapter overview

This chapter includes the methodology used for this research project. It consists of the study design, study method, inclusion criteria, exclusion criteria, instruments, procedures, and ethical approval of the study.

3.2 Study design

The study design for this study is a cross-sectional study. A cross-sectional study is a type of observational research that analyses data from a population subset at a single point in time. (Cherry, 2022).

3.3 Study setting

The research will be conducted at Universiti Tunku Abdul Rahman in Sungai Long.

3.4 Study population

The study population includes male undergraduate students at Universiti Tunku Abdul Rahman, Sungai Long.

3.5 Sample size

The sample size is calculated using OpenEpi, Version 3 software with a formula n = [DEFF*Np(1-p)]/ [(d2/Z21-α/2*(N-1)+p*(1-p)].

DEFF = Design effect

N = Population size

p = Hypothesized % frequency of outcome in the population

d= Confidence limit as %

Z = Value found in Z table (1.96)

α = Significance level (0.05)

There are around 2520 male undergraduate students at Universiti Tunku Abdul Rahman, Sungai Long. Hence, the total sample size calculated for a 95% confidence level is 334 participants.

3.6 Sampling method

The samples will be selected using a convenient sampling method. Convenient sampling is a non-probability sampling approach that involves choosing respondents capable of being attained by the researcher. (Galloway, 2005).

3.7 Inclusion criteria

Participants will be included if they match the following requirements:

1. Male genders
2. Aged between 18-26
3. Undergraduate students study at UTAR Sungai Long

3.8 Exclusion criteria

Participants will be disqualified if they meet the following criteria:

1. Had been diagnosed with bladder cancer (Wessel et al., 2019)
2. Had been diagnosed with prostate cancer (Smith et al., 2014)
3. Had been diagnosed with enlarged prostate (Smith et al., 2014)
4. History of neurological disease (Moussa et al., 2020)
5. Had undergone surgery on the prostate or bladder (Smith et al., 2014)

3.9 Instrumentation

3.9.1 Self-developed Questionnaire

The self-developed questionnaire consists of questions to collect basic demographic data, including age, educational level, height, and weight. The questionnaire also includes medical history questions such as diagnosis of bladder or prostate cancer, enlarged prostate, neurologic disease, history of surgery on prostate or bladder, hypertension, and diabetes. Additionally, the questionnaire also asks about the participant's lifestyle, including drinking and smoking habits, as well as their physical activity. Three experts in this area validated the questionnaire with an average scale of 3. The questionnaire is valid and can provide unbiased data for the investigation, allowing 11 to 15%.

3.9.2 International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms Module (ICIQ-MLUTS)

The ICIQ-MLUTS is a tool designed to assess male lower urinary tract symptoms and their influence on quality of life (QoL). It is made up of 13 items that assess various aspects of LUTS, which include hesitancy, straining to continue urination, strength of stream, intermittency, incomplete emptying, urgency, urge urinary incontinence, stress urinary incontinence, unexplained urinary incontinence, nocturnal enuresis, post micturition dribble, nocturia, and frequency. It consists of 0 to 20 scores for voiding symptoms

subscale while 0 to 24 scores for incontinence symptoms subscale. The higher the individual's score, the more symptoms are present. A recent study has established scoring bands for the ICIQ-MLUTS range, 0-44; mild (0-16), moderate (17-25), and severe (26-44) (Uren et al., 2020).

The ICIQ-MLUTS has been rigorously verified, dependable, and responsive in multiple data sets (Abdelmoteleb, 2017). Cronbach's α coefficients were 0.76 for ICSmaleVS and 0.78 for ICSmaleIS (Donovan et al., 2000). It has also been proven to have a grade A level of validation by the International Consultation on Incontinence. It is now an internationally applicable questionnaire, translated into 26 languages.

3.10 Procedure

After getting ethical approval from the Scientific and Ethical Review Committee (SERC) of Universiti Tunku Abdul Rahman (UTAR), the validation form for the self-developed questionnaire was sent out to the validators. After that, some questions were amended, and descriptions were added to enhance the participants' understanding. Then, the questionnaire was officially sent out to the participants.

The link to the Google Forms of the questionnaire was sent out through social media, including WhatsApp and Instagram, as well as Microsoft Teams, to male undergraduate students of UTAR Sungai Long. Face-to-face recruitment on the university campus was also carried out using the questionnaire's Quick Response (QR) code. Before answering the questions, the participants must fill up the informed consent form and the Personal Data Protection Note.

The first section of the questionnaire was the demographic data questionnaire. This is to assess the participants' sociodemographic characteristics and rule out the inclusion and exclusion criteria of the study. Any participants who did not fulfill the inclusion criteria were excluded.

Next, the second section of the questionnaire was the screening questionnaire to check if any participants had bladder or prostate cancer, Benign Prostatic Hyperplasia, a history of neurological disease, or surgery on the prostate or bladder. This section also rules out the study's exclusion criteria.

After that, the next section of the questionnaire was the self-developed questionnaire on the risk factors of LUTS, which also included the alcohol use questionnaire, smoking history, and physical activity questionnaire. This section assesses the risk factors associated with those who have LUTS.

Finally, the last part of the questionnaire will be the International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms Module (ICIQ-MLUTS). This section consists of 13 questions to evaluate the male Lower Urinary Tract Symptoms and their impact on quality of life.

Once the responses were concluded, data collection and coding were done using Microsoft Excel. The Statistical Package for Social Sciences (SPSS) version 27.0 was used to analyze the data. Descriptive data was used to provide data with frequencies, percentages, means, and standard deviations. The Chi-Square Test determined any association or relationship between the data. And finally, the report were written.

3.11 Statistical analysis

Microsoft Excel was used for the data collection and data coding process. The Statistical Package for the Social Sciences (SPSS) software version 27.0 was used to perform the statistical analysis. Descriptive analysis was done to analyze the demographic characteristics, including the Risk Factors Questionnaire, Alcohol use Questionnaire, Smoking history, Physical Activity Questionnaire, and ICIQ-MLUTS. Any categorical data were reported with frequencies and percentages, whereas any continuous data were reported with means and standard deviations. The Chi-Square Test was used to determine the relationship between the prevalence of LUTS and the associated risk factors since the normality test concluded there are non-normal distributed data. The significant level was set at $p < 0.05$.

3.12 Ethical Approval

This study is subjected to ethical approval by the Scientific and Ethical Review Committee (SERC) of Universiti Tunku Abdul Rahman (UTAR). Informed consent and Personal Data Protection Notes were obtained from all participants upon giving the questionnaire. The purpose of the study, length of participation, procedure, benefits, and data confidentiality were well-informed to the participants upon receiving the consent form inside the questionnaire.

Chapter 4

Results

4.1 Chapter overview

This chapter presents the results of the research project's data collection. The sequence will start with the demographic data, the Alcohol Use Questionnaire, the smoking history, the physical activity questionnaire, and ICIQ-MLUTS. Any tabulation of the results will be shown with a brief description and any relevant graphs according to the data collected.

4.2 Normality test

The normality test assessed whether the data follows a normal distribution. The null hypothesis for this test assumes that the data is normally distributed. From the test results, the p-value is less than 0.05 ($p < 0.05$), below the commonly used significance level of 0.05. This means we reject the null hypothesis and conclude that sufficient evidence suggests that the data does not follow a normal distribution. Consequently, an alternative statistical method that does not assume a normal distribution, the Chi-squared test, is used to determine the association between the prevalence and the associated risk factors of LUTS among male university students.

4.3 Demographic data of respondents

Table 4.1 Sociodemographic data:

Item	N (%)	Mean (μ) ± Standard deviation (SD)
Age		20.97 ± 1.78
Body Mass Index (BMI)		
< 18.5	38 (14.4)	22.49 ± 3.45
18.5 - 24.9	154 (58.3)	
25 - 29.9	71 (26.9)	
> 30	1 (0.4)	
Hypertension		
No	255 (96.6)	
Yes	9 (3.4)	
Diabetes		
No	260 (98.5)	
Yes	4 (1.5)	

Note: N = Total number of respondents

A total of 333 responses were successfully obtained. However, 68 participants met the exclusion criteria. 15 of them disagreed to participate in the study, 9 females were received, 34 were from foundation and postgraduate, 3 of them had a history of bladder cancer, 3 had prostate cancer, 2 had an enlarged prostate, 9 had a history of neurological disease, and 3 had undergone surgery on the prostate or bladder. The study excluded these participants, leaving 264 responses for the final analysis.

Table 4.1 displays the demographic information of 264 participants concerning age, BMI, diabetes, and hypertension. The means and standard deviations of the respondents' age and BMI are displayed. The frequency and proportion of diabetes, hypertension, and BMI are also displayed.

4.3.1 Age

The age of respondents spans from 18 to 26 years old. The majority of respondents were 20 years old, comprising 28.4% (N=75), while those aged 23 years accounted for 16.3% (N=43). The smallest proportion of respondents came from the age groups of 25 and 26, accounting for 2.3% (N=6). The age groups of 18 and 19 include 53 respondents, accounting for 20.1%. The age groups of 21, 22, and 23 years old consist of 40, 31, and 16 respondents, corresponding to 15.2%, 11.7%, and 6.1% respectively.

4.3.2 Body Mass Index (BMI)

The Body Mass Index (BMI) of the participants was determined based on the weight and height data provided by them, utilizing the formula [weight (kg)/ height $(m)^2$]. The World Health Organisation (WHO) classifies BMI into five distinct categories: a BMI of less than 17 signifies thinness, a BMI below 18.5 indicates underweight, a BMI ranging from 18.5 to 24.9 represents normal weight, a BMI of 25 or higher denotes overweight, and a BMI of 30 or above is classified as obesity. Over half of the respondents were classified within the normal BMI range (58.3%, N=154). The analysis revealed that 71 respondents

fall into the overweight category, representing 26.9%, while 38 respondents are classified as underweight, accounting for 14.4%. Only one respondent is classified as obese, representing 0.4% of the findings.

4.3.3 Hypertension

There are 96.6% (N=255) of the respondents are not diagnosed with hypertension, whereas the remaining 3.4% (N=9) have been diagnosed with hypertension.

4.3.4 Diabetes

From the results, 98.5% (N=260) of the respondents are not diagnosed with diabetes, whereas the remaining 1.5% (N=4) have been diagnosed with diabetes.

4.4 Alcohol Use Questionnaire

Table 4.2 Alcohol Use Questionnaire:

Item	N (%)
Do you drink alcohol?	
Yes	105 (39.8%)
No	159 (60.2%)
How often do you drink alcohol?	
Never	0
Monthly	82 (31.1%)
2 to 4 times/ month	21 (8.0%)
2 to 3 times/ week	1 (0.4%)
4 or more times/ week	1 (0.4%)
How many drinks containing alcohol do you have in a typical day when you are drinking?	
1 or 2	62 (23.5%)
3 or 4	23 (8.7%)
5 or 6	10 (3.8%)
7, 8, or 9	4 (1.5%)
10 or more	6 (2.3%)
How often do you have six or more drinks on one occasion?	
Never	40 (15.2%)
Less than monthly	54 (20.5%)
Monthly	8 (3.0%)
Weekly	3 (1.1%)
Daily or almost daily	0 (0%)

N = Total number of respondents

Table 4.2 shows the information about the alcohol use of the respondents, including the frequency and proportion of drinking frequency and the number of glasses of alcohol.

4.4.1 Alcohol use

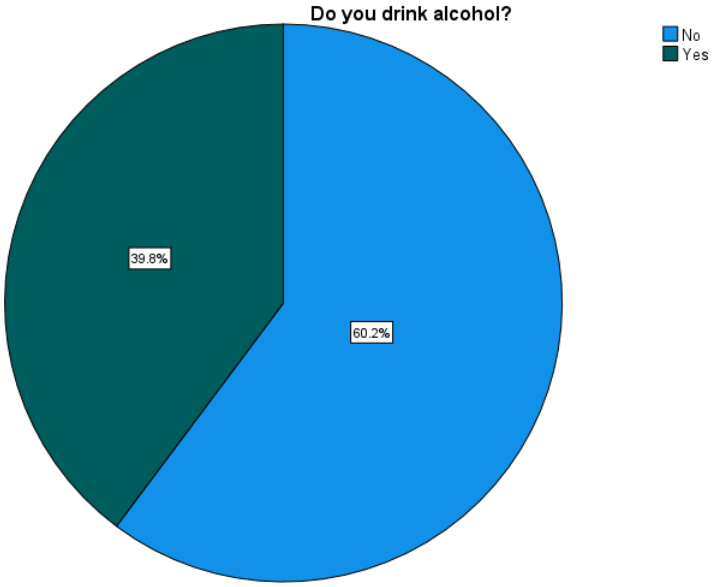


Figure 4.1 Pie chart distribution of alcohol use

The pie chart reveals that 60.2% (N=159) of the participants abstain from alcohol consumption, while the remaining 39.8% (N=105) engage in drinking alcohol.

4.4.2 Frequency of alcohol use

A significant majority of the respondents (31.1%; N= 82) consume alcohol monthly. 8.0% (N= 21) drink alcohol 2 to 4 times per month, suggesting a moderate drinking pattern. Only a very small proportion of respondents (0.4%; N= 1) drink alcohol more frequently, reporting drinking 2 to 3 times a week, and another reporting drinking 4 or more times a week.

4.4.3 Number of alcoholic drinks in a typical day of drinking

A majority consume 1 or 2 drinks (23.5%; N= 62), followed by those who have 3 or 4 drinks (8.7%; N= 23). The minimum percentage recorded is 7, 8, or 9 drinks, represented by 4 respondents (1.5%). In the meantime, 3.8% (N= 10) of the participants reported consuming 5 or 6 drinks, while 2.3% (N= 6) indicated having 10 or more drinks.

4..4 Frequency of having six or more drinks on one occasion

A significant portion of respondents, precisely 20.5% (N=54), reported consuming six or fewer drinks less than monthly. The second highest is never having six or more drinks on one occasion (15.2%, N= 40). A mere 3.0% of participants (N=8) reported consuming six or more drinks on a single occasion each month. Having six or more drinks on one occasion weekly is the least reported behavior with (1.1%, N=3).

4.5 Smoking History Questionnaire

Table 4.3 Smoking History Questionnaire:

Items	N (%)
Do you smoke?	
Yes	25 (9.5%)
No	239 (90.5%)
How long have you been smoking?	
1 to 3 years	12 (4.6%)
4 to 6 years	10 (3.8%)
7 to 9 years	3 (1.2%)
How frequently do you smoke? (Days/ week)	
1 to 2	3 (1.1%)
3 to 4	1 (0.4%)
5 to 6	0 (0%)
7	21 (8%)
How many sticks do you smoke per day?	
1 to 5	12 (4.6%)
6 to 10	2 (0.8%)
More than 10	1 (0.4%)
How many puffs do you smoke per day?	
< 50	10 (3.9%)
51 to 100	8 (3.1%)
> 100	3 (1.2%)

N= Total number of respondents

Table 4.3 shows the information about the smoking history of the respondents, including the frequency and proportion of years of smoking, frequency, and the number of sticks or puffs smoked.

4.5.1 Smoking history

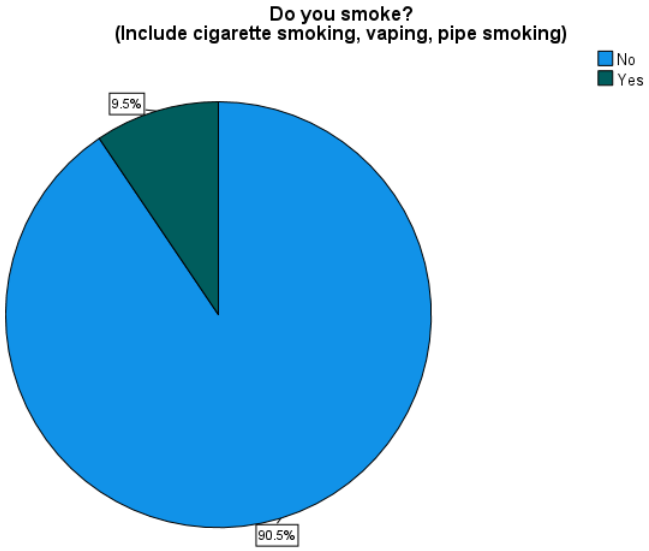


Figure 4.2 Pie chart distribution of the smoking history

The pie chart indicates that 90.5% (N=239) of the participants do not smoke, whereas 9.5% (N=25) are smokers.

4.5.2 Years of Smoking

From the results, it indicates that 4.6% of smokers (N= 12) have a smoking history of 1 to 3 years. Among the respondents, 3.8% of smokers (N= 10) reported smoking for a duration of 4 to 6 years, while 3% of smokers (N= 3) indicated they had smoked for 7 to 9 years.

4.5.3 Frequency of smoking

The majority of smokers engage in smoking every day of the week, accounting for 8% of the respondents (N= 21). Additionally, 1.1% of smokers (N= 3) engage in smoking 1 to 2 days per week, while 0.4% of smokers (N= 1) smoke 3 to 4 days per week.

4.5.4 Number of Cigarettes Smoked Per Day

Most smokers smoke 1 to 5 sticks per day, accounting for 4.6% of the respondents (N= 12). Additionally, 0.8% of smokers (N= 2) smoke 6 to 10 sticks per day, while 0.4% of smokers (N= 1) smoke more than 10 sticks per day.

4.5.5 Number of Puffs Smoked Per Day

Most smokers smoke less than 50 puffs per day, accounting for 3.9% of the respondents (N= 10). Additionally, 3.1% of smokers (N= 8) smoke 51 to 100 puffs per day, while 2.0% of smokers (N= 3) smoke more than 100 puffs per day.

4.6 Physical Activity Questionnaire

Table 4.4 Physical Activity Questionnaire:

Items	N (%)
Day of vigorous physical activity	
0	74 (28.0%)
1 to 3	92 (59.8%)
4 to 6	27 (10.3%)
7	5 (1.9%)
Day of moderate physical activity	
0	46 (17.4%)
1 to 3	146 (55.4%)
4 to 6	59 (22.3%)
7	13 (4.9%)
Days of walking for at least 10 minutes at a time	
0	9 (3.4%)
1 to 2	33 (12.5%)

3 to 4	28 (10.6%)
5 to 6	69 (26.2%)
7	125 (47.3%)
Level of Physical Activity	
High	73 (27.7%)
Moderate	126 (47.7%)
Low	65 (24.6%)
Time spent sitting on a weekday	
1 to 4	51 (20.5%)
5 to 8	155 (58.7%)
More than 8	55 (20.8%)

N= Total number of respondents

Table 4.4 shows information about the respondents' physical activity, including the frequency and proportion of vigorous and moderate physical activity, days of walking for at least 10 minutes at a time, and time spent sitting on a weekday.

4.6.1 Day of Vigorous Physical Activity

The number of days respondents engaged in vigorous physical activity over the past week is recorded. A majority of respondents, specifically 59.8% (N= 92), reported engaging in 1 to 3 days of vigorous physical activity. The least was 7 days of vigorous physical activity, accounting for 5% of the respondents (N= 5). In the past week, 28% of the respondents (N= 74) reported no engagement in vigorous physical activity. In the meantime, 10.3% of participants (N= 27) reported engaging in 4 to 6 days of vigorous physical activity over the past week.

4.6.2 Days of Moderate Physical Activity

The results show the count of days on which respondents participated in moderate physical activity during the last week. A significant portion of participants, precisely 55.4% (N= 146), indicated participating in 1 to 3 days of moderate physical activity. The least day was 7 days of moderate physical activity, accounting for 4.9% of the respondents (N= 13). During the previous week, 17.4% of the participants (N= 46) indicated they did not engage in moderate physical activity. During this period, 22.3% of participants (N= 59) indicated that they had engaged in moderate physical activity for 4 to 6 days in the preceding week.

4.6.3 Days of Walking for At Least 10 Minutes At A Time

In the last 7 days, 47.3% of the respondents (N= 125) did walking for a minimum of 10 minutes at a time each day. A notable 26.2% of participants (N= 69) have been walking for at least 10 minutes at a time, 5 to 6 days a week. A total of 10.6% (N= 28) of respondents engaged in walking for 3 to 4 days, while 12.5% (N= 33) walked for 1 to 2 days. Additionally, 3.4% (N= 9) of respondents did not walk for at least 10 minutes at a time over the past week.

4.6.4 Level of Physical Activity

A significant portion of the respondents, specifically 47.7% (N= 126), exhibit moderate levels of physical activity. Although the other shows a nearly identical percentile, 27.7% of respondents (N= 73) exhibit high levels of physical activity, while 24.6% (N= 65) demonstrate low levels of physical activity.

4.6.5 Time Spent Sitting On a Weekday

A large majority of the respondents, specifically 58.79% (N=155), reported spending between 5 to 8 hours seated on an average weekday. Additionally, 20.5% (N= 51) of participants reported spending 1 to 4 hours seated on a weekday, while 2% (N= 55) indicated they spent over 8 hours seated during the same period.

4.7 International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms Module (ICIQ-MLUTS)

Table 4.5 International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms Module (ICIQ-MLUTS):

Items	N (%)	Mean (μ)	Standard deviation (SD)
Hesitancy			
Never	145 (54.9%)		
Occasionally	75 (28.4%)		
Sometimes	25 (9.5%)		
Most of the time	12 (4.5%)		
All of the time	7 (2.7%)		
Straining to void			
Never	197 (74.6%)		
Occasionally	33 (12.5%)		
Sometimes	18 (6.8%)		
Most of the time	9 (3.4%)		
All of the time	7 (2.7%)		
Would you say that the strength of your urinary stream is…			
Normal	208 (78.8%)		
Occasionally reduced	38 (14.4%)		
Sometimes reduced	11 (4.2%)		
Reduced most of the time	4 (1.5%)		
Reduced all of the time	3 (1.1%)		

Do you stop and start more than once while you urinate?	
Never	179 (67.8%)
Occasionally	57 (21.6%)
Sometimes	14 (5.3%)
Most of the time	12 (4.5%)
All of the time	2 (0.8%)
How often do you feel that your bladder has not emptied properly after you have urinated?	
Never	146 (55.3%)
Occasionally	87 (33.0%)
Sometimes	22 (8.3%)
Most of the time	5 (1.9%)
All of the time	4 (1.5%)
Do you have a sudden need to rush to toilet to urinate?	
Never	148 (56.1%)
Occasionally	72 (27.3%)
Sometimes	35 (13.3%)
Most of the time	7 (2.7%)
All of the time	2 (0.8%)

Does urine leak before you can get to the toilet?	
Never	227 (86.0%)
Occasionally	23 (8.7)
Sometimes	8 (3.0%)
Most of the time	3 (1.1%)
All of the time	3 (1.1%)
Does urine leak when you cough or sneeze?	
Never	221 (83.7%)
Occasionally	33 (12.5%)
Sometimes	6 (2.3%)
Most of the time	0
All of the time	4 (1.5%)
Do you ever leak for no reason and without feeling that you want to go?	
Never	240 (90.9%)
Occasionally	14 (5.3%)
Sometimes	6 (2.3%)
Most of the time	2 (0.8%)
All of the time	2 (0.8%)

Do you leak urine when you are asleep?	
Never	222 (84.1%)
Occasionally	31 (11.7%)
Sometimes	5 (1.9%)
Most of the time	2 (0.8%)
All of the time	4 (1.5%)
How often have you had a slight wetting of your pants a few minutes after you had finished urinating and had dressed yourself?	
Never	204 (77.3%)
Occasionally	48 (18.2%)
Sometimes	4 (1.5%)
Most of the time	4 (1.5%)
All of the time	4 (1.5%)
How often do you pass urine during the day?	
1 to 6 times	157 (59.5%)
7 to 8 times	75 (28.4%)
9 to 10 times	23 (8.7%)
11 to 12 times	7 (2.7%)
13 or more times	2 (0.8%)

During the night, how many times do you have to get up to urinate, on average?			
None	149 (56.4%)		
One	94 (35.6%)		
Two	19 (7.2%)		
Three	2 (0.8%)		
Four or more			
ICIQ-MLUTS Score			
No	36 (13.6%)	5.51	6.566
Mild	217 (82.2%)		
Moderate	6 (2.3%)		
Severe	5 (1.9%)		

N= Total number of respondents

Table 4.5 shows the information obtained from ICIQ-MLUTS, a total of 13 questions. The questions are about some lower urinary tract symptoms that respondents may face daily. Every question has a score: 1 – Never, 2 – Occasionally, 3 – Sometimes, 4 – Most of the time, and 5 – all of the time. This makes the lowest total possible score to be 13 and the highest total possible score to be 65. The scores are as follows: 0-16 points mean mild symptoms, 17-25 points mean moderate symptoms, and 26-44 points mean severe symptoms.

4.7.1 Hesitancy

The question asked for hesitancy is, “Is there a delay before you can start to urinate?”. Most respondents (54.9%; N= 145) never experienced hesitancy, followed by 28.4% (N= 75) who occasionally experienced hesitancy. Only 2.7% of respondents (N=7) experience hesitancy all of the time. The other 9.5% of respondents (N= 25) sometimes experience hesitancy, and 4.5% of respondents (N= 12) experience hesitancy most of the time.

4.7.2 Straining to void

The question asked for straining to void is, “Do you have to strain to continue urinating?”. Most respondents (74.6%; N= 197) never experienced straining to void, followed by 12.5% (N= 33) who occasionally experienced straining to void. Only 2.7% of respondents (N=7) experience straining to void all of the time. The other 6.8% of respondents (N= 18) sometimes experience straining to void, and 3.4% of respondents (N= 9) experience straining to void most of the time.

4.7.3 Strength Of Urinary Stream

The question asked for the strength of the urinary stream is, “Would you say that the strength of your urination stream is…”. Most respondents (78.8%; N= 208) have normal strength of the urinary stream. There are 14.4% of respondents (N= 38) who have occasionally reduced strength of the urinary stream. Only 1.1% of respondents (N=3) experience reduced strength of the urinary stream all of the time. The other 4.2% of respondents (N= 11) sometimes experience reduced strength, and 1.5% (N= 4) experience reduced strength most of the time.

4.7.4 Intermittency

The question asked for the experience of intermittency is, “Do you stop and start more than once while you urinate?”. The majority of respondents (67.8%; N= 179) never experience intermittency, followed by 21.6% of respondents (N= 57) who have occasionally experienced intermittency. Only 0.8% of respondents (N=2) experience intermittency all of the time. The other 5.3% of respondents (N= 14) sometimes experience intermittency, and 4.5% of respondents (N= 12) experience intermittency most of the time.

4.7.5 Incomplete Bladder Emptying

The question asked for the experience of incomplete bladder emptying is, “How often do you feel that your bladder has not emptied properly after you have urinated?”. The majority of respondents (55.3%; N= 146) never experience incomplete bladder emptying, followed by 33.0% of respondents (N= 87) who have occasionally experienced incomplete bladder emptying. Only 1.5% of respondents (N=4) experience incomplete bladder emptying all of the time. The other 8.3% of respondents (N= 22) sometimes experience incomplete bladder emptying, and 1.9% of respondents (N= 5) experience incomplete bladder emptying most of the time.

4.7.6 Urgency

The question asked for the experience of urgency is, “Do you have a sudden need to rush to toilet to urinate?”. Most respondents (56.1%; N= 148) never experience urgency, followed by 27.3% (N= 72) who have occasionally experienced urgency. Only 0.8% of respondents (N=2) experience urgency all of the time. The other 13.3% of respondents (N= 35) sometimes experience urgency, and 2.7% (N= 7) experience urgency most of the time.

4.7.7 Urinary Incontinence

The question asked for the experience of urinary incontinence is, “Does urine leak before you can get to the toilet?”. Most respondents (86.0%; N= 227) never experience urine leaks before getting to the toilet, followed by 8.7% (N= 23) who have occasionally experienced urinary incontinence. Two groups of 1.1% of respondents (N= 3) have experienced urinary incontinence most of the time and all of the time, respectively. The other 3.0% of respondents (N= 8) sometimes experience urinary incontinence.

4.7.8 Stress Urinary Incontinence

The question asked for the experience of stress urinary incontinence is, “Does urine leak when you cough or sneeze?”. Most respondents (83.7%; N= 221) never experience stress urinary incontinence, followed by 12.5% (N= 33) who have occasionally experienced stress urinary incontinence. The other 2.3% of respondents (N= 6) sometimes experience stress urinary incontinence. The lowest percentile of respondents is 1.5% (N= 4), who experienced stress urinary incontinence most of the time.

4.7.9 Insensible Urinary Incontinence

The question asked for the experience of insensible urinary incontinence is, “Do you ever leak for no reason and without feeling that you want to go?”. Most respondents (90.9%; N= 240) never experience insensible urinary incontinence, followed by 5.3% (N= 14) who have occasionally experienced insensible urinary incontinence. The other 2.3% of respondents (N= 6) sometimes experience insensible urinary incontinence. The lowest percentile of respondents comes with two groups of 0.8% (N= 2), who experienced insensible urinary incontinence most of the time and all of the time, respectively.

4.7.10 Nocturia enuresis

The question asked for the experience of nocturia enuresis is, “Do you leak urine when you are asleep?”. Most respondents (84.1%; N= 222) never experience nocturia enuresis, followed by 11.7% (N= 31) who have occasionally experienced nocturia enuresis. The other 1.9% of respondents (N=5) sometimes experience it, and 1.5% (N=4) experience it all of the time. The lowest percentile of respondents comes from 0.8% (N= 2), who experienced nocturia enuresis most of the time.

4.7.11 Post-voiding Incontinence

The question asked for the experience of post-voiding incontinence is, “How often have you had a slight wetting of your pants a few minutes after you had finished urinating and had dressed yourself?”. Most respondents (77.3%; N= 204) never experience this, followed by 18.2% (N= 48) who have occasionally experienced post-voiding incontinence. The other three scores (sometimes, most of the time, and all of the time) have the same percentile of respondents, 1.5% (N= 4).

4.7.12 Day-time Frequency

The question asked for the day-time frequency is, “How often do you pass urine during the day?”. Most respondents (59.5%; N= 157) pass urine 1 to 6 times a day, followed by 28.4% (N= 75) who pass 7 to 8 times urine a day. The other 8.7% (N= 23) pass urine 9 to 10 times a day, and 2.7% (N= 7) pass urine 11 to 12 times a day. The least reported is 13 or more times a day, accounting for 0.8% (N= 2).

4.7.13 Nocturia

The question asked for the nocturia is, “During the night, how many times do you have to get up to urinate, on average?”. Most respondents (56.4%; N= 149) did not get up to urinate at night, followed by 35.6% (N= 94) who got up one time at night to urinate. The other 7.2% (N= 19) get up 2 times to urinate at night, and 0.8% (N= 2) get up three times.

4.7.14 ICIQ-MLUTS Score

Figure 4.3 presents the proportion of respondents who report experiencing LUTS and those who do not. Symptoms can be categorized into three levels: mild, moderate, and severe. A significant portion of the respondents, precisely 95.8% (N= 217), display mild symptoms. A minimal fraction comprises individuals facing severe symptoms, accounting for 1.9% (N= 5). A total of 2.3% (N= 6) demonstrate moderate symptoms. Among the respondents, 13.6% (N= 36) reported no LUTS.

4.8 Association Between Prevalence of LUTS and Risk Factors

Table 4.6: Association between Prevalence of LUTS and Risk Factors

Risk factor		LUTS		x^2	df	p-value
		No, N (%)	Yes N, (%)			
BMI	< 18.5	10 (3.8)	28 (10.6)	12.452	9	0.189
	18.5 - 24.9	15 (5.7)	139 (52.7)			
	25 - 29.9	11 (4.2)	60 (22.7)			
	> 30	0	1 (0.4)			
Hypertension	No	35 (13.3)	220 (83.4)	0.483	3	0.923
	Yes	1 (0.4)	8 (3.0)			
Diabetes	No	36 (13.6)	224 (84.9)	0.880	3	0.830
	Yes	0	4 (1.5)			

Alcohol use	No	30 (11.4)	129 (48.8)	11.169	3	0.011
	Yes	6 (2.3)	99 (37.6)			
How often do you drink alcohol?	Never	0	0	27.431	12	0.007
	Monthly	5 (1.9)	77 (29.2)			
	2 to 4 times/ month	0	21 (8.0)			
	2 to 3 times/ week	0	1 (0.4)			
	4 or more times/week	1 (0.4)	0			
How many drinks containing alcohol do you have in a typical day when you are drinking?	1 or 2	1 (0.4)	61 (23.1)	42.653	15	<0.001
	3 or 4	0	23 (8.7)			
	5 or 6	3 (1.1)	7 (2.7)			

	7, 8, or 9	0	4 (1.5)			
	10 or more	2 (0.8)	4 (1.5)			
How often do you have six or more drinks on one occasion?	Never	1 (0.4)	39 (14.8)	82.141	12	<0.001
	Less than monthly	4 (1.5)	50 (19.0)			
	Monthly	1 (0.4)	7 (1.2)			
	Weekly	0	3 (100.0)			
	Daily or almost daily	36 (13.6)	228 (86.4)			
Smoking	No	31 (11.7)	208 (78.8)	7.233	3	0.065
	Yes	5 (1.9)	20 (7.6)			

How long have you been smoking	1 to 3 years	1 (0.4)	11 (4.3)	61.690	24	<0.001
	4 to 6 years	4 (1.6)	6 (2.3)			
	7 to 9 years	0	3 (1.2)			
How frequently do you smoke? (Days/ week)	1 to 2	0	3 (1.1)	15.347	9	0.082
	3 to 4	1 (0.4)	0			
	5 to 6	0	0			
	7	4 (1.5)	17 (6.5)			
How many sticks do you smoke per day?	1 to 5	4 (1.6)	8 (3.1)	50.748	21	< 0.001
	6 to 10	0	2 (0.8)			
	More than 10	0	1 (0.4)			

How many puffs do you smoke per day?	< 50	0	10 (4.0)	59.897	30	< 0.001
	51 to 100	3 (1.1)	5 (1.9)			
	> 100	1 (0.4)	2 (0.8)			
Vigorous physical activity	0	6 (2.3)	68 (25.8)	36.636	21	0.019
	1 to 3	28 (10.6)	126 (49.3)			
	4 to 6	2 (0.8)	25 (9.5)			
	7	0	5 (1.9)			
Moderate physical activity	0	5 (1.9)	41 (15.5)	30.206	21	0.088
	1 to 3	21 (8.0)	125 (47.4)			
	4 to 6	5 (1.9)	54 (20.5)			
	7	5 (1.9)	8 (3.0)			

Days of walking for at least 10 minutes at a time	0	3 (1.1)	6 (2.3)	50.505	21	< 0.001
	1 to 2	7 (2.7)	11 (4.2)			
	3 to 4	0	28 (10.7)			
	5 to 6	5 (1.9)	64 (24.2)			
	7	21 (8.0)	104 (39.4)			
Level of physical activity	High	14 (5.3)	59 (22.4)	10.531	6	0.104
	Moderate	11 (4.2)	115 (43.5)			
	Low	11 (4.2)	54 (20.5)			
Time spent sitting on a weekday	1 to 4	12 (4.6)	42 (16.1)	80.982	27	< 0.001
	5 to 8	21 (7.9)	134 (50.8)			
	More than 8	3 (1.2)	52 (19.7)			

*Chi Square test was performed, level of significant at $p < 0.05$, df = degree of freedom.

Table 4.6 illustrates the association between the occurrence of LUTS and the associated risk factors. Nine out of seventeen risk factors have a significant association with the prevalence of LUTS since the p-value is less than 0.05. So, the null hypothesis is rejected and the alternate hypothesis is that there is a significant association between the prevalence and the associated risk factors of LUTS among male university students. The analysis indicates that there is no notable connection between BMI and the occurrence of LUTS, given that the p-value exceeds the standard significance level of 0.05. This indicates that BMI does not seem to affect the likelihood of experiencing LUTS in this sample. This applies equally to hypertension and diabetes.

Conversely, a notable association exists between alcohol consumption and LUTS, indicated by a p-value of less than 0.05. This indicates that the intake of alcohol could play a role in the development of LUTS. The frequency of alcohol intake also shows a notable correlation with LUTS (p-value < 0.05). Increased alcohol consumption is probably associated with a greater occurrence of LUTS. A notable and significant correlation exists between alcohol consumption on a typical day when drinking and the occurrence of LUTS, indicating that individuals who consume higher amounts are more prone to experiencing these symptoms. Next, a significant correlation is observed between binge drinking behavior (having six or more drinks on one occasion) and LUTS. People who participate in binge drinking, whether regularly or less

than monthly, have a significantly higher likelihood of reporting lower urinary tract symptoms.

The analysis of smoking behavior reveals no significant association with LUTS, indicated by a p-value exceeding 0.05. This suggests that smoking is not a major factor influencing the prevalence of LUTS within this sample. Nonetheless, a robust and significant association exists between the duration of smoking and LUTS. Individuals with a longer history of smoking tend to have a higher likelihood of reporting LUTS. The frequency of smoking (in days per week) demonstrates a trend approaching significance; however, the p-value remains just above 0.05 (p= 0.082), suggesting that the association does not reach statistical significance in this instance. There is a significant correlation between daily cigarette consumption and the prevalence of LUTS. A higher daily intake of cigarettes correlates with an increased probability of experiencing LUTS. The same applies to the daily count of puffs consumed.

The analysis of the respondents' physical activity reveals a notable correlation between vigorous physical activity and LUTS. Individuals who participate in lower levels of vigorous physical activity are more prone to experiencing LUTS. Nonetheless, the relationship between moderate physical activity and LUTS does not reach statistical significance (p-value > 0.05). A notable and significant correlation exists between regular walking (for a minimum of 10 minutes) and the presence of LUTS. Individuals who engage in walking more often generally exhibit reduced occurrences of LUTS. In summary, the findings indicate that there is no meaningful relationship between overall physical activity levels (high, moderate, low) and LUTS, as evidenced by a p-

value greater than 0.05. A notable and significant correlation is identified between the duration of sitting on weekdays and LUTS. A greater amount of sedentary behavior correlates with an increased prevalence of LUTS.

Chapter 5

DISCUSSION

5.1 Chapter overview

This chapter will present the results and findings in alignment with the research objectives. Following that discussion, the study will address certain limitations and provide recommendations.

5.2 Prevalence of Lower Urinary Tract Symptoms (LUTS)

This study highlights a striking prevalence of LUTS among male university students, with an overall prevalence of 86.4%. This finding underscores the substantial burden of LUTS even in a relatively young and healthy population, a demographic typically considered at low risk for urinary tract conditions. The distribution of LUTS was according to the scoring from ICIQ-MLUTS, which indicates mild (0-16), moderate (17-25), and severe (26-44) (Uren et al., 2020). However, this study excluded those who scored 0 as having LUTS, as it was determined that participants who do not report any symptoms should not be included as having LUTS or mild symptoms.

The breakdown of symptom severity revealed that the majority of participants (82.2%) experienced mild symptoms, with only a tiny fraction reporting moderate (2.3%) or severe (1.9%) symptoms. These results are consistent with the understanding that LUTS can manifest across a spectrum of severities, often beginning with mild symptoms that may go unnoticed or be considered insignificant by individuals. However, even mild symptoms can negatively impact quality of life, productivity, and overall well-being if left unaddressed.

The high prevalence of mild symptoms may be attributed to lifestyle factors commonly associated with university students, such as prolonged sitting periods during studies, smoking, irregular hydration patterns, high intake of caffeinated or carbonated beverages, and stress. These behaviours can irritate the bladder or disrupt normal urinary patterns, potentially contributing to LUTS. Additionally, some participants may have underlying but undiagnosed conditions, such as bladder overactivity or mild infections, which could exacerbate symptoms.

The low prevalence of moderate and severe symptoms aligns with expectations for this age group, as more severe LUTS are typically associated with older populations and may result from conditions like benign prostatic hyperplasia (BPH) or other age-related changes in urinary function. However, any severe symptoms in this young cohort warrant attention, as they may indicate underlying urological abnormalities requiring medical evaluation.

Comparing these findings to existing literature, the prevalence of LUTS among this sample appears similar to a recent study focusing on younger populations. A study on young men aged 39 or younger found that approximately half reported experiencing LUTS, with storage or "irritative" voiding symptoms being nearly twice as common as "obstructive" symptoms (Beland et al., 2022). Compared to older populations, the prevalence of LUTS in this study is notably higher for mild symptoms but lower for moderate and severe symptoms. This aligns with expectations that LUTS severity increases with age due to factors such as prostate enlargement and diminished bladder function. For instance, studies on men aged 50 and older report prevalence rates of moderate to severe LUTS ranging from 30% to 50%, primarily driven by obstructive symptoms related to benign prostatic hyperplasia (BPH) (Samir et al., 2014). A 2020 study conducted in an urban public primary care clinic in Malaysia reported that among male patients aged 60 and above, the prevalence of moderate symptoms was 17.6%, and severe symptoms were 2.9% (Isa & Aziz, 2020).

5.3 The Prevalence of The Associated Risk Factors for Lower Urinary Tract Symptoms (LUTS)

This study examined various risk factors associated with the prevalence of lower urinary tract symptoms (LUTS) among male university students. The findings revealed that several lifestyle and health-related behaviours contribute significantly to LUTS in this population.

The data demonstrated a higher prevalence of LUTS among participants with a normal BMI between 18.5 to 24.9 (52.7%), followed by those in the overweight category with a BMI between 25 to 29.9 at 22.7%. Surprisingly, the prevalence of LUTS was very low (0.4%) in individuals with a BMI over 30. This distribution contrasts with some existing literature that identifies overweight and obesity as key risk factors for LUTS. A recent study published in 2024 assessed the prevalence of LUTS among normal-weight, overweight, and obese Palestinians. The findings indicated that overweight and obese individuals had a higher prevalence of LUTS compared to their normal-weight counterparts, suggesting a direct correlation between increased BMI and the occurrence of LUTS (Amous et al., 2024). However, the absence of severe obesity in this study limits further interpretation of this association.

The results also conclude that among participants with LUTS, 3% had hypertension, and 1.5% had diabetes. Interestingly, more participants (83.4%) who are not diagnosed with hypertension have LUTS and the same for those without diabetes, with 84.9% having LUTS. Compared with another study that is in young adult men, the study shows that the prevalence of LUTS is relatively higher among men with hypertension and diabetes (Korneyev et al., 2019). Hypertension is known to impair blood flow to pelvic organs, which may contribute to bladder dysfunction, while diabetes can cause neuropathy and microvascular complications, leading to altered bladder sensation and impaired detrusor muscle activity (Laurent & Boutouyrie, 2015). These conditions are well-established risk factors for LUTS, particularly in older populations, due to their impact on vascular health and bladder function. A study among older adults reported that over 50% of men and women with diabetes have bladder dysfunction, reflecting a progressive uropathic complication of diabetes (Brown et al., 2005). The relatively low prevalence of hypertension and diabetes in this young cohort aligns with their age demographic but still underscores their potential role in exacerbating LUTS when present.

Besides, alcohol consumption emerged as a significant risk factor for LUTS, with 37.6% of participants who consumed alcohol experiencing symptoms, but higher in those who did not consume alcohol, which is 48.8% of the participants. A study by Kawahara et al. (2020) reported that LUTS prevalence could be higher among non-drinkers due to the absence of protective

mechanisms associated with moderate alcohol consumption, such as improved blood flow and reduced inflammation in the urinary tract. Notably, among these participants, those who consumed alcohol monthly accounted for the most significant proportion (29.2%), suggesting that even moderate or infrequent alcohol intake may contribute to the development of LUTS. In a study by Wong et al. (2010), frequent alcohol intake was associated with a higher prevalence of LUTS, particularly storage symptoms. However, infrequent drinkers, such as those consuming alcohol monthly, were less studied. This study suggests that even occasional consumption could trigger LUTS, potentially due to individual variability in alcohol metabolism or sensitivity. For those who have binge drinking daily, it is more prevalent to LUTS in this study. There is also a similar finding in the study by Bradley et el (2017), which moderate alcohol consumption might protect against LUTS, heavy episodic drinking increases the risk and another study by Noh et al. (2020) found that binge drinking is significantly associated with an increased severity of LUTS, particularly storage symptoms like frequency and urgency.

Smoking was reported by 7.6% of participants with LUTS. However, more proportion came from non-smokers (78.8%). The majority of smokers with LUTS indicate daily smoking habits. Among those affected, longer durations of smoking (4-6 years) and higher smoking frequencies (7 days per week) were notably associated with an increased prevalence of LUTS. Among participants who smoked, those smoking 1 to 5 cigarettes per day constituted 1.6% of

individuals without LUTS and 3.1% of those with LUTS. Participants smoking 6 to 10 cigarettes per day were exclusively found in the LUTS group (0.8%). Smoking more than 10 cigarettes per day was rare, with 0.4% prevalence only among individuals with LUTS. These findings suggest a possible dose-response relationship where higher cigarette consumption is associated with LUTS. A study by Kawahara et al. (2020) has similarly observed that increased smoking frequency contributes to the prevalence of LUTS due to vascular dysfunction, bladder irritation, and chronic inflammation caused by smoking. The number of puffs per day also demonstrated a link with LUTS. Participants taking less than 50 puffs per day were absent in the non-LUTS group but constituted 4.0% of those with LUTS. Vaping 51 to 100 puffs per day was more prevalent in the LUTS group (1.9%) compared to the non-LUTS group (1.1%). Participants consuming more than 100 puffs per day were observed only in the LUTS group (0.8%). This can conclude that a higher prevalence of participants with LUTS among those reporting more puffs suggests that vaping intensity may be a significant risk factor for LUTS. Although there is limited research directly examining the prevalence of LUTS among individuals who vape, given the known association between smoking and LUTS, and the presence of harmful chemicals in e-cigarette vapour, it is plausible that vaping could similarly affect urinary tract function

In this study, low vigorous and moderate physical activity were prevalent among participants with LUTS. Among participants with LUTS, 49.3% engaged

in vigorous physical activity 1 to 3 days per week, while only 1.9% reported daily vigorous activity. The prevalence of LUTS appears to decrease with increasing frequency of vigorous physical activity. This suggests that more consistent vigorous physical activity may have a protective effect against LUTS. Infrequent vigorous physical activity (1-3 days per week) is the most prevalent among those with LUTS, which underscores a potential relationship between insufficient vigorous exercise and the persistence or exacerbation of LUTS. Existing research supports the beneficial role of physical activity in reducing LUTS prevalence. Studies, such as De Nunzio et al. (2019), have shown that higher levels of physical activity are associated with a reduced risk of LUTS in older adults, likely due to improved circulation, enhanced detrusor muscle function, and reduced systemic inflammation. Conversely, Park et al. (2018) found that sedentary behaviour and low physical activity levels increase LUTS risk, especially in middle-aged individuals.

Moderate physical activity followed a similar pattern, with 47.4% of participants with LUTS engaging in moderate activity 1 to 3 days per week, compared to only 3.0% reporting daily moderate activity. The findings suggest that moderate activity, even when performed consistently, may have a less pronounced association with LUTS reduction than vigorous physical activity. However, the absence of a linear association between moderate activity and LUTS prevalence aligns with findings by Mondul et al. (2020), which suggest

that moderate activity alone may not significantly impact LUTS progression or severity.

This study assessed the frequency of walking for at least 10 minutes at a time. Participants who walked daily (7 days per week) for at least 10 minutes represented the largest group among those with LUTS, accounting for 39.4% of the population. This was followed by participants who walked 5 to 6 days per week (24.2%) and those who walked 3 to 4 days per week (10.7%). On the other hand, participants who rarely walked (1 to 2 days per week) or did not walk at all comprised a smaller proportion, at 4.2% and 2.3%, respectively. Existing research highlights the potential benefits of regular walking on LUTS. Studies, such as those by De Nunzio et al. (2019), suggest that walking, as a low-impact physical activity, can improve pelvic floor muscle tone, enhance bladder control, and reduce the risk of LUTS. Furthermore, Park et al. (2018) found that sedentary behaviour is closely linked to increased LUTS prevalence, while even moderate physical activity like walking can mitigate some symptoms. However, the inconsistent relationship between walking frequency and LUTS in this study aligns with findings by Mondul et al. (2020), which suggest that physical activity may have a variable impact on LUTS depending on the intensity, duration, and other factors such as age and comorbidities. The high prevalence of LUTS among daily walkers may seem counterintuitive, as walking is generally regarded as beneficial for overall health and potentially protective against LUTS. However, this pattern may reflect the participants' attempts to mitigate LUTS

symptoms through lifestyle changes, including increased physical activity by walking, or it could indicate that walking alone may not sufficiently address the underlying mechanisms of LUTS.

Prolonged sitting on weekdays was also common among participants with LUTS, with 50.8% sitting for 5-8 hours daily and 19.7% sitting for more than 8 hours. A smaller proportion (16.1%) of participants sat for 1 to 4 hours per weekday. This study concludes that individuals with a more sedentary lifestyle are more prevalent in LUTS. A study by Park et al. (2018) had similar findings, highlighting that sedentary behaviour, defined as sitting for extended periods, was correlated with an increased prevalence of LUTS in middle-aged Korean men. Interestingly, individuals who reported sitting for 1 to 4 hours daily represented a smaller proportion of those with LUTS. This observation is consistent with research indicating that individuals who engage in more than 30 hours of television viewing per week are at a higher risk of developing LUTS than those who watch less than 1 hour weekly (Mondul et al., 2020)

.

5.4 Association Between The Prevalence and The Associated Risk Factors of Lower Urinary Tract Symptoms (LUTS)

The study concluded a significant relationship between the prevalence of LUTS and some associated risk factors. This is proved by the results of the Chi-Square Test used to identify the association between the variables. Risk factors include alcohol consumption, frequency of alcohol intake, number of alcoholic drinks on a typical day when drinking, binge drinking behaviour, duration of smoking, daily cigarette consumption, daily puffs smoked, frequency of vigorous physical activity, regular walking and duration of sitting on weekdays all had a p-value of < 0.05, indicating a strong association with LUTS. Other risk factors, including BMI, hypertension, diabetes, smoking behaviour, frequency of smoking (in days per week), frequency of moderate physical activity, and level of physical activity, had a p-value larger than 0.05, which indicates that they do not have any relationship with LUTS.

The results of the association were mixed for alcohol consumption. The results of this study showed a significant association between alcohol consumption, frequency of alcohol intake, number of alcoholic drinks on a typical day when drinking, and binge drinking behaviour associated with LUTS. Participants who consume alcohol monthly have a greater chance of developing LUTS. However, some research suggests a protective effect of moderate alcohol consumption against LUTS. Studies have reported a J-shaped association, indicating that while moderate alcohol consumption may be associated with a

reduced risk of LUTS, heavy drinking could increase the risk (Myung Ju Oh et al., 2012). These findings suggest that the relationship between alcohol consumption and LUTS is complex and may depend on the amount and pattern of drinking.

While the association between smoking and LUTS are complicated in this study. Duration of smoking history, daily cigarette consumption, and daily puffs smoked were found to be significantly associated with LUTS while smoking behaviour and frequency of smoking (in days per week) were not. This may be due to the cumulative effect of duration of smoking and daily intake. Longer smoking histories represent prolonged exposure to harmful substances like nicotine and tar, which can lead to more chronic changes in vascular health, inflammation, and possibly bladder function. The number of cigarettes or puffs smoked per day directly relates to the intensity of exposure to toxins, which may have more immediate and measurable effects on the urinary system compared to the number of days smoking occurs. Various studies have explored the connection between smoking and LUTS, with some suggesting that smoking may have a negative effect on LUTS. A study shown at the ICS 2019 conference revealed that smoking notably worsens LUTS and chronic prostatic inflammation in individuals with benign prostatic hyperplasia (BPH) (Inamura et al., 2019). The investigation examined 118 patients with BPH and found that smokers exhibited elevated scores on the International Prostatic Symptom Score (IPSS) in comparison to non-smokers, suggesting more severe symptoms.

Nonetheless, the length of smoking was found to have a negative correlation with bladder function, including aspects such as a strong desire to void and urgency in the research.

The study into the association of vigorous physical activity and regular walking with LUTS is substantiated by current literature. Studies have demonstrated that higher levels of physical activity are associated with a lower prevalence and severity of LUTS. For instance, research has found that higher physical activity levels were associated with reduced odds of LUTS in men (Hwang et al., 2024). On the other hand, moderate physical activity was found to be not associated with LUTS. This could be due to LUTS being more influenced by vigorous physical activity than moderate physical activity. Many research has found that vigorous activity could reduce the risk of developing LUTS including study by Mondul et al. (2020) and Hwang et al. (2024). This indicates that while moderate activity may not have a significant effect, engaging in more vigorous exercise is associated with better bladder health and function in improving pelvic floor strength, reducing obesity-related pressure on the bladder, and enhancing vascular health, which are factors potentially affecting LUTS.

Additionally, the duration of sitting on weekdays was associated with the prevalence of LUTS. A longer sitting time indicates a more sedentary lifestyle,

which will increase the risk of developing LUTS. This was also found in the study by Park et al. (2018), which found that longer sitting time has been associated with an increased risk of LUTS development, independently of physical activity levels. This can be explained by reduced muscle activity, which further weakens muscles and reduces the ability to support bladder function effectively. The sustained pressure on the perineum due to prolonged sitting will cause impaired blood flow, increasing discomfort or irritation in the pelvic region and exacerbating LUTS (Maharajh et al., 2015). Participants who report longer sitting time also show lower overall physical activity levels, which is another associated risk factor. These findings underscore the importance of regular physical activity and reducing sedentary behaviour in mitigating LUTS risk.

Next, walking at least 10 minutes a day is a significant association with the prevalence of LUTS. While specific studies examining the impact of walking for at least 10 minutes per day on LUTS are limited, broader research indicates a significant association between physical activity and reduced prevalence of LUTS, as shown above. These findings suggest that incorporating regular physical activity, such as daily walking, may contribute to a decreased risk of LUTS.

This study did not find a significant association between BMI and LUTS. This could be due to the sample size being relatively small, and it may have lacked sufficient power to detect a true association between BMI and LUTS. Other studies have also reported no significant association between obesity and LUTS, which could be due to less marked weight differences in their cohorts (Yee et al., 2015). Some studies suggest that higher BMI is associated with an increased risk of LUTS, potentially due to increased abdominal pressure and its impact on bladder function. An epidemiological study has identified obesity as a significant independent risk factor for urinary incontinence, a common component of LUTS. An apparent dose-response effect has been observed, with each 5-unit increase in BMI associated with a 20% to 70% increase in the risk of urinary incontinence (Subak et al., 2009). Additionally, research on the correlation between obesity and prostate volume in patients with benign prostatic hyperplasia found that men with higher BMI and central obesity had larger prostate volumes, which could contribute to LUTS (Mampa et al., 2021). These discrepancies may be influenced by factors such as age, sex, and comorbid conditions, which could account for the differences observed between studies.

The lack of significant associations between hypertension and diabetes to LUTS in this study contrasts with some existing literature that has identified these conditions as potential risk factors for LUTS. For instance, a study published in 2013 found that men with type 2 diabetes were 32% more likely to report LUTS compared to men without diabetes. The association was stronger

among those on active pharmaceutical treatment and with longer disease duration (Van Den Eeden et al., 2013). Additionally, according to Hwang et al. (2013), men with hypertension are more likely to have severe LUTS, suggesting a link between cardiovascular risk factors and urinary symptoms. However, there is also a study similar to my finding, which is no statistically significant association between blood pressure and the International Prostate Symptom Score (IPSS), suggesting that hypertension may not directly influence LUTS severity (Daher et al., 2023). The lower incidence of hypertension and diabetes observed in my study may be attributed to the reliance on self-reported data or inconsistencies in symptom measurement. This may impact the precision of the data and restrict the capacity to identify associations. Subsequently, the variations between my results and earlier research could stem from differences in study design, population characteristics, or the prevalence of these conditions within the sample.

On the other hand, some confounding factors are also undercover in this study. For example, individuals who are taking medication such as anticholinergics and diuretics can influence bladder function and contribute to LUTS (Maharajh et al., 2015). Psychosocial and emotional factors such as stress and anxiety are also leading concerns in university students. These psychological stresses can increase awareness of urinary symptoms or exacerbate urgency and frequency (Zhang & Xu, 2018). Other factors of their lifestyle may also affect the findings, such as fluid intake, caffeine and hygiene.

5.5 Limitations

It cannot be denied that every study has limitations, and the same applies to this study. Identifying these limitations throughout the study is important to obtain the best results. One limitation of this study was the initial recruitment process, where a significant number of participants (over 60) were later excluded due to fitting the exclusion criteria. This highlighted a need for a clearer understanding and application of the exclusion criteria during the recruitment phase, which ultimately impacted our ability to achieve the target sample size. The study initially had an anticipated sample size of 334 participants, but after excluding those with exclusion criteria, the final participant pool only ended up being 264. The participant count of a study should typically meet or exceed its expected sample size to obtain more data and achieve more accurate results. Despite that, the study only managed to get 79% of the expected sample size, making it a significant limitation.

Additionally, the sampling method employed in this study presents a limitation. The study employed a convenience sampling method, enabling the recruitment of participants who were readily accessible. This could lead to possible sampling bias during the data collection process. The findings of the study indicated that certain participants were under-represented over over-represented. This could have led to misinterpretation of data due to the unequal representation of groups.

Thirdly, the participants in the study consisted solely of male undergraduate students from Universiti Tunku Abdul Rahman Sungai Long Campus, Malaysia. This does not take into account any other university students from different institutions in Malaysia and overseas.

Finally, the investigation is limited to a select number of potential risk factors. While there are additional risk factors that are more pertinent to younger populations, including issues related to hygiene and levels of stress. Furthermore, the risk factors and symptoms were entirely self-reported by participants through their responses to the questionnaire. This could lead to inaccuracies in the results, as self-reporting may introduce bias. In other terms, respondents might not provide truthful answers when completing the questionnaire.

5.6 Recommendations

To address the aforementioned limitations, several recommendations can be proposed for future study. Firstly, it is recommended to refine and clearly define the exclusion criteria during the planning stage and ensure that these criteria are rigorously applied during the initial recruitment process. This can be achieved through better training for the recruitment team and implementing a pre-screening checklist to minimize the exclusion of participants after recruitment, thereby enhancing the efficiency of the process and ensuring the target sample size is achieved. Enhancing the sample size is crucial to consider boosting the precision and reliability of study results. An increased sample size enhances statistical power, allowing for the detection of both minor and significant effects. To accomplish this, a prolonged timeline for participant recruitment may be established. The recruitment of participants shall cease only upon reaching the anticipated sample size. This approach ensures that recruitment concludes only when adequate data is available for thorough analysis.

Secondly, the study can involve more researchers to assist during the recruitment period to minimise any sampling bias. A group can be assembled with individuals of varying demographic traits to engage a broader range of participants from diverse backgrounds. This ensures that there is no under or over-representation of groups, as the recruitment process will be accessible to a wider audience.

Thirdly, since the study is conducted solely at Universiti Tunku Abdul Rahman, Sungai Long Campus, Malaysia, it is advisable to explore additional research in various study environments. Investigations across various populations and environments can be conducted to pinpoint gaps and enhance understanding of related subjects.

Lastly, more research can be conducted concerning other factors associated with LUTS. This could involve exploring additional risk factors that are more pertinent to younger populations, examining the impact of LUTS on their quality of life, or assessing management strategies for LUTS. This aims to offer deeper insights on pertinent topics and enhance awareness surrounding this issue. Additionally, observational studies can be conducted instead of solely relying on questionnaires. Given the possibility of bias in self-reported data, this can aid in obtaining more accurate results.

Chapter 6

CONCLUSION

In summary, the occurrence of LUTS in a sample of 264 male university students is 86.4%. Of the 86.4%, it was determined that 95.2% exhibited mild LUTS, 2.6% exhibited moderate LUTS, and 2.2% exhibited severe LUTS. People who consume alcoholic beverages more regularly are at an increased risk of experiencing LUTS. This applies equally to individuals who smoke or vape. Engaging in higher levels of vigorous physical activity is associated with a reduced likelihood of developing LUTS. A sedentary lifestyle is associated with an increased likelihood of developing LUTS. Educational campaigns promoting healthy behaviours, such as reducing alcohol consumption, quitting smoking, increasing physical activity, and minimizing sedentary time, could help alleviate LUTS prevalence in this demographic. While hypertension, diabetes, and BMI did not demonstrate significant relationships with LUTS in this cohort. The study has demonstrated that LUTS commonly occurs in younger populations as well. Consequently, additional studies can be conducted on pertinent subjects to enhance the awareness of those impacted, as well as the general public, in order to address this challenge. Future research should aim to explore these associations further through longitudinal studies to determine causality and better understand the mechanisms underlying these relationships.

Additionally, interventions tailored to young adults should be implemented and evaluated for their effectiveness in reducing LUTS prevalence and improving overall quality of life. Some physiotherapy implications can be introduced to manage LUTS in younger males. Firstly, pelvic floor muscle training and Kegel exercise help strengthen the pelvic floor muscle and improve bladder control to manage stress incontinence and urgency (Fries, 2009). Furthermore, this exercise can be trained together using biofeedback, which helps individuals learn to control and strengthen pelvic floor muscles to reduce urinary incontinence (Hsu et al., 2016). Next, postural correction and core stability training can be implemented. This reduces the impact of poor posture, which causes increased intra-abdominal pressure, affecting bladder control and exacerbating LUTS (TURKAY & SUNA, 2023). Lastly, physiotherapists should encourage regular physical therapy including any sports of preference to reduce the symptoms and help managing comorbidities like obesity which can exacerbate LUTS.

References

Abdelmoteleb, H. (2017). Validity and Reliability of ICIQ-MLUTS. *Urology & Nephrology Open Access Journal*, *4*(2). https://doi.org/10.15406/unoaj.2017.04.00124

Abdelmoteleb, H., Jefferies, E. R., & Drake, M. J. (2016). Assessment and management of male lower urinary tract symptoms (LUTS). *International Journal of Surgery*, *25*, 164–171. https://doi.org/10.1016/j.ijsu.2015.11.043

Ahmad Zamree, M. R., Shaiful Bahari, I., Faridah, M. Z., & Norhayati, M. N. (2018). Premature ejaculation and its associated factors among men attending a primary healthcare clinic in Kelantan, Malaysia. *Journal of Taibah University Medical Sciences*, *13*(2), 173–179. https://doi.org/10.1016/j.jtumed.2017.10.001

Akhtar, A., Ahmad Hassali, M. A., Zainal, H., Ali, I., & Khan, A. H. (2021). A Cross-Sectional Assessment of Urinary Tract Infections Among Geriatric Patients: Prevalence, Medication Regimen Complexity, and Factors Associated With Treatment Outcomes. *Frontiers in Public Health*, *9*(657199). https://doi.org/10.3389/fpubh.2021.657199

Amous, Y., Isefan, S., Hamarsheh, K., Hijaz, H., Amer, R., & Shawahna, R. (2024). Lower urinary tract symptoms among normal-weight, overweight, and obese palestinians: a study of prevalence and impact on the quality of life. *BMC Urology*, *24*(1). https://doi.org/10.1186/s12894-024-01587-5

Andersson, S.-O., Rashidkhani, B., Karlberg, L., Wolk, A., & Johansson, J.-E. (2004). Prevalence of lower urinary tract symptoms in men aged 45-79 years: a population-based study of 40 000 Swedish men. *BJU International*, *94*(3), 327–331. https://doi.org/10.1111/j.1464-410x.2004.04930.x

Anyaegbu, E. I., & Dharnidharka, V. R. (2014). Hypertension in the Teenager. *Pediatric Clinics of North America*, *61*(1), 131–151. https://doi.org/10.1016/j.pcl.2013.09.011

Aslan, A., Çirakoglu, A., & Kasko Arici, Y. (2019). The Relationship Between Body Mass Index and Lower Urinary Tract Symptoms in Men. *Middle Black Sea Journal of Health Science*, *5*(2), 138–144. https://doi.org/10.19127/mbsjohs.591267

Bajunirwe, F., Stothers, L., Berkowitz, J., & Macnab, A. J. (2018). Prevalence estimates for lower urinary tract symptom severity among men in Uganda and sub-Saharan Africa based on regional prevalence data. *Canadian Urological Association Journal*, *12*(11). https://doi.org/10.5489/cuaj.5105

Barry, M. J., Fowler, F. J., O'Leary, M. P., Bruskewitz, R. C., Holtgrewe, H. L., Mebust, W. K., & Cockett, A. T. K. (1992). The American Urological Association Symptom Index for Benign Prostatic Hyperplasia. *Journal of Urology*, *148*(5 Part 1), 1549–1557. https://doi.org/10.1016/s0022-5347(17)36966-5

Bauer, S. R., Scherzer, R., Suskind, A. M., Cawthon, P., Ensrud, K. E., Ricke, W. A., Covinsky, K., & Marshall, L. M. (2020). Co-Occurrence of Lower Urinary Tract Symptoms and Frailty among Community-Dwelling Older Men. *Journal of the American Geriatrics Society*, *68*(12), 2805–2813. https://doi.org/10.1111/jgs.16766

Beland, L., Martin, C., & Han, J. S. (2022). Lower Urinary Tract Symptoms in Young Men—Causes and Management. *Current Urology Reports*, *23*(2), 29–37. https://doi.org/10.1007/s11934-022-01087-9

Bordoni, B., Sugumar, K., & Leslie, S. W. (2021). *Anatomy, Abdomen and Pelvis, Pelvic Floor*. PubMed; StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK482200/

Bradley, C. S., Erickson, B. A., Messersmith, E. E., Pelletier-Cameron, A., Lai, H. H., Kreder, K. J., Yang, C. C., Merion, R. M., Bavendam, T. G., & Kirkali, Z. (2017). Evidence of the Impact of Diet, Fluid Intake, Caffeine, Alcohol and Tobacco on Lower Urinary Tract Symptoms: A Systematic Review. *Journal of Urology*, *198*(5), 1010–1020. https://doi.org/10.1016/j.juro.2017.04.097

Brown, J. S., Wessells, H., Chancellor, M. B., Howards, S. S., Stamm, W. E., Stapleton, A. E., Steers, W. D., Eeden, S. K. V. D., & McVary, K. T. (2005). Urologic Complications of Diabetes. *Diabetes Care*, *28*(1), 177–185. https://doi.org/10.2337/diacare.28.1.177

Chapple, C., Castro-Diaz, D., Chuang, Y.-C., Lee, K.-S., Liao, L., Liu, S.-P., Wang, J., Yoo, T. K., Chu, R., & Sumarsono, B. (2017). Prevalence of Lower Urinary Tract Symptoms in China, Taiwan, and South Korea: Results from a Cross-Sectional, Population-Based Study. *Advances in Therapy*, *34*(8), 1953–1965. https://doi.org/10.1007/s12325-017-0577-9

Cherry, K. (2022, September 4). *What Is a Cross-Sectional Study?* Verywell Mind. https://www.verywellmind.com/what-is-a-cross-sectional-study-2794978

Chia, L., De Oliveira Silva, D., Whalan, M., McKay, M. J., Sullivan, J., Fuller, C. W., & Pappas, E. (2022). Non-contact Anterior Cruciate Ligament Injury Epidemiology in Team-Ball Sports: A Systematic Review with Meta-analysis by Sex, Age, Sport, Participation Level, and Exposure Type. *Sports Medicine*, *52*(10). https://doi.org/10.1007/s40279-022-01697-w

Chin, W.-Y., Choi, E. P. H., Wan, E. Y. F., & Lam, C. L. K. (2017). The mediating factors in the relationship between lower urinary tract symptoms and health-related quality of life. *BMC Research Notes*, *10*(1). https://doi.org/10.1186/s13104-017-2928-7

Chong, C., Fong, L., Lai, R., Lau, W. K. O., Hartmann, M., & Chia, S. E. (2012). The prevalence of lower urinary tract symptoms and treatment-seeking behaviour in males over 40 years in Singapore: a community-based study. *Prostate Cancer and Prostatic Diseases*, *15*(3), 273–277. https://doi.org/10.1038/pcan.2011.69

Choo, M. S., Han, J. H., Shin, T. Y., Ko, K., Lee, W. K., Cho, S. T., Lee, S. K., & Lee, S. H. (2015). Alcohol, Smoking, Physical Activity, Protein, and Lower Urinary Tract Symptoms: Prospective Longitudinal Cohort. *International Neurourology Journal*, *19*(3), 197–206. https://doi.org/10.5213/inj.2015.19.3.197

D'Ancona, C., Haylen, B., Oelke, M., Abranches-Monteiro, L., Arnold, E., Goldman, H., Hamid, R., Homma, Y., Marcelissen, T., Rademakers, K., Schizas, A., Singla, A., Soto, I., Tse, V., de Wachter, S., & Herschorn, S. (2019). The International Continence Society (ICS) report on the terminology for adult male lower urinary tract and pelvic floor symptoms and dysfunction. *Neurourology and Urodynamics*, *38*(2), 433–477. https://doi.org/10.1002/nau.23897

Daher, M., Tareq Saqer, Jabr, M., & Samaher Al-Mousa. (2023). Benign prostatic hyperplasia and metabolic syndrome; prevalence and association: a cross-sectional study in Syria. *BMC Urology*, *23*(1). https://doi.org/10.1186/s12894-023-01365-9

De Nunzio, C., Nacchia, A., Cicione, A., Cindolo, L., Gacci, M., Cancrini, F., Castellan, P., Lombardo, R., D'Annunzio, S., Sarchi, L., Trucchi, A., Schips, L., & Tubaro, A. (2019). Physical Activity as a Protective Factor for Lower Urinary Tract Symptoms in Male Patients: A Prospective Cohort Analysis. *Urology*, *125*, 163–168. https://doi.org/10.1016/j.urology.2018.12.035

DeLay, K. J., Haney, N., & Hellstrom, W. J. (2016). Modifying Risk Factors in the Management of Erectile Dysfunction: A Review. *The World Journal of Men's Health*, *34*(2), 89–100. https://doi.org/10.5534/wjmh.2016.34.2.89

Derimachkovski, G., Yotovski, V., Mladenov, V., Ianev, K., & Mladenov, D. (2014). Men with LUTS and diabetes mellitus. *Acta Chirurgica Iugoslavica*, *61*(1), 91–94. https://doi.org/10.2298/aci1401091d

Donovan, J., Peters, T., Abrams, P., Brookes, S., De La Rosette, J. J. M. C. H., & Schafer, W. (2000). Scoring the Short Form ICS male SF questionnaire. *JUrol*, *164*(6), 1948–1955.

Eric, C., Darren J, K., & Christopher, L. (2017). *Adult male stress and urge urinary incontinence – A review of pathophysiology and treatment strategies for voiding dysfunction in men*. The Royal Australian College of General Practitioners. https://www.menshealthmelbourne.com.au/pdf/afp-2017-9-focus-male-incontinence.pdf

Farhat, K., Aqdas, S., Al-Atawi, M., Rabah, D., & Arafa, M. (2015). Assessment of lower urinary tract symptoms in Saudi men using the International Prostate Symptoms Score. *Urology Annals*, *7*(2), 221. https://doi.org/10.4103/0974-7796.150492

Farshid Araghizadeh, & Abier Abdelnaby. (2013). Anatomy and Physiology. *Elsevier EBooks*, 3–16. https://doi.org/10.1016/b978-1-4377-1724-2.00001-5

Fries, W. C. (2009, March 20). *Kegel Exercises: Treating Male Urinary Incontinence*. WebMD; WebMD. https://www.webmd.com/urinary-incontinence-oab/kegel-exercises-treating-male-urinary-incontinence

Galloway, A. (2005). Non-Probability Sampling. *Encyclopedia of Social Measurement*, *2*, 859–864. https://doi.org/10.1016/b0-12-369398-5/00382-0

Gondžetović, N., Jatić, Z., & Omerbašić, A. (2018). Assessment of Lower Urinary Tract Symptoms (LUTS) in hypertensive men. *Folia Med. Fac. Med. Univ. Saraeviensis*, *53*(1), 3–6.

Grimes, W. R., & Stratton, M. (2021). *Pelvic Floor Dysfunction*. PubMed; StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK559246/

Hamzah, A. A., Rahman, M. N. G., Daud, M. A. M., & Mahamood, Z. (2007). A Survey on Lower Urinary Tract Symptoms (LUTS) Among patients with Benign Prostatic Hyperplasia (BPH) in Hospital Universiti Sains Malaysia (HUSM). *The Malaysian Journal of Medical Sciences : MJMS*, *14*(2), 67–71. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3442630/

Hsu, L.-F., Liao, Y.-M., Lai, F.-C., & Tsai, P.-S. (2016). Beneficial effects of biofeedback-assisted pelvic floor muscle training in patients with urinary incontinence after radical prostatectomy: A systematic review and metaanalysis. *International Journal of Nursing Studies*, *60*, 99–111. https://doi.org/10.1016/j.ijnurstu.2016.03.013

Huang, J., Chun Man Chan, Yee, S. W., Deng, Y., Bai, Y., Sze Chai Chan, Man Sing Tin, Liu, X., Lok, V., Zhang, L., Wang, X., Zheng, Z.-J., Jeremy Yuen-Chun Teoh, Ng, C.-F., & Martin. (2022). Global burden and temporal trends of lower urinary tract symptoms: a systematic review and meta-analysis. *Prostate*

Cancer and Prostatic Diseases, *26*(2), 421–428. https://doi.org/10.1038/s41391-022-00610-w

Hwang, E. C., KIM, S.-O., NAM, D.-H., YU, H. S., HWANG, I., JUNG, S. I., KANG, T. W., KWON, D. D., & KIM, G. S. (2013). Men with Hypertension are More Likely to Have Severe Lower Urinary Tract Symptoms and Large Prostate Volume. *LUTS: Lower Urinary Tract Symptoms*, *7*(1), 32–36. https://doi.org/10.1111/luts.12046

Hwang, S. E., Yun, J. M., Cho, S. H., Min, K., Kim, J. Y., Kwon, H., & Park, J. H. (2024). Higher Physical Activity is Associated with Reduced Lower Urinary Tract Symptoms in Korean Men. *The World Journal of Men S Health*, *42*. https://doi.org/10.5534/wjmh.230303

Inamura, S., Kobayashi, H., Tsutsumiuchi, M., Itoga, A., Seki, M., Taga, M., Tsuchiyama, K., Fukushima, M., Aoki, Y., Ito, H., & Yokoyama, O. (2019). *Smoking exacerbates lower urinary tract symptoms and chronic prostatic inflammation in patients with benign prostatic hyperplasia.* Continence (Elsevier); John Wiley & Sons, Inc. https://www.ics.org/2019/abstract/702

Inbaraj, L., Kant, P., Franklyn, N., & Norman, G. (2021). Prevalence, risk factors and quality of life of Lower Urinary Tract Symptoms (LUTS) among men attending Primary Care slum clinics in Bangalore: A cross-sectional study. *Journal of Family Medicine and Primary Care*, *10*(6), 2241. https://doi.org/10.4103/jfmpc.jfmpc_2316_20

Irwin, D. E., Milsom, I., Hunskaar, S., Reilly, K., Kopp, Z., Herschorn, S., Coyne, K., Kelleher, C., Hampel, C., Artibani, W., & Abrams, P. (2006). Population-Based Survey of Urinary Incontinence, Overactive Bladder, and Other Lower Urinary Tract Symptoms in Five Countries: Results of the EPIC Study.

European Urology, *50*(6), 1306–1315. https://doi.org/10.1016/j.eururo.2006.09.019

Isa, N. M. M., & Aziz, A. F. A. (2020). Lower Urinary Tract Symptoms: Prevalence and Factors Associated with Help-Seeking in Male Primary Care Attendees. *Korean Journal of Family Medicine*, *41*(4), 256–262. https://doi.org/10.4082/kjfm.19.0012

Jamzadeh, A., Xie, D., Laudano, M., Seklehner, S., Elterman, D., Shtromvaser, L., Lee, R., Kaplan, S. A., Te, A. E., & Chughtai, B. (2013). Urodynamic characterization of lower urinary tract symptoms in men less than 40 years of age. *World Journal of Urology*, *32*(2), 469–473. https://doi.org/10.1007/s00345-013-1134-z

Jung, J., Ahn, H. K., & Huh, Y. (2012). Clinical and Functional Anatomy of the Urethral Sphincter. *International Neurourology Journal*, *16*(3), 102. https://doi.org/10.5213/inj.2012.16.3.102

Karami, H., Valipour, R., & Lotfi, B. (2011). UP-03.209 Urodynamic Findings in Young Men with Chronic Lower Urinary Tract Symptoms. *Urology*, *78*(3), S415. https://doi.org/10.1016/j.urology.2011.07.1297

Karunaharamoorthy, A., & Arzt (Eds.). (2023). *Levator ani muscle*. Kenhub. https://www.kenhub.com/en/library/anatomy/levator-ani

Kawahara, T., Ito, H., & Uemura, H. (2020). The impact of smoking on male lower urinary tract symptoms (LUTS). *Scientific Reports*, *10*(1). https://doi.org/10.1038/s41598-020-77223-7

Kijima, F. J., Motta, L. C., Cavalcante, J. S., Jordão, L., Eduardo, C., Santos, Leite, C., Sabage, L. E., Medeiros, G. A., Mazzo, A., & Nardi, A. C. (2024). Prevalence and quality of life associated with erectile dysfunction and lower urinary tract

symptoms: a cross-sectional study. *Sao Paulo Medical Journal*, *143*(1). https://doi.org/10.1590/1516-3180.2024.0045.r1.03072024

Kim, S.-K., Kim, K.-H., Kim, S.-H., Yoo, S.-J., & Jeong, Y.-W. (2019). Health-related quality of life in adult males with lower urinary tract symptoms. *Quality of Life Research*, *28*(9), 2419–2428. https://doi.org/10.1007/s11136-019-02205-w

Knol-de Vries, G. E., & Blanker, M. H. (2022). Prevalence of co-existing pelvic floor disorders: A scoping review in males and females. *Continence*, *2*, 100028. https://doi.org/10.1016/j.cont.2022.100028

Korneyev, I. A. K., Alexeeva, T. A. A., Potapova, M. K. P., Alexeeva, N. M. A., & Al-Shukri, S. Kh. A.-S. (2019). Lower urinary tract symptoms in young adult men: analysis of prevalence, profile and relationship with metabolic syndrome' risk factors. *Urologiia*, *1_2019*, 47–51. https://doi.org/10.18565/urology.2019.1.47-51

Laurent, S., & Boutouyrie, P. (2015). The Structural Factor of Hypertension. *Circulation Research*, *116*(6), 1007–1021. https://doi.org/10.1161/circresaha.116.303596

Liang, Y., Guo, W., Hui Jie Hu, Zhen Wei Zhang, Cui Ping Song, Qi Feng Dou, & Jian Guo Wen. (2022). Prevalence, Risk Factors, and Psychological Effects of Overactive Bladder in Chinese University Students. *International Neurourology Journal*, *26*(4), 342–348. https://doi.org/10.5213/inj.2244188.094

Lui, P. S. C., & Dorji, N. (2020). Prevalence and predictors of lower urinary tract symptoms in Solomon Islander adult men. *Journal of Clinical Urology*, *14*(5), 205141582094553. https://doi.org/10.1177/2051415820945537

Maharajh, S., Abdel Goad, E. H., Ramklass, S. S., & Conradie, M. C. (2015). Lower urinary tract symptoms (LUTS) in males: a review of pathophysiology. *South African Family Practice*, *57*(2), 88–92. https://doi.org/10.1080/20786190.2014.983307

Mampa, E., Haffejee, M., & Fru, P. (2021). The correlation between obesity and prostate volume in patients with benign prostatic hyperplasia at Charlotte Maxeke Johannesburg Academic Hospital. *African Journal of Urology*, *27*(1). https://doi.org/10.1186/s12301-021-00160-y

Mancini, V., Balzarro, M., Illiano, E., Hoznek, A., Stallone, G., & Carrieri, G. (2018). Lower urinary tract symptoms in elderly men: a simple yet comprehensive approach. *Lower Urinary Tract Symptoms in Elderly Men: A Simple yet Comprehensive Approach*, *66*, 245–252.

Manski, D. M. (n.d.). *Pelvic Cavity Anatomy*. Www.urology-Textbook.com. Retrieved December 6, 2023, from https://www.urology-textbook.com/pelvic-cavity-anatomy

Maserejian, N. N., Chen, S., Chiu, G. R., Wager, C. G., Kupelian, V., Araujo, A. B., & McKinlay, J. B. (2013). Incidence of Lower Urinary Tract Symptoms in a Population-based Study of Men and Women. *Urology*, *82*(3), 560–564. https://doi.org/10.1016/j.urology.2013.05.009

Mohamad Anuar, M. F., Solihin Rezali, M., Mohamed Daud, M. A., & Ismail, S. B. (2022). A community-based study on lower urinary tract symptoms in Malaysian males aged 40 years and above. *Scientific Reports*, *12*(1). https://doi.org/10.1038/s41598-022-05890-9

Mondul, A. M., Giovannucci, E., & Platz, E. A. (2020). A Prospective Study of Physical Activity, Sedentary Behavior, and Incidence and Progression of

Lower Urinary Tract Symptoms. *Journal of General Internal Medicine*, *35*(8), 2281–2288. https://doi.org/10.1007/s11606-020-05814-1

Morton, H., Collinson, E., Bray, A., Blake, J., & Harding, C. (2019). Comparison of IPSS and ICIQ-MLUTS scores in men with voiding lower urinary tract symptoms. *Neurourology and Urodynamics*. https://www.ics.org/2019/abstract/684

Moussa, M., Papatsoris, A., Chakra, M., Fares, Y., & Dellis, A. (2020). S70 ENDOUROLOGY. *Turk J Urol*, *46*(1), 70–78. https://doi.org/10.5152/tud.2020.20092

Myung Ju Oh, Chun Sick Eom, Hye Jin Lee, Hye Won Choi, Cho, B., & Jin Ho Park. (2012). Alcohol Consumption Shows a J-Shaped Association With Lower Urinary Tract Symptoms in the General Screening Population. *The Journal of Urology*, *187*(4), 1312–1317. https://doi.org/10.1016/j.juro.2011.11.085

N, Z., N, A., N, A., N, S., N, A., & F, D. (2011). Prevalence of lower urinary tract symptoms (LUTS) among young age medical population. *IIUM Medical Journal Malaysia*, *10*(1). https://doi.org/10.31436/imjm.v10i1.700

Nishii, H. (2021). A Review of Aging and the Lower Urinary Tract: The Future of Urology. *International Neurourology Journal*, *25*(4), 273–284. https://doi.org/10.5213/inj.2142042.021

Noh, J., Yoo, K.-Y., Kim, K.-B., Jae Heon Kim, & Young Dae Kwon. (2020). Association between lower urinary tract symptoms and cigarette smoking or alcohol drinking. *Translational Andrology and Urology*, *9*(2), 312–321. https://doi.org/10.21037/tau.2020.03.07

Oyelade, B., & Jemilohun, A. (2016). Prevalence of Lower Urinary Tract Symptoms in Apparently Healthy Young Nigerian Women. *British Journal of Medicine and Medical Research*, *16*(4), 1–7. https://doi.org/10.9734/bjmmr/2016/26472

Park, H. J., Park, C. H., Chang, Y., & Ryu, S. (2018). Sitting time, physical activity and the risk of lower urinary tract symptoms: a cohort study. *BJU International*, *122*(2), 293–299. https://doi.org/10.1111/bju.14147

Parsons, J. K., & Im, R. (2009). Alcohol Consumption is Associated With a Decreased Risk of Benign Prostatic Hyperplasia. *Journal of Urology*, *182*(4), 1463–1468. https://doi.org/10.1016/j.juro.2009.06.038

Penson, D. F., Munro, H. M., Signorello, L. B., Blot, W. J., & Fowke, J. H. (2011). Obesity, Physical Activity and Lower Urinary Tract Symptoms: Results From the Southern Community Cohort Study. *J Urol*, *186*(6), 2316–2322. https://doi.org/10.1016/j.juro.2011.07.067

Przydacz, M., Golabek, T., Dudek, P., Lipinski, M., & Chlosta, P. (2020). Prevalence and bother of lower urinary tract symptoms and overactive bladder in Poland, an Eastern European Study. *Scientific Reports*, *10*(1). https://doi.org/10.1038/s41598-020-76846-0

Qasrawi, H., Tabouni, M., Almansour, S. W., Ghannam, M., Abdalhaq, A., Abushamma, F., Koni, A. A., & Zyoud, S. H. (2022). An evaluation of lower urinary tract symptoms in diabetic patients: a cross-sectional study. *BMC Urology*, *22*(1). https://doi.org/10.1186/s12894-022-01133-1

Quaghebeur, J., Petros, P., Wyndaele, J.-J., & De Wachter, S. (2021). Pelvic-floor function, dysfunction, and treatment. *European Journal of Obstetrics, Gynecology, and Reproductive Biology*, *265*, 143–149. https://doi.org/10.1016/j.ejogrb.2021.08.026

Rohrmann, S. (2004). Associations of Obesity with Lower Urinary Tract Symptoms and Noncancer Prostate Surgery in the Third National Health and Nutrition Examination Survey. *American Journal of Epidemiology*, *159*(4), 390–397. https://doi.org/10.1093/aje/kwh060

Rohrmann, S., Katzke, V., & Kaaks, R. (2016). Prevalence and Progression of Lower Urinary Tract Symptoms in an Aging Population. *Urology*, *95*, 158–163. https://doi.org/10.1016/j.urology.2016.06.021

Rosenbaum, T. Y. (2007). REVIEWS: Pelvic Floor Involvement in Male and Female Sexual Dysfunction and the Role of Pelvic Floor Rehabilitation in Treatment: A Literature Review. *The Journal of Sexual Medicine*, *4*(1), 4–13. https://doi.org/10.1111/j.1743-6109.2006.00393.x

Sam, P., & LaGrange, C. A. (2019, February 6). *Anatomy, Abdomen and Pelvis, Sphincter Urethrae*. Nih.gov; StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK482438/

Samir, A., Maqsoud, A., & Nour, A. (2014). Patients' Concerns about BPH Patients' Concerns regarding Symptoms Severity and Treatment of Benign Prostate Hypertrophy (BPH). *ASNJ*, *16*(2).

Smith, D. P., Weber, M. F., Soga, K., Korda, R. J., Tikellis, G., Patel, M. I., Clements, M. S., Dwyer, T., Latz, I. K., & Banks, E. (2014). Relationship between Lifestyle and Health Factors and Severe Lower Urinary Tract Symptoms (LUTS) in 106,435 Middle-Aged and Older Australian Men: Population-Based Study. *PLoS ONE*, *9*(10), e109278. https://doi.org/10.1371/journal.pone.0109278

Soler, R., Gomes, C. M., Averbeck, M. A., & Koyama, M. (2017). The prevalence of lower urinary tract symptoms (LUTS) in Brazil: Results from the epidemiology

of LUTS (Brazil LUTS) study. *Neurourology and Urodynamics*, *37*(4), 1356–1364. https://doi.org/10.1002/nau.23446

Sophie, F. (2023). *The Pelvic Floor - Structure - Function - Muscles - TeachMeAnatomy*. TaeachMe Anatomy. https://teachmeanatomy.info/pelvis/muscles/pelvic-floor/

Subak, L. L., Richter, H. E., & Hunskaar, S. (2009). Obesity and Urinary Incontinence: Epidemiology and Clinical Research Update. *Journal of Urology*, *182*(6S). https://doi.org/10.1016/j.juro.2009.08.071

Thiesse, R. (2023, March 14). *Pelvic floor issues aren't just a woman's health condition, Kegels can work for men, too*. Mayo Clinic News Network. https://newsnetwork.mayoclinic.org/discussion/pelvic-floor-issues-arent-just-a-womans-health-condition-kegels-can-work-for-men-too/

TURKAY, Ibrahim. K., & SUNA, G. (2023). Urinary Incontinence, Kegel Exercises, Core Training and Collagen - A Systematic Review. *Journal OfComplementary Medicine Research*, *13*(5). https://doi.org/10.5455/jcmr.2022.13.05.26

Uren, A. D., Cotterill, N., Pardoe, M., & Abrams, P. (2020). The International Consultation on Incontinence Questionnaires (ICIQ): An update on status and direction. *Neurourology and Urodynamics*, *39*(6), 1889–1896. https://doi.org/10.1002/nau.24437

Van Den Eeden, S. K., Ferrara, A., Shan, J., Jacobsen, S. J., Quinn, V. P., Haque, R., & Quesenberry, C. P. (2013). Impact of type 2 diabetes on lower urinary tract symptoms in men: a cohort study. *BMC Urology*, *13*(1). https://doi.org/10.1186/1471-2490-13-12

Vrolijks, R. O., Notenboom-Nas, F. J. M., Boer, D., Schouten, T., Timmerman, A., Zijlstra, A., Witte, L. P. W., Knol-de Vries, G. E., & Blanker, M. H. (2020). Exploring pelvic floor muscle activity in men with lower urinary tract symptoms. *Neurourology and Urodynamics*, *39*(2), 732–737. https://doi.org/10.1002/nau.24267

Wallace, S. L., Miller, L. D., & Mishra, K. (2019). Pelvic floor physical therapy in the treatment of pelvic floor dysfunction in women. *Current Opinion in Obstetrics and Gynecology*, *31*(6), 485–493. https://doi.org/10.1097/gco.0000000000000584

Wessel, M., Wyant, T., Pena, C., & Cabera, M. (2019, January 30). *Bladder Cancer Signs and Symptoms*. Www.cancer.org. https://www.cancer.org/cancer/types/bladder-cancer/detection-diagnosis-staging/signs-and-symptoms.html

Whitehead, W. E., & Bharucha, A. E. (2010). Diagnosis and Treatment of Pelvic Floor Disorders: What's New and What to Do. *Gastroenterology*, *138*(4), 1231-1235.e4. https://doi.org/10.1053/j.gastro.2010.02.036

Wong, S. Y., Woo, J., Leung, J. C., & Leung, P. C. (2010). Depressive symptoms and lifestyle factors as risk factors of lower urinary tract symptoms in Southern Chinese men: a prospective study. *The Aging Male*, *13*(2), 113–119. https://doi.org/10.3109/13685530903440432

World Health Organization. (2020). *Hypertension*. WHO. https://www.who.int/health-topics/hypertension#tab=tab_1

Yee, C., Chan, C., Teoh, J. Y., Chiu, P. K., Wong, J. H., Chan, E. S., Hou, S. S., & Ng, C. (2019). Survey on prevalence of lower urinary tract symptoms in an Asian population. *Hong Kong Medical Journal*. https://doi.org/10.12809/hkmj187502

Yee, C.-H., So, W.-Y., Yip, S. K., Wu, E., Yau, P., & Ng, C.-F. (2015). Effect of weight reduction on the severity of lower urinary tract symptoms in obese male patients with benign prostatic hyperplasia: A randomized controlled trial. *Korean Journal of Urology*, *56*(3), 240. https://doi.org/10.4111/kju.2015.56.3.240

Zhang, A. Y., & Xu, X. (2018). Prevalence, Burden, and Treatment of Lower Urinary Tract Symptoms in Men Aged 50 and Older: A Systematic Review of the Literature. *SAGE Open Nursing*, *4*, 237796081881177. https://doi.org/10.1177/2377960818811773

APPENDICES

APPENDIX A – ETHICAL APPROVAL FORM

UNIVERSITI TUNKU ABDUL RAHMAN
Wholly Owned by UTAR Education Foundation (Company No. 578227-M)

Re: U/SERC/78-363/2024

23 September 2024

Mr Muhammad Noh Zulfikri bin Mohd Jamali
Head, Department of Physiotherapy
M. Kandiah Faculty of Medicine and Health Sciences
Universiti Tunku Abdul Rahman
Jalan Sungai Long
Bandar Sungai Long
43000 Kajang, Selangor

Dear Mr Muhammad Noh,

Ethical Approval For Research Project/Protocol

We refer to your application for ethical approval for your students' research project from Bachelor of Physiotherapy (Honours) programme enrolled in course UMFD3026. We are pleased to inform you that the application has been approved under Expedited Review.

The details of the research projects are as follows:

No	Research Title	Student's Name	Supervisor's Name	Approval Validity
9.	Assessment Of Diagnostic Clinical Reasoning Skills Among Undergraduate Physiotherapy Students	Jason Ho Yi Zeng	Mr Avanianban Chakkarapani	23 September 2024 – 22 September 2025
10.	Awareness, Knowledge, Attitude and Perception of Active Isolated Stretching Among Physiotherapy Academics and Students in a Private University: A Cross Sectional Study	Law Jing Tien		
11.	Knowledge Of Quadriceps Angle (Q-Angle) Among Physiotherapy Students	Tay Yu Xin		
12.	Cortical Excitability and Body Awareness in Individuals with Adolescent Idiopathic Scoliosis: An Exploratory Study	Mark Isaac Fernandez	Dr Deepak Thazhakkattu Vasu	
13.	Exercise Interventions in Primiparous Women for the Prevention and Management of Pelvic Floor Dysfunction: A Systematic Review	Jenny Peng Mei Shi		
14.	Exploring the Novel Sensor System for Detecting Postural Reactions Among Healthy Younger Adults: A Pilot Study	Ooi Xin Rou		
15.	Prevalence of Chronic Fatigue Syndrome (CFS) and Its Association on Quality of Life and Sleep Quality Among Young Adults: A Cross-sectional Study	Delphine Yeo Sze Qi	Mr Sathish Kumar Sadagobane Co-Supervisor: Mr Tarun Amalnerkar	
16.	Association Between Level of Ergonomic Knowledge and Prevalence of Neck Pain Among Part-time Postgraduate Students in Klang Valley	Ng Jia Xuan	Mr Sathish Kumar Sadagobane Co-Supervisor: Mr Edwin Gaspar	
17.	Effectiveness of Kinesiotaping with Static Stretching and Proprioceptive Neuromuscular Facilitation Stretching for Gastrocnemius Tightness Management Among Adults	Tan Jia Yin	Ms Heaw Yu Chi	
18.	Awareness, Knowledge and Perceptions of Chronic Fatigue Syndrome/ Myalgic Encephalomyelitis Between Student and Working Physiotherapists: A Comparative Study	Tee Yee Pei		
19.	Effect of Pulmonary Rehabilitation on Dyspnea and Quality of Life Among Chronic Obstructive Pulmonary Disease Patients: A Systematic Review	Chin Jay Ven	Mr Imtiyaz Ali Mir	
20.	Efficacy of Music Therapy and Mindfulness Meditation on Blood Pressure and Mental Health Among University Students	Tan Pei Chen		
21.	Effects of Music Therapy on Haemodynamic Variables and Mental Health in Patients with Coronary Artery Disease: A Systematic Review	Foong Ei Yan		
22.	Effects of Different Phases of the Menstrual Cycle on Daytime Drowsiness and Muscular Fatigue Among Recreational Female Badminton Players	Lee Kae Shyan	Mr Muhammad Noh Zulfikri Bin Mohd Jamali Co-supervisor: Mr Tarun Amalnerkar	
23.	Association between Gastrocnemius Tightness, Hallux Valgus and Physical Activity Among University Students	Chong Yi Xian	Ms Siti Hazirah Binti Samsuri	
24.	The Prevalence of Lower Urinary Tract Symptoms (LUTS) and Its Associated Risk Factors Among Male University Students	Gan Xinyi		
25.	Examining Doms Reduction in Recreational Versus Competitive Athletic Populations	Jona Kong Zong Na	Ms Kamala a/p Krishnan	
26.	Effectiveness of Virtual Reality Games on Hand Movement and Strength rehabilitation in Stroke Patients: A Systematic Review	Rachel Hew Zi Qi		

Kampar Campus : Jalan Universiti, Bandar Barat, 31900 Kampar, Perak Darul Ridzuan, Malaysia
Tel: (605) 468 8888 **Fax:** (605) 466 1313
Sungai Long Campus : Jalan Sungai Long, Bandar Sungai Long, Cheras, 43000 Kajang, Selangor Darul Ehsan, Malaysia
Tel: (603) 9086 0288 **Fax:** (603) 9019 8868
Website: www.utar.edu.my

The conduct of this research is subject to the following:

(1) The participants' informed consent be obtained prior to the commencement of the research;

(2) Confidentiality of participants' personal data must be maintained; and

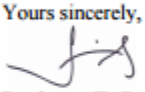
(3) Compliance with procedures set out in related policies of UTAR such as the UTAR Research Ethics and Code of Conduct, Code of Practice for Research Involving Humans and other related policies/guidelines.

(4) Written consent be obtained from the institution(s)/company(ies) in which the physical or/and online survey will be carried out, prior to the commencement of the research.

Should the students collect personal data of participants in their studies, please have the participants sign the attached Personal Data Protection Statement for records.

Thank you.

Yours sincerely,



Professor Ts Dr Faidz bin Abd Rahman
Chairman
UTAR Scientific and Ethical Review Committee

c.c Dean, M. Kandiah Faculty of Medicine and Health Sciences
Director, Institute of Postgraduate Studies and Research

APPENDIX B – INFORMED CONSENT FORM

Consent:

6. By submitting or providing your personal data to UTAR, you had consented and agreed for your personal data to be used in accordance to the terms and conditions in the Notice and our relevant policy.

7. If you do not consent or subsequently withdraw your consent to the processing and disclosure of your personal data, UTAR will not be able to fulfill our obligations or to contact you or to assist you in respect of the purposes and/or for any other purposes related to the purpose.

8. You may access and update your personal data by writing to us at **samxy01@1utar.my (Gan Xinyi)**.

Acknowledgement of Notice *

- ○ I have been notified and that I hereby understood, consented and agreed per UTAR above notice.
- ○ I disagree, my personal data will not be processed

Electronical Signature (electronically s/d name) *

(E.g: Electronically s/d Gan Xinyi)

Short answer text

Today's date *

Month, day, year

APPENDIX C – PERSONAL DATA PROTECTION NOTE

Personal Data Protection Note

Please be informed that in accordance with Personal Data Protection Act 2010 ("PDPA") which came into force on 15 November 2013, University Tunku Abdul Rahman ("UTAR") is hereby bound to make notice and require consent in relation to collection, recording, storage, usage, and retention of personal information.

1. Personal data refers to any information which may directly or indirectly identify a person which could include sensitive personal data and expression of opinion. Among others it includes:
a) Name
b) Identity card
c) Place of Birth
d) Address
e) Education History
f) Employment History
g) Medical History
h) Blood Type
i) Race
j) Religion
k) Photo
l) Personal Information and Associated Research Data

2. The purposes for which your personal data may be used are inclusive but not limited to:
a) For assessment of any application to UTAR
b) For processing any benefits and services
c) For communication purposes
d) For advertorial and news
e) For general administration and record purposes
f) For enhancing the value of education
g) For educational and related purposes consequential to UTAR
h) For replying any responds to complaints and enquiries
i) For the purpose of our corporate governance
j) For the purposes of conducting research/ collaboration

3. Your personal data may be transferred and/or disclosed to third party and/or UTAR collaborative partners including but not limited to the respective and appointed outsourcing agents for purpose of fulfilling our obligations to you in respect of the purposes and all such other purposes that are related to the purposes and also in providing integrated services, maintaining and storing records. Your data may be shared when required by laws and when disclosure is necessary to comply with applicable laws.

4. Any personal information retained by UTAR shall be destroyed and/or deleted in accordance with our retention policy applicable for us in the event such information is no longer required.

5. UTAR is committed in ensuring the confidentiality, protection, security and accuracy of your personal information made available to us and it has been our ongoing strict policy to ensure that your personal information is accurate, complete, not misleading and updated. UTAR would also ensure that your personal data shall not be used for political and commercial purposes.

APPENDIX D – ONLINE QUESTIONNAIRE

Demographic data

Description (optional)

Age *

Short answer text

Education level *

- Foundation
- Undergraduate
- Postgraduate

Height (in cm) *

Short answer text

Weight (in kg) *

Short answer text

Screening Questionnaire

Description (optional)

Have you been diagnosed with bladder cancer? *

- Yes
- No

Have you been diagnosed with prostate cancer? *

- Yes
- No

Have you been diagnosed with an enlarged prostate/ BPH (Benign Prostatic Hyperplasia)? *

- Yes
- No

Do you have any history of neurological disease? *
(Eg: Spinal Cord Injury, Multiple Sclerosis, Cerebrovascular Accidents)

- Yes
- No

Have you undergone surgery on your prostate or bladder? *

- Yes
- No

Risk Factor Questionnaire

Description (optional)

Have you been diagnosed with hypertension? *

- Yes
- No

Have you been diagnosed with diabetes? *

- Yes
- No

Alcohol Use Questionnaire

Description (optional)

Do you drink alcohol? *

- Yes
- No

Alcohol Use Questionnaire

Description (optional)

How often do you drink alcohol? *

- Never
- Monthly
- 2 to 4 times a month
- 2 to 3 times a week
- 4 or more times a week

How many drinks containing alcohol do you have in a typical day when you are drinking? *

- 1 or 2
- 3 or 4
- 5 or 6
- 7, 8, or 9
- 10 or more

How often do you have six or more drinks on one occasion? *

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

Smoking History

Description (optional)

Do you smoke? *
(Include cigarette smoking, vaping, pipe smoking)

- ○ Yes
- ○ No

er section 9 Continue to next section

Section 10 of 12

Smoking History

Description (optional)

How long have you been smoking? (in year) *

Short answer text

How frequently do you smoke? (Days/week) *

Short answer text

How many sticks do you smoke per day? *
For cigarette smoking

Short answer text

How many puffs do you smoke per day? *
For vaping and pipe smoking

Short answer text

Physical Activity Questionnaire

Description (optional)

During the last 7 days, how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling? (In days) *

(Vigorous physical activity means breathing hard and fast, and your heart rate is higher than moderate activity. You won't be able to say more than a few words without pausing for a breath)

Short answer text

During the last 7 days, how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or double tennis? (In days) *

(Moderate physical activity means working hard enough to breathe, raise your heart rate, and break a sweat. You'll notice that you'll be able to talk, but not sing the words to your favourite song)

Short answer text

During the last 7 days, on how many days did you walk for at least 10 minutes at a time? (In days) *

Short answer text

During the last 7 days, how much time did you spend sitting on a weekday? (In hours) *

(Sitting time include sitting in class and sitting using phone/ watch tv in house)

Short answer text

Section 3: International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms Module (ICIQ-MLUTS)

The International Consultation on Incontinence Questionnaire Male Lower Urinary Tract Symptoms Module is a tool used in evaluating male Lower Urinary Tract Symptoms and their impact on quality of life. The test is a list of 13 questions in which you rate your recurrence of the urinary symptoms on a scale of 0, never, to 4, all of the time. The total score for the first five questions scaled 0-20, indicates the voiding symptoms while questions 6 to 11 with a total score scaled 0-24 indicate incontinence symptoms. The last two questions are about nocturia and frequency. The scale estimates whether you are experiencing any LUTS symptoms.

Please answer the following questions based on your average performance over the last four weeks. by checking "never", "occasionally". "sometimes", "most of the time", or "all of the time".

Is there a delay before you can start to urinate? *

- ◯ Never
- ◯ Occasionally
- ◯ Sometimes
- ◯ Most of the time
- ◯ All of the time

Do you have to strain to continue urinating? *

- ◯ Never
- ◯ Occasionally
- ◯ Sometimes
- ◯ Most of the time
- ◯ All of the time

Would you say that the strength of your urinary stream is... *

- Normal
- Occasionally reduced
- Sometimes reduced
- Reduced most of the time
- Reduced all of the time

Do you stop and start more than once while you urinate? *

- Never
- Occasionally
- Sometimes
- Most of the time
- All of the time

How often do you feel that your bladder has not emptied properly after you have urinated? *

- Never
- Occasionally
- Sometimes
- Most of the time
- All of the time

Do you have a sudden need to rush to the toilet to urinate? *

- ○ Never
- ○ Occasionally
- ○ Sometimes
- ○ Most of the time
- ○ All of the time

Does urine leak before you can get to the toilet? *

- ○ Never
- ○ Occasionally
- ○ Sometimes
- ○ Most of the time
- ○ All of the time

Does urine leak when you cough or sneeze? *

- ○ Never
- ○ Occasionally
- ○ Sometimes
- ○ Most of the time
- ○ All of the time

Do you ever leak for no obvious reason and without feeling that you want to go? *

- Never
- Occasionally
- Sometimes
- Most of the time
- All of the time

Do you leak urine when you are asleep? *

- Never
- Occasionally
- Sometimes
- Most of the time
- All of the time

How often have you had a slight wetting of your pants a few minutes after you had finished urinating and had dressed yourself? *

- Never
- Occasionally
- Sometimes
- Most of the time
- All of the time

How often do you pass urine during the day? *

- 1 to 6 times
- 7 to 8 times
- 9 to 10 times
- 11 to 12 times
- 13 or more times

During the night, how many times do you have to get up to urinate, on average? *

- None
- One
- Two
- Three
- Four or more

APPENDIX E- VALIDATION FORM

Validator's detail:

Name	Muhammad Noh Zulfikri Bin Mohd Jamali
Department	Physiotherapy
Signature	
Date	29/10/2024

THE PREVALENCE OF LOWER URINARY TRACT SYMPTOMS (LUTS) AND ITS ASSOCIATED RISK FACTORS AMONG MALE UNIVERSITY STUDENTS

Please evaluate the questionnaire for the study stated above to establish its validity. You are required to assess using the scale stated below, please write the scale down.

Scale	Interpretation	Description
5	Very high valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 0-5%
4	High valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 8-10%
3	Valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 11-15%
2	Less valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 16-20%
1	Not valid at all	The questionnaire is valid and can provide unbiased data for the investigation, allowing 21-25%

Indicators	Scale
The indicators in the questionnaire consistently and accurately measure each variables of the investigation	2
The questionnaire fits with the variables under investigation, thus measuring what it intends to measure	4
The questionnaire has the capability to measure items of variables within a given time frame	2
The questionnaire has the ability to distinguish the characteristics or the properties of differing attributes of the subjects under study	2
The questionnaire has the ability to gather factual data, eliminating biases and subjectivity	2
Quick and complete data can be generated by the questionnaire within the time frame allowed to obtain the data	5
The questionnaire has no influence on the variables being measured Statement is not clear	
The questionnaire is framed in a clear, simple, in order to avoid risk of error	4
The questionnaire is capable of generating data that will be of value and practical use to the sectors concerned in the investigation	4

Responses for questions #3 and #13 onnwards should be should be in continuous data rather than categorical to be more accure and meaningful.

Further explaination e.g. definition of moderate intensity should be provided

#13 should consider the difference between response "No" and "I have never..."

Validator's detail:

Name	Arti a/p Vijai Kumar
Department	Department of Physiotherapy, MKFMHS
Signature	
Date	6/11/2024

THE PREVALENCE OF LOWER URINARY TRACT SYMPTOMS (LUTS) AND ITS ASSOCIATED RISK FACTORS AMONG MALE UNIVERSITY STUDENTS

Please evaluate the questionnaire for the study stated above to establish its validity. You are required to assess using the scale stated below, please write the scale down.

Scale	Interpretation	Description
5	Very high valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 0-5%
4	High valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 8-10%
3	Valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 11-15%
2	Less valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 16-20%
1	Not valid at all	The questionnaire is valid and can provide unbiased data for the investigation, allowing 21-25%

Indicators	Scale
The indicators in the questionnaire consistently and accurately measure each variables of the investigation	5
The questionnaire fits with the variables under investigation, thus measuring what it intends to measure	5
The questionnaire has the capability to measure items of variables within a given time frame	5
The questionnaire has the ability to distinguish the characteristics or the properties of differing attributes of the subjects under study	5
The questionnaire has the ability to gather factual data, eliminating biases and subjectivity	4
Quick and complete data can be generated by the questionnaire within the time frame allowed to obtain the data	5
The questionnaire has no influence on the variables being measured	5
The questionnaire is framed in a clear, simple, in order to avoid risk of error	4
The questionnaire is capable of generating data that will be of value and practical use to the sectors concerned in the investigation	5

Validator's detail:

Name	Nadia Safirah Rusli
Department	Physiotherapy
Signature	NSR
Date	12.11.2024

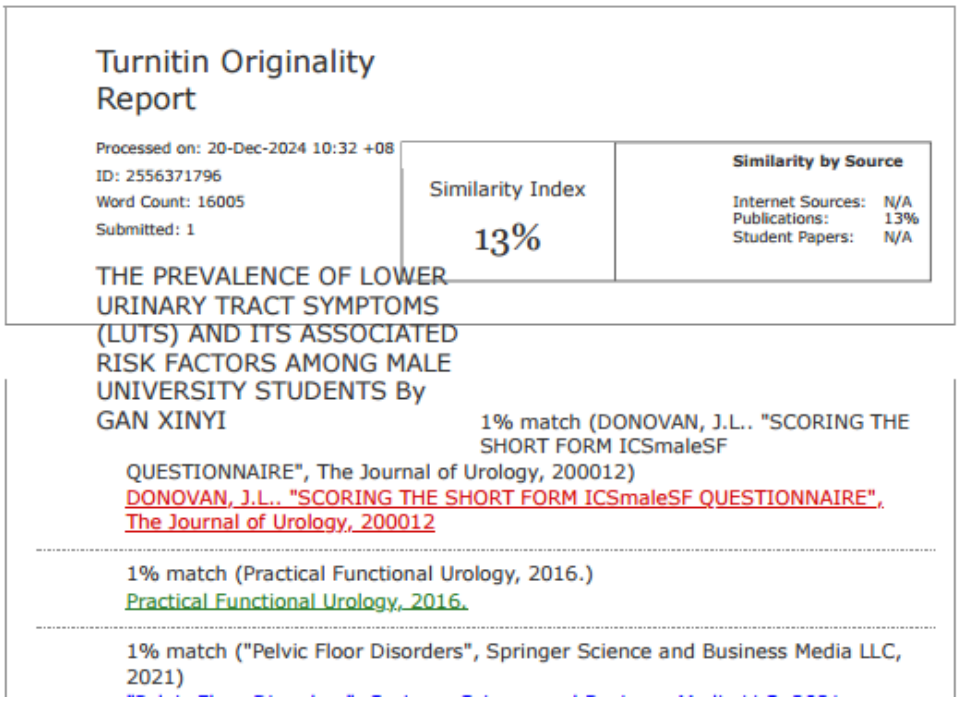
THE PREVALENCE OF LOWER URINARY TRACT SYMPTOMS (LUTS) AND ITS ASSOCIATED RISK FACTORS AMONG MALE UNIVERSITY STUDENTS

Please evaluate the questionnaire for the study stated above to establish its validity. You are required to assess using the scale stated below, please write the scale down.

Scale	Interpretation	Description
5	Very high valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 0-5%
4	High valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 8-10%
3	Valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 11-15%
2	Less valid	The questionnaire is valid and can provide unbiased data for the investigation, allowing 16-20%
1	Not valid at all	The questionnaire is valid and can provide unbiased data for the investigation, allowing 21-25%

Indicators	Scale
The indicators in the questionnaire consistently and accurately measure each variables of the investigation	4
The questionnaire fits with the variables under investigation, thus measuring what it intends to measure	4
The questionnaire has the capability to measure items of variables within a given time frame	4
The questionnaire has the ability to distinguish the characteristics or the properties of differing attributes of the subjects under study	3
The questionnaire has the ability to gather factual data, eliminating biases and subjectivity	4
Quick and complete data can be generated by the questionnaire within the time frame allowed to obtain the data	4
The questionnaire has no influence on the variables being measured	3
The questionnaire is framed in a clear, simple, in order to avoid risk of error	4
The questionnaire is capable of generating data that will be of value and practical use to the sectors concerned in the investigation	4

APPENDIX F – TURNITIN REPORT



Turnitin Originality Report

Processed on: 20-Dec-2024 10:32 +08
ID: 2556371796
Word Count: 16005
Submitted: 1

Similarity Index	Similarity by Source	
13%	Internet Sources:	N/A
	Publications:	13%
	Student Papers:	N/A

THE PREVALENCE OF LOWER URINARY TRACT SYMPTOMS (LUTS) AND ITS ASSOCIATED RISK FACTORS AMONG MALE UNIVERSITY STUDENTS By GAN XINYI

1% match (DONOVAN, J.L.. "SCORING THE SHORT FORM ICSmaleSF QUESTIONNAIRE", The Journal of Urology, 200012)
DONOVAN, J.L.. "SCORING THE SHORT FORM ICSmaleSF QUESTIONNAIRE", The Journal of Urology, 200012

1% match (Practical Functional Urology, 2016.)
Practical Functional Urology, 2016.

1% match ("Pelvic Floor Disorders", Springer Science and Business Media LLC, 2021)

APPENDIX G

TABLE OF CORRECTION AFTER EXAMINER'S FEEDBACK

Examiner's feedback	Amendment	Page & paragraph
Problem statement: Non-evidence based. **Introduction & Justification:** Acceptable, please add recent references though. More reasons / rationales should be added.	Added references	Pg 3, paragraph 2
Hypothesis: Formulate a hypothesis for Objective 3.	Formulated hypothesis for objective 3	Pg 5
Sampling method, inclusion/exclusion criteria: Sampling methods and criteria are appropriate, however, a total of 60 plus initially recruited participants were later rejected from the study on the grounds of them fitting exclusion criteria and hence not being able to achieve the target sample size. This reflects the student's misunderstanding of the concepts of the exclusion criteria and its application.	Listed in the limitation of this study	Pg 90, paragraph 1
Sampling method, inclusion/exclusion criteria: Content validity and reliability test could have been conducted.	Content validity and interpretation is added	Page 33, paragraph 1
Statistical analysis: Lack the justification for using the mentioned statistical tools. Validity analysis is not performed.	Added justification for using Chi-Square test	Page 37, paragraph 1
	Added normality test	Page 38, paragraph 2
Discussion: Should add more the relevant literatures for the future researchers, also to include the confounding factors. Can discuss modern	Added confounding factors	Page 89, paragraph 2

day methods of physiotherapy techniques for the future researchers. Should consider adding Malaysian, South Asian perspective context and practice references.		

Checked by supervisor,

Name: Siti Hazirah binti Samsuri

Date: 3/1/2025