TITLE PAGE

POST PARTUM URINARY INCONTINENCE AND ITS PREDISPOSING FACTORS IN ENUGU METROPOLIS

BY

CHUKWU, SYLVESTER CAESAR
PG/M.Sc./12/64043

Being an M.Sc. Dissertation Submitted to the Department of Medical Rehabilitation,Faculty of Health Sciences and Technology University of Nigeria Enugu Campus, in Partial Fulfillments of the Requirement for the Award of M.Sc. in Physiotherapy
(Obstetrics and Gynaecology)

SUPERVISOR: PROF G.C. OKOYE

SEPTEMBER, 2015.

APPROVAL PAGE

This M.sc Dissertation has been approved for the Department of Medical Rehabilitation Faculty of Health Sciences and Technology, University of Nigeria Enugu Campus

By

……	…….
PROF G.C. OKOYE	PROF. G.C. OKOYE
PROJECT SUPERVISOR	HEAD OF DEPARTMENT

é é é é é é é é é .
PROF. P.U. NWOHA
EXTERNAL EXAMINER

DEDICATION

This work is dedicated to my supervisor Prof. G.C. Okoye

ACKNOWLEDGEMENTS

My profound gratitude goes to my head of department, supervisor and father, Prof. G.C. Okoye, whose initiative and guidelines gave this project different outlook. To my beloved senior colleague and brother,Dr. S.E. Igwe for his unrelenting effort, advice and support which made this work a success. I wish to thank the Faculty of Health Sciences, post graduate representative, Dr. MarkOkeji for his assistance and guidance. I cannot fail to thank all my other colleagues,

especially Mrs. C.P. Ojukwu, Dr. Ezema Charlesand Dr. Ezeaku Israel for their wonderful support.

This work would have been incomplete without the effort of my dear mother,Mrs. Chukwu Mary, whose provision, support & prayer brought me this far.My appreciation goes to my sibling; Simon, Chukwudi, Onyeka, Ifesinachi and Chimaobi for being there for me always. To my beloved,ñAnyabuikeNkemPaschalineò for her wonderful effort, and my spiritual leaderPresidentOkekeDonatus and my daughter OkekeChidimma for their immerse love and prayers. I will never forget to say thanks to my friends and students; OgbonnayaChukwuebuka, Orji Ebube, OnyekaChiamaka(Maski), AgujiKosisochukwu, OnwukaEzinne, UmejiburuOluebube, ObuekweChineye, IfuduPriscillia, AnukwuChukwuka, Ugwa Wisdom, OliObunmneme, OforKanayochukwu, AguChidubem, UcheagwuEbuka, Ochi Christiantus, UgwuanyiIkenna for their immense effort which made this work easier. I will also not forget the effort of the former departmental secretary,MrsOchiagha Rose and her colleagues. May the good Lord bless all the subjects who participated in this study.

Above all, to God be the glory.

ABSTRACT

The aim of this study was to determine the prevalence of postpartum urinary incontinence and its predisposing factors in Enugu metropolis. The study adopted a cross sectional survey. A total of 864 postpartum mothers within the age range of 16 and 45 years, who gave their informed consent, were conveniently selected from the post-natal clinics of the nine public health institutions in Enugu metropolis. Women continence and pelvic health centre questionnaire was

adopted. The questionnaire sought information on the continence status of the subject. Body mass index, waist-hip ratio, percentage body fat and percentage body water was also determined. The major findings revealed high prevalent rate (59.7%) of postpartum urinary incontinence, especially in those without formal education (78.7%), those who were centrally obese (100%) and (74.1%) of those within the age of 36years and above. Result showed a significant association ($p<0.05$) between postpartum urinary incontinence and educational qualification, weight of the baby, parity, age of the mother, and obesity, and no significant association with mode of delivery ($p>0.05$). It was also observed that most women affected (96%) do not seek for medical attention, higher percentage of those who sought medical attention (2.2%) are not referred for physiotherapy intervention which was confirmed to be effective in this research. Based on the findings of this study, it could be concluded that; educational attainment, age of the mother, baby weight, parity and obesitymay be predisposing factors to urinary incontinence in postpartum mothers. It was thus recommended that there is a need to involve womenôs health physiotherapist in maternal care.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS

UI: Urinary Incontinence

SUI: Stress Urinary Incontinence

GSI: Genuine Stress Incontinence

PFM: Pelvic Floor Muscle

PFME: Pelvic Floor Muscle Exercise

CS: Caesarean Section

SVD: Spontaneous Vagina Delivery

BMI: Body Mass Index

ICS: International Continence Society

CPS: Clinical Problem Solving

OAB: Overactive bladder

OR: Odd Ratio

RCT: Random Control Trials

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Urinary incontinence (UI) is a common condition in pregnancy and postpartum. Urinary incontinence postpartum is a so called ñmixed bagò of incident urinary incontinence before pregnancy, incident urinary incontinence in pregnancy and incident urinary incontinence postpartum (Iosif, 1981; Nygaard, 2006) Risk factors for incident urinary incontinence at the different time points vary. For instance, mode of delivery; vaginal delivery, vacuum and forceps, are risk factors for incident UI postpartum compared to cesarean section (Glazener *et al*., 2006).There are more than a thousand published journal articles on urinary incontinence (UI) in pregnancy. Incidence and prevalence figures of urinary incontinence in association with pregnancy vary substantially. Not many reviews have focused solely on incidence and prevalence of urinary incontinence in association with postpartum. One report gives a range of prevalence of urinary incontinence in pregnancy from 32 to 64 % (Milsom et al., 2009). There are few published reviews on incident urinary incontinence postpartum; most of them being on a small number of studies. However, one systematically reviews (Thom & Rortveit, 2010) and few traditional reviews have been published on prevalence of urinary incontinence postpartum.

This study is geared at postpartum urinary incontinence and its predisposing factors. The International Continence Society (ICS) definitions and terminologies of urinary incontinence have been revised several times (Abrams et al., 1988; Abrams et al., 2002; Haylen et al., 2010). The current definition of urinary incontinence symptoms is ñComplaint of involuntary loss of urineò (Haylen et al., 2010). Urinary incontinence as the involuntary passage of urine occurs in the absence of a detrusor contraction, when the intra-vesical pressure i.e. the pressure

in the bladder, exceeds the maximum urethra pressure (Abrams et al., 1988). As earlier stated, urinary incontinence is a common complaint among pregnant women and postpartum which may persist long after delivery (Bok *et al.,*1989). Normally, nerves, ligaments and pelvic floor muscles work synergically to support the bladder and keep the urethra closed so that urine does not leak out (Delancey, 1994). Overstretching or injury to these structures during pregnancy or childbirth can reduce the effectiveness of these structures to function in ensuring urinary continence (Devis and Kumar, 2003).

Tincello et al., (2008) in their research on urinary incontinence among pregnant women observed that most women that suffer from incontinence before pregnancy or develop it during pregnancy are much likely to experience it after giving birth. Also some mothers develop the problem for the first time after giving birth while those who give birth vaginally are more likely to have the problem than women who deliver by caesarean section (Kargar, 2006). Furthermore, mothers who avoid labor altogether and have a scheduled caesarean section continue to have urinary incontinence after delivery and even some young women who have never been pregnant experience this condition (Sultan and Staton, 1996).

Some studies have shown that having an assisted vaginal delivery particularly with the use of forceps contributes to urinary problems after childbirth (Meyer et al., 1992), and having a prolonged labour or a large baby makes urinary incontinence more likely (Kargar, 2006). Women who are obese are about four times as likely to have urinary incontinence and smokers are at greater risk too (Elia & Bergman, 1993). Recent researches suggest that genetic predisposition may play a role as well (Elia & Bergman, 1993). The chance of having urinary incontinence is higher for mothers who have had many children although women who have reached menopause experience incontinence in similar numbers regardless of the number of pregnancies they had or the type of delivery (Wilson et al., 1980).

The study by Hojberg *et al.* (1999) showed that pregnancy is a risk factor to urinary incontinence. Joley (1998) reported that every woman is symptomatic to urinary incontinence. While Meyer *et al.* (1998), in their work, discovered that birth is a major risk factor for urinary incontinence mechanism and the pelvic floor characteristics. Furthermore, Morked and Bok (1999) also discovered significant difference between urinary incontinence severity before birth and after birth. Overactive bladder was seen as a factor for urinary incontinence (Stewart *et al.,* 2003).

Each year in the United States of America, billions of dollars is spent on incontinence related care, the estimated total national costs in 2007 for adults aged Ó 25 years was $65.9 billion, with projected costs of $76.2 billion in 2015 and $82.6 billion in 2020 (Economic burden of urgency urinary incontinence in the United State: a systematic review 2014). For cultural and social reasons, the prevalence of urinary incontinence is difficult to assess especially in the developing nations, but population based surveys indicated varying UI prevalence estimates with ranges of 1.8- 30.5% in European populations, 1.7- 36.4% in US populations and 1.5- 15.2% in Asian populations, with prevalence dependent on age (European Association of Urology, 2013).

There is a paucity of data and literature on postpartum urinary incontinence and its predisposing factors in Enugu Nigeria. Hence, the motivation for this research work which hopefully will shed some light about this disorder and its predisposing factors in this part of the country.

1.2 Statement of Problem

During childbirth, trauma to the pelvic floor muscle of the postpartum mothers may be due to prolonged delivery, instrumental delivery and episiotomy. The trauma and other factors such as age of the mother, parity, percentage body fat, percentage body water, body mass index and waistï hip ratio, may also result in

muscle weakness. These may predispose the mothers to urinary incontinence after child birth. Engaging and maintaining regular pelvic floor muscle exercise is one of the strategies that may help women in optimizing their continence status.

Most women are unaware of the importance of pelvic floor muscle exercise in the prevention of urinary incontinence. During the antenatal and postpartum periods it is the role of the womenôs health physiotherapist to teach correct practice and benefit of pelvic floor muscle exercise for full postpartum recovery as well as prevention of urinary incontinence. Considering studies done by Hannestad et al., 2003; Groutz *et* al., 2004; Goldberg *et al.,* 2005; Danforth et al., 2006, level of educational attainment was documented as one of the predisposing factors of UI postpartum. Based on the result of these studies, most postpartum mothers in Enugu metropolis are more likely to suffer incontinence due to low level of education among African women generally which may hinder the knowledge of prenatal exercise.

Some of the leading causes of urinary incontinence in postpartum mothers are laxity of the pelvic floor muscle and ligament, ignorance to the predisposing factors and inappropriate intervention measure by health care workers or the mothers themselves (Delancey, 1994; Devis and Kumar, 2003; Hannestad et al. 2003; Groutz *et* al., 2004, Goldberg *et al.,* 2005; Danforth et al. 2006).

For appropriate intervention to be initiated, baseline knowledge of the level of postpartum mothers affected by the condition has to be delineated.

1.3 Research Questions

In order to find solution to the problems enumerated above, the following research questions arose and need to be answered.

- What is the prevalent rate of urinary incontinence in women after childbirth in Enugu metropolis, with respect to level of educational qualification, baby

weight, parity, age of the mother, mode of delivery and obesity (BMI waist-hip ratio, percentage body fat and percentage body water)?

- What is the treatment measure taken by the affected mothers?
- Is there any significant association between urinary incontinence in postpartum mother and the following risk factors: level of educational qualification, baby weight, parity, age of the mother and mode of delivery?
- Is there any significant association between postpartum urinary incontinence and obesity using body mass index, waist-hip ratio percentage body fat and percentage body water as an outcome measure?
- What is the effect of physiotherapy intervention in the management of postpartum urinary incontinence?

1.4 Objectives of the Study

General objective

The general objective of this research was to investigate the prevalence of urinary incontinence in women after childbirth in Enugu metropolis and it association with some selected predisposing factors.

Specific Objectives

- To determine the prevalence of urinary incontinence in women after childbirth in Enugu metropolis, with respect to the following socio-demographic and risk factors related:

- Level of educational attainment
- Baby weight
- Parity
- Age of the mother
- Mode of delivery
- Obesity (BMI, waist-hip ratio, percentage body fat and percentage body water).

- To identify the treatment measure taken by the affected mothers.
- To ascertain the association between postpartum urinary incontinence and the following risk factors:

- Level of educational qualification
- Baby weight
- Parity,
- Age of the mother,
- Mode of delivery.

- To determine the association between postpartum urinary incontinence and obesity using body mass index, waist-hip ratio percentage body fat and percentage body water as outcome measures.

- To investigate the effect of physiotherapy intervention in the management of postpartum urinary incontinence?

1.5 Research Hypotheses

- There is no significant association between postpartum urinary incontinence and the following risk factors:

- Level of educational qualification
- Baby weight
- Parity
- Age of the mother
- Mode of delivery.

- There is no significant association between postpartum urinary incontinence and obesity using body mass index waist-hip ratio, percentage body fat and percentage body water as outcome measure.

- There is no significant difference in the strength of pelvic floor muscle of mothers suffering postpartum urinary incontinence after physiotherapy intervention.

1.6 Significance of the Study

Rehabilitation of women with urinary incontinence as a post-partum common complication is an aspect of physiotherapy in obstetrics and gynecology which much research work has not been done in this part of the world (Enugu state). It will be useful as an indicator for planning health services, because it will reflect the impact of the disease on the population. Therefore, a measure of prevalence can be used to project requirement such as health care personnel and specialized medical equipment. It can also play a vital role in government policy on maternal and child health care delivery, and when adequate measures are taken to reduce the incidence, the occurrence will be reduced to the barest minimum.

1.7 Delimitation of the Study

This research work is delimited to postpartum mothers within 1-9 months after child birth and are within 16-45 years, who came for postnatal clinic immunization in these hospitals in Enugu metropolis: University of Nigeria Teaching Hospital Enugu, Enugu state University Teaching hospital Parklane, Uwani health centre Amaigbo lane, Poly Clinic Ogui Enugu, Abapka Nike health center Abapka, Iji Nike health center Iji, Mother of Christ Ogbete, Saint Patrick hospital Ogui and Balm of Gilead hospital Mary land.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Literature review presented a critical review of available literature on prevalence of urinary incontinence in women after childbirth and its association with some selected predisposing factors. This review incorporated literature around the following theme:

- Conceptual framework
- Theoretical framework
- Review of empirical literature
- Summary of empirical literature

These themes provided a background for what has already been learned or written on this topic and how they apply to this research. These review highlighted deficits within literatures and may serve as orientation towards areas where further research needs to be done. Several strategies were employed to retrieve literature which includes manual searching of books, journal and use of electronic databases available in the internet.

2.1 Conceptual framework

This theme will provide information on the following concept below:

- Anatomy of the pelvis
- Physiology of muscle contraction
- Urinary incontinence and its management
- Childbirth and labor

2.1.1 Anatomy of the Pelvis

Pelvic Cavity

The pelvic cavity consists of the hip bone, sacrum and the coccyx. When they are articulated, they enclose to form a cavity. From the brim of the cavity the ala of

each illium projects up to form the iliac fossa, part of the part of the posterior abdominal wall. The pelvis brim is formed in continuity by the pelvic crest, pectineal line of the pubis, arcuate line of the ilium and ala and promontory of the sacrum. The line of the brim is oblique, lying at 60 degrees with the horizontal; the vagina is in the same plane. From the brim, the pelvic cavity projects back to the buttocks (Chaurasiaôs, 2010).

The Female Pelvic Cavity

The female pelvic cavity is broader than that of the male for easier passage of the fetal head. The female bones including the head of the femur are more slender than those of the males. These slender bones make a wide sub pubic angle which is rounded like a roman arch. Also there is less indentation of the outline by the sacral promontory and the brim is widest further forward (a transversely oval outline) (Chaurasiaôs, 2010).

Position of the Pelvis

In the erect individual the anterior superior iliac spines and the upper margin of the symphysis pubis lie in the same vertical plane. The upper margin of the symphysis pubis, the spine of the ischium and the tip of the coccyx, the head of the femur and the apex of the greater trochanter lie in the same horizontal plane. This plane passes through the pelvic cavity at a level with the tip of the finger of the clinician during rectal or vaginal examination (Chaurasiaôs, 2010).

The Pelvic Floor Muscles / Urogenital Diaphragm: The pelvic floor consist of a gutter shaped sheet of muscles, the pelvic diaphragm, slung around the midline body effluents (urethra and anal canal and in the female vagina). The muscles of the pelvis floor are:

- Levator ani
- The coccygeus and
- Connective tissue.

They arise in continuity from the body of the pubis, they form tendinous arch over the obturator fascia, and from the spine of the ischium and are inserted into the coccyx and the post anal plate. From their origin the muscle fibres slope downwards and backwards to the midline; the pelvic floor so produced is a gutter that slopes downward and faces forwards. The levator ani is made of the following:

- Illiococcygeus
- Pubococcygeus

Their fibres arise in continuity from the body of the pubis to the ischial spine across the obturator fascia, along a condensation of the fascia, the tendinous arch.

The pubococcygeus is made up of:

Puborectalis: The anterior fibres which form a óUô shaped sling which holds the anorectal junction angled forward.

Pubovaginalis (in female) and Puboprostate (in male): These are medial fibres passing backwards alongside the urethral sphincters and are inserted into the perineal body. In the male, it merges with the musculature of the prostrate while in the female they are attached to the muscles of the vagina.

Illiococcygeus: Some of its part arises from the posterior half of the tendinous arch and the pelvic surface of the ischial spine. It overlaps the pelvic surface of the coccygeus. Its insertion is into the side of the coccyx and the anococcygeal raphae.

The post anal plate: This is a layered muscolutendinous structure between the anal canal and the caudal part of the vertebrae column. It consists of above downwards, the presacral plate, the tendinous plate of pubococcygeus, the

muscular raphae of iliococcygeus and the posterior parts of the puborectalis and the external and sphincter (Chaurasiaôs, 2010).

The coccygeus also known as ischiococcygeus arises from the tip of the ischial spine. Its fibres fan out and are inserted into the side of the coccyx and the lowest part of the sacrum.

Nerve Supply to the Pelvic Floor Muscle

Levator Ani is mainly supplied from the sacral plexus by branches S3 and S4. Some of their somatic fibres may travel in or very close to the pelvic splachnic nerves (Chaurasiaôs, 2010). Puboretalis may be supplied from below by the perineal branch of S4 and the inferior rectal branch of the pudendal nerve. Coccygeus is supplied by perineal branches of S3 and S4 (Chaurasiaôs, 2010).

Action of Pelvic Floor Muscle

- They support the pelvic viscera and retain them in their normal positions (Chaurasiaôs, 2010).
- They counteract increased intra-abdominal pressure by contracting during coughing, sneezing, and muscular effort like lifting.
- The pelvic floor muscle relaxes during defecation, thus aiding defecation.
- The pubovaginalis assist the urethral sphincter to close at the end of micturition in the female.
- In parturition, the pelvic floor muscles direct the fetal head to the pelvic outlet.

The degree of stretching to which the muscular and fibrous parts of the floor are subjected to renders it liable to damage by tearing (Chaurasiaôs, 2010).

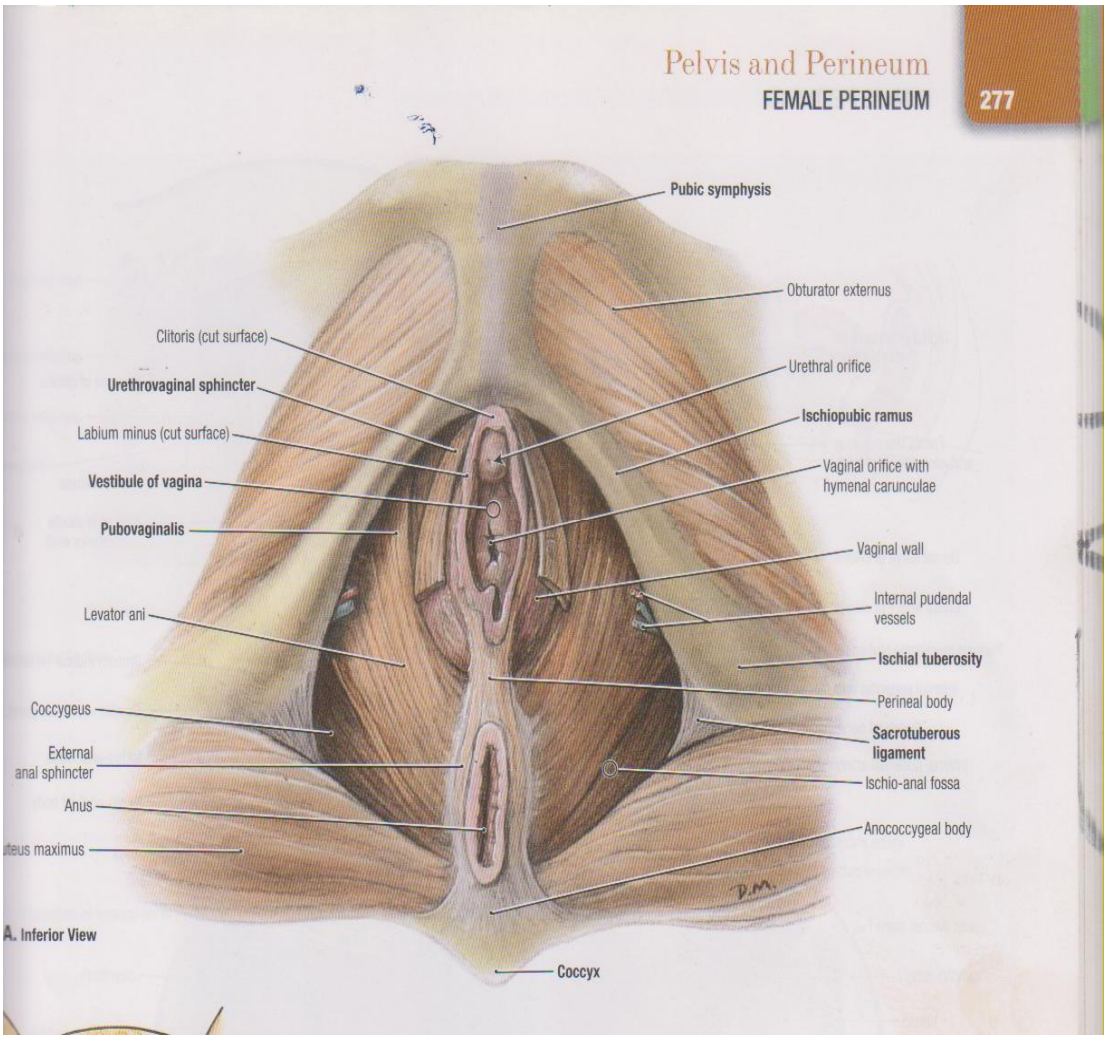

Fig 1: Female Perineum

Source: Grant's Atlas of Anatomy 13th edition 2013.

Clinical Significance

In women, the levator muscles and their supplying nerves can be damaged in pregnancy or childbirth. This occurs more commonly after a normal vaginal delivery but can also occur following a caesarean section. There is some evidence that these muscles may also be damaged during hysterectomy. Also damage to the pelvic floor not only contributes to urinary incontinence but can lead to pelvic organ prolapse.

Pelvic organ prolapse occur in women when pelvic organ protrude into or outside of the vagina. The causes of pelvic organ prolapse are similar to those of urinary incontinence. This includes inappropriate (asymmetrical, excessive, insufficient) muscle tone and asymmetries caused by trauma to the pelvis. Age, childbirth, family history and hormonal status all contribute to the development of pelvic organ prolapse. The vagina is suspended by the attachment to the perineum, pelvic side wall and sacrum via attachment that include collagen, elastic and smooth muscle.

The repair of lost vaginal support may involve surgery. Disorders of the posterior pelvic floor include rectal prolapse, rectocoele. Perineal hernia and a number of functional disorders including anismus, constipation due to any of these disorders is called ñfunctional constipationò and is identifiable by clinical diagnostic criteria.

2.1.2 Physiology of Muscle Contraction

Skeletal muscle is made up individual muscle fibres that are the building blocks of the muscular system (Ganong, 2005). The muscle fibres are arranged in parallel between the tedious ends so that the force contraction of the units is addictive. Each muscle fibre is a single cell that is multinucleated, long, cylindrical and surrounded by a cell membrane, the sacrolemma.

The muscle fibres are made up of myofibrils which are divisible into individual filament. The filaments are made up of contractile proteins. The contractile mechanism of the skeletal muscle depends on the following proteins:

- Myosin 11 (molecular weight 460,000).
- Actin (molecular weight 43,000).
- Tropomysin (molecular weight 70,000).
- Troponin which is made up of 3 sub-units; troponin I, troponin T and Troponin C with molecular weight ranging from 18,000 to 35,000.

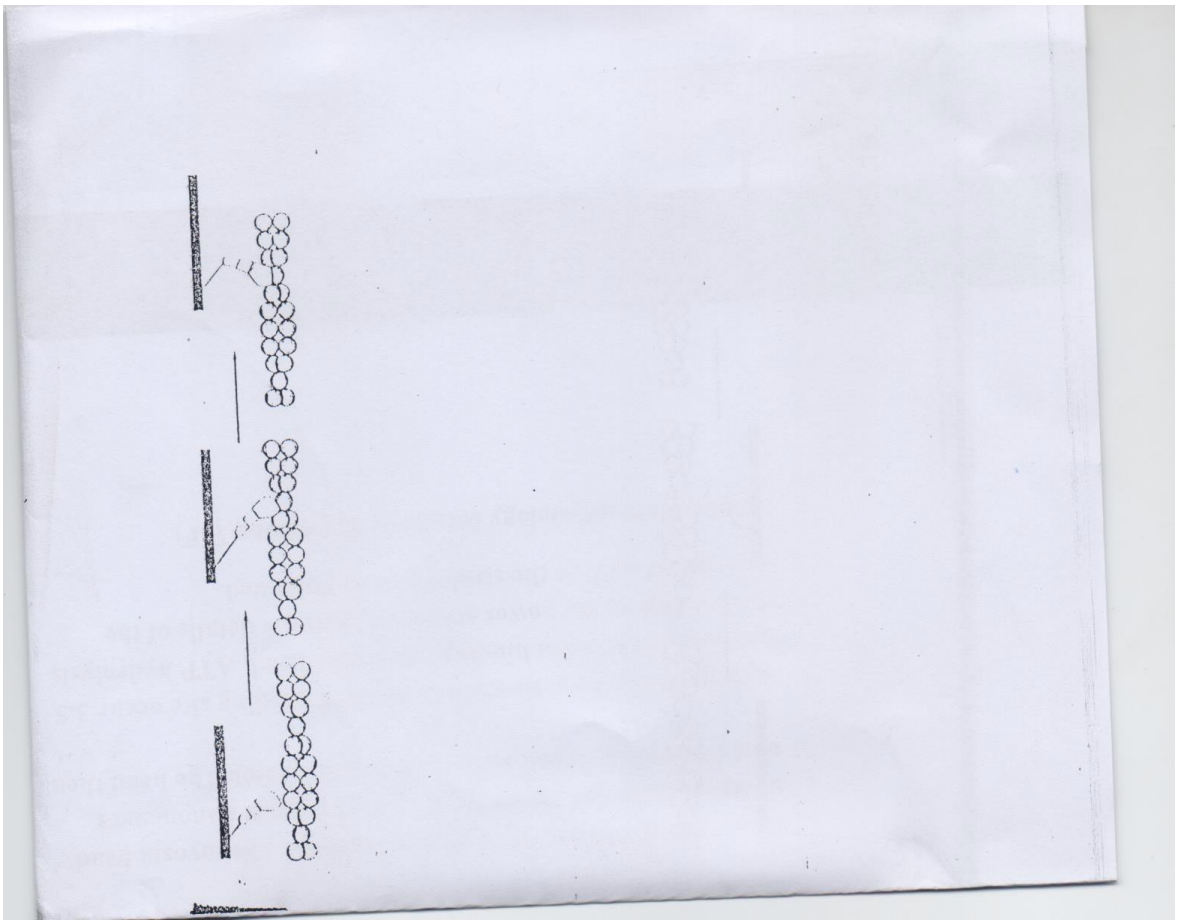

Fig 2: Physiology of Muscle Contraction
(called from physiology text book by Ganong WF)

Power Stroke of Myosin in Skeletal Muscle

The myosin head detaches from the actin (top), moves several nanometers along the actin strand and reattaches (middle). The head then flexes on the neck of the myosin molecule (bottom), moving the myosin along the actin strand. An ATP binding site occurs 3.5mm behind the actin building site on the head. ATP hydrolysis occurs during the power stroke, though the details of the relation of ATP to the stroke remain unsettled.

Molecular Mechanism of Muscle Contraction

The process by which the shortening of the contractile elements in muscle is brought about by a sliding of the thin filaments over the thick filaments. The

width of the A band is constant whereas the Z lines move closer together when the muscle contracts and further apart when it is stretched (Ganong, 2005). The sliding during muscle contraction occurs when the myosin heads bind firmly to actin, bend at the junction of the head with the neck and then detach. Many heads cycle at or near the same time and they cycle repeatedly, thereby producing gross muscle contraction. Each power stroke shortens the sacromere about 10mm. each thick filament has about 500 myosin heads and each head cycles about five times per second during rapid contraction. The process by which deplorization of the muscle fibre initiates contraction is called excitation ï contraction coupling (Ganong, 2005).

Fibre type of pelvic floor muscles

Although skeletal muscles fibres resemble one another in a general way, skeletal muscle is a very heterogeneous tissue made up of fibres that vary in myosin ATPase activity, contractile speed and other properties (Ganong, 2005). Generally muscle fibres are divided into 2 main types:

- Fast muscle fibres.
- Slow muscle fibres (Guyton and Halls, 2000).

OR

- Type 1 muscle fibres.
- Type 11 muscle fibres (Ganong, 2005).

Fast fibres or type 11 fibres: They are large fibres with great strength of contraction, extensive sarcoplasmic reticulum, large amount of glycolyic enzymes, less extensive blood supply and fewer mitochondria. They are also called white muscles.

Slow Fibres or Type 1 Fibres: They are smaller fibres, innervated by smaller nerve fibre, more extensive blood vessel and capillary supply, great numbers of

mitochondria and large amount myoglobin. The slow muscle fibres have a high proportion of slow oxidative muscle fibres.

2.1.3 **Urinary Incontinence and its Management**:

The pelvic floor muscle has been shown to be involved in the maintenance of incontinence during episodes of increased intra-abdominal pressure (Dalency, 1994), for example during coughing, running, laughing etc. The international continence society defined urinary incontinence as the ñinvoluntary loss of urine which is objectively demonstrable and is a social and hygienic problem (Abrams et al, 1988). Urinary incontinence in general is of two kinds.

- That related to abnormalities of the storage phase.
- That related to abnormalities of the voiding phase.

The concept of UI can also be defined based on:

- symptoms (a morbid phenomenon or departure from the normal in structure, function, or sensation, experienced by the woman and indicative of disease or a health problem) (Abrams *et al*., 1988; Abrams *et al.*, 2002; Haylen *et al*., 2010).
- Signs (observed by the physician to verify symptoms and quantify them) (Abrams *et al*., 1988; Abrams et al., 2002; Haylen *et al.*, 2010).
- Urodynamic findings (observations made during urodynamic studies) (Abrams *et al*., 2002).
- Conditions (the presence of urodynamic observations associated with characteristic symptoms or signs and/or non-urodynamic evidence of relevant pathological processes) (Abrams *et al*., 2002)

The ICS definitions and terminologies of UI according to the above descriptions have been revised several times (Abrams *et al*., 1988, Abrams et al., 2002; Haylen

et al., 2010). The current definition of UI symptoms is ñComplaint of involuntary loss of urineò (Haylen *et al*., 2010).

Storage Phase

1. Stress Incontinence: This is when urine leaks because of sudden pressure on the abdominal muscles such as when coughing, laughing, lifting or exercise. Stress incontinence usually occurs when the pelvic muscles are weakened for example by childbirth or surgery. This is common in women.

2. Urge Incontinence: This occurs when the need to urinate comes on very suddenly often before getting to a toilet. The body may only give a warning for a few seconds before urination starts. Urge incontinence is common in the elderly and may be a sign of urinary tract infection or overactive bladder.

3. Functional Incontinence: This type occurs when there is normal urine control but trouble getting to the bathroom in time. Arthritis or other disease that limit movement can be the limiting factor for not getting to the toilet on time.

4. Mixed Incontinence: This is a mixture of more than one type of the incontinence listed above.

5. Bypass: This is related to anatomic abnormalities that bypass the urethral sphincter mechanism (e.g., vesicovaginal fistula, urethra diverticulum, ectopic ureter).

Voiding Phase

Overflow Incontinence: This is an uncontrollable leakage of small amount of urine. It is caused by overfilled bladder. There is the feeling of not being able to empty the bladder all the way and straining of urination. This occurs often in men and is caused by something blocking the urinary flow such as enlarged prostate gland or tumor. Diabetic complications such as neuropathy and myopathy may cause this problem.

Bladder Control Mechanism for Urination and Micturition Reflex

The bladder stores urine until the accumulated urine stretches the bladder to a significant degree to trigger the reflexes that will result in urination. With the relaxation of the external urethral sphincter, increase in abdominal pressure and contraction of the detrusor muscle, urine will be passed out when the situation is acceptable. This process seems quite simple but is made of up various phases that contribute to both voluntary and involuntary bladder control

Filling of the Bladder and the Micturition Reflex

The ureters carry urine from the kidney to the bladder. It penetrates the detrusor muscle of the bladder wall, which can also compress the ureters during urination to prevent urine from the bladder emptying into the ureters (vesicoureteral reflux). As urine collects in the bladder, the pressure rises slightly but once more than 300 milliliters accumulates in the bladder, the pressure rises rapidly. Stretch receptors in the bladder wall, internal urethral orifice and posterior urethra sends signal back to the spinal cord by the way of the sensory fibers of the pelvic nerve. Once the stretching reaches a certain point, it triggers the micturition reflex.

Motor impulses travel through the parsympathetic nerve fibers in the pelvic nerves (mainly from S2 and S3 of the sacral spinal cord) and synapse with short postganglionic nerves in the bladder wall. These nerves in turn innervate the detrusor muscle. The detrusor muscle contracts and relaxes almost immediately causing sudden peaks and dips known as the micturition wave.

As the bladder fills up further, the frequency and intensity of the micturition reflexes increase substantially. Eventually this leads to period of sustained contraction of the detrusor muscle which leads to the typical urgency to urinate. If urine is not passed out at this time, the process subsides for a few minutes to an hour and then starts again. http://www.healthhype.com/bladder-control-mechanism-for-urination-and-micturition-reflex.html

Bladder Control by the Brain

The micturition reflex can also trigger a second reflex that inhibits the tonic contraction of the voluntary external urethral sphincter through impulses via the pudendal nerve. This occurs once the bladder is distended to a significant degree. However impulses from the brain can inhibit this secondary action of the micturition reflex. This allows a person to find a suitable setting to urinate.

In addition, the brain can also directly act on the external urethral sphincter to maintain its contracted state and prevent urination despite the effects of the micturition reflex. When the situation is suitable, the higher centers can then relax the external urethral sphincter and stimulate the micturition reflex to commence urination.

Voluntary Urination

Even though a person may voluntary prevent urination despite the urging, eventually the bladder has to be emptied or voluntary control measures will fail. In a suitable setting, a person increases the pressure on the bladder by contracting the abdominal muscles, this forces urine into the bladder neck thereby stretching its wall further. The micturition reflex occurs again and without interruption by the higher centers, the muscles of the external urethral sphincter relax and urine is expelled into the environment

Pathophysiology

Currently, the pathophysiology of urinary incontinence is considered to be multifactorial. The main explanations involve the pelvic supportive structures because of aging or birth trauma or defects in collagen composition (Elia, 1999). They include:

Muscle Weakness: Delancey (1994), after meticulous dissection of female cadavers and study of biomechanical models, has formulated the ñhammock

hypothesisò. He suggests that the vaginal wall and the endopelvic fascia support the urethra and bladder neck like a hammock, attaching laterally to the tendinous insertion of the levator ani muscle (arcus tendineus fasciae pelvis, also called the ñwhite lineò of the pelvis). These structures may provide a posterior support against which the urethra is compressed in the presence of increased intra-abdominal pressure. If this support weakens, increased pressure will cause the urethra to descend and open, resulting in incontinence.

The anatomic support of the pelvic organs provided by the elevator ani is particularly important in humans because of bipedal posture. The chronic pressure of gravity on the pelvic support is acutely increased during daily activities such as coughing, sneezing and exercises.

Neuromuscular Damage: Another proposed cause of urinary incontinence is neuromuscular damage. Studies on nerve conduction have found substantial denervation at the level of the pelvic muscles in women who have given birth by vaginal delivery (Snooks et al., 1985; Schussler, 1994; Allen et al., 1990; Foldspang, 1992). The aging of neuromuscular structures is thought to play a role in the development of pelvic floor support dysfunction or to unveil a subclinical deficiency. The proved (although not consistent) efficacy of pelvic muscle exercises appears to confirm this theory (Bo K et al., 1990; Elia and Bergman, 1993).

Weakened Collagen: One more factor that has been thought to affect the development of urinary incontinence and pelvic relaxation is the collagen composition in the supportive structures of the pelvis. In one study, six women who had stress urinary incontinence were found to have weaker collagen than eight normal controls (Bergman et al., 1994). This observation seems to place urinary incontinence in the category of genetic disorders. The composition and strength of collagen is also affected by the presence of estrogens. Lack of estrogen, as in menopause, results in weaker collagen (Brincat et al., 1987).

Estrogen deficiency alone, however, does not explain the occurrence of urinary incontinence. A study (Karram et al., 1989) of young women who had premature ovarian failure did not reveal a significant difference in urodynamic parameters before and after estrogen replacement. It appears that aging of the neuromuscular structures is an element in the development of urinary incontinence, and that pelvic ligamentous supportive structures work in concert with the muscles and nerves to provide continence. Hormonal milieu and genetic predisposition also probably play a role in the development of urinary incontinence.

Incidence of Urinary Incontinence Postpartum

According to Iosif (1981) and Nygaard (2006), UI postpartum is a so called ñmixed bagò of incident UI before pregnancy, incident UI in pregnancy and incident UI postpartum. Risk factors for incident UI at the different time points vary. Mode of delivery; vaginal delivery, vacuum and forceps, are risk factors for incident UI postpartum compared to cesarean section (Glazener *et al*., 2006). Cross-sectional studies on incident UI postpartum must rely on maternal recall of UI status during pregnancy. Several large cross-sectional studies have data on incident UI postpartum. A large population based cross-sectional study from USA investigated incidence of UI postpartum among 5,599 primiparous women (Boyles *et al*., 2009). The incidence of UI 6 months postpartum was 10 %. About 25 % of the study population had delivered by cesarean section, which might explain the low incidence. Glazener *et al* (2006) published in 2006 cross-sectional data on incident UI in pregnancy among 3,405 primiparous women with mean age of 25 years. They found an incidence of UI 3 months postpartum of 15 %. Wilson *et al.*, (1996) used questionnaires to investigate incident UI postpartum among 1,505 women who were resident in the Dunedin area, New Zealand. The incidence of UI 3 months postpartum was 12 % and 21 % among primiparous and parous women, respectively. Prospective data on incident UI among 595 primiparous Canadian women 6 months postpartum by a validated questionnaire

showed an incidence of any UI of 26 % (Farrell *et al.*, 2001). The use of a research nurse to clarify and complete the questionnaire with each participant might explain the high incidence. Several Scandinavian cohort studies have reported incidence of UI postpartum; in the 30 years old Swedish cohort of 1,411 primiparous women, 19 % reported incident stress UI 6 months postpartum (Iosif, 1981). Wesnes et al (2009) found a similar incidence of any UI 6 months postpartum (21 %) among 12,679 primiparous women who were continent before pregnancy. Eliasson et al. (2005) found an identical incidence of UI 12 months postpartum among 665 Swedish primiparous women. In a smaller Danish cohort of 305 primiparous women Viktrup et al. (1992) found an incidence of stress UI of 7 % 3 months after vaginal delivery. Mode of delivery affects the incidence estimates, as study populations with high CS rate is likely to report lower incidence of UI postpartum. Prolonged pressure from babyôs head and trauma as baby passes through the vaginal canal may affect the pelvic floor and urethral support.

Prevalence of urinary incontinence postpartum

Vaginal delivery is an important and well documented risk factor for UI postpartum, also when compared with cesarean section. If a woman delivers by caesarean section only, a protective effect on UI compared with vaginal delivery is documented 12 years after delivery (MacArthur *et al.*, 2011). The population based cross sectional EPINCONT study found that women aged 50ï 64 years who had delivered by cesarean section or vaginal only had similar UI prevalence, suggesting that any protection from caesarean section might be lost with advancing age (Rortveit *et al.*, 2003). UI after delivery may affect women for the rest of their lives. Several studies have presented data on the long term prognoses of UI postpartum. Farrell found that prevalence of UI did not change from 6 weeks postpartum to 6 months postpartum (Farrell *et al.*, 2001). A six year follow up study concluded that 24 % of the women had persisting UI from 3 months

postpartum to 6 years postpartum (MacArthur *et al*., 2006). A 12 year prospective study indicates that onset of UI in pregnancy or postpartum increased the risk for UI 12 years later (Viktrup *et al*., 2006). A systematic review found only small changes in prevalence of UI over the first year postpartum (Thom & Rortveit, 2010). As prevalence figures of UI postpartum appear to be stable, time point of data collection postpartum may be of less importance. A large questionnaire based cross-sectional study of 5,599 primiparous American women investigated prevalence of UI postpartum (Boyles *et al*., 2009). The prevalence of any UI was 17 % 6 months postpartum. A similar questionnaire based cross-sectional study was performed in Turkey (Ege *et al*., 2008). One year postpartum, 20 % of the parous women had UI. Stress and mixed UI were most common types of UI. A large cohort study on 2,390 Swedish women recruited in pregnancy assessed stress UI at 2 and 12 months postpartum by questionnaire (Schytt *et al*., 2004). Data was linked to the Swedish birth registry. The authors found that 18 % of primiparous women and 24 % of multiparous women had stress UI 12 months postpartum. The largest study (by 2011) on UI during pregnancy and postpartum found a prevalence of UI of 31 % among 12,679 primiparous women 6 months postpartum. All the participants were continent before pregnancy (Wesnes *et al*., 2011).

Causes of Urinary Incontinence

There is a growing interest in the causal factor for pelvic floor disorders. These conditions include pelvic organ prolapse and urinary and faecal incontinence these are affected by a myriad of factors that increase occurrence of symptomatic diseases. Unraveling the complex causal network of genetic factors, birth induced injury, connective tissue ageing, lifestyle and co morbid factors which is challenging. Factors affecting pelvic floor function can be classified into 3 major phases.

1. Development of functional reserve during an individual growth.

2. Variation in the amount of injury and potential recovery that occur during and after vaginal birth.
3. Deterioration that occurs with advancing age.

Others include, thinning and drying of the skin in the vagina or urethra especially after menopause. For men, enlarged prostate gland or prostrate surgery, weakened and stretched pelvic muscles after childbirth, certain medicines, buildup of stool in the bowels, overweight and obesity which increases pressure on the bladder and muscles that control the bladder, urinary tract infections, vascular disease, diseases such as diabetes, Alzheimerôs disease and multiple sclerosis.

Evaluation

Symptoms of urinary incontinence should be evaluated in the context of the general health and lifestyle of each patient. Clinically significant urinary incontinence may be related in younger women to increased physical activity. For example, a teenager involved in competitive sports may have occasion urinary incontinence during strenuous training, whereas her more sedentary friends may not have the problem. On the other hand, physical fitness and mobility in older individuals may help prevent incontinence.

History

Studies on incontinence confirm vast majority of urine during other activities, such as routine daily activities (Bo K. *et al*., 1989; Niggard, Delancey and Arnsdorf, 1990). Accordingly, evaluation of women who have urinary incontinence during exercise should include assessment of the impact of incontinence on their daily coughing, sneezing, walking, standing up and lifting in addition to exercising. Women may have symptoms of stress incontinence only on an associated sudden, strong need to void (urgency) with loss of urine (urge incontinence). Any history of urgency is important because, in such patients, cystoscopy with urodynamic testing may be necessary. The medical history may

disclose information such as the use of diuretics or alpha or beta blockers. A history of chronic obstructive pulmonary disease, neuropathy or diabetes mellitus is also of great importance, although rare in a younger population (Elia *et al*., 1999).

Voiding Dairy

Often underestimated is the social history. Knowing the time and amount of caffeine or alcohol intake maybe essential in the treatment of urinary incontinence and other urinary problems. Therefore, an invaluable tool to obtain a more objective picture of the patientsô voiding and drinking habits as well as the frequency of incontinence episodes is the voiding diary. This should be completed over 1 week, but since many women find that length of time difficult, 2 or 3 days may be a good compromise. The voiding diary should include calculation of total fluid intake, amount and type of beverages (coffee, soda, juice, etc), volume voided and number and circumstances of incontinence episodes (Elia *et al*., 1993).

Physical Examination: Whether sedentary or active, women who have urinary incontinence should be evaluated for anatomic and structural derangement of the pelvic supportive structures. After a detailed history, a urine dipstick test is necessary to screen for infection or other bladder or renal pathology. Bladder catheterization should then be performed not more than 5 minutes after voiding to measure the post void residual and thus rule out voiding dysfunction. To rule out a subclinical neuropathy, a neurologic exam targeted to the assessment of the S ï 2 through S ï 4 levels of the spinal cord should be performed. This is easily achieved by testing pinprick, pressure and vibration sensation in the vulva, perineum and inner thighs and by assessing the anal and clitoral reflexes. Genital organ estrogenization and degree of pelvic relaxation, if any, should also be evaluated.

During the pelvic examination, care should be taken to assess the strength of the levator ani and the patientôs ability to contract the pelvic floor muscles without using accessory muscles and without performing Valsalvaôs maneuver. This information can be very helpful in deciding if a subject is a candidate for pelvic floor muscle exercises. A scale using grades 0 to 5 has been developed for a more objective assessment of the power of the pelvic floor muscles. Grades are assigned from findings as follows: no contraction= grade 0, flicker= grade 1, weak= grade 2, moderate= grade 3, good= grade 4; or strong contraction= grade 5 (Schussler, 1994). In a woman who has stress urinary incontinence, the loss of urine can be objectively demonstrated with a cough stress test. The patient is asked to cough while in a standing position with a full bladder. The diagnosis is made by observing loss of urine from the urethra exactly at the time of the cough.

This assessment and the urine loss reported in the voiding diary should be sufficient to quantify the severity of the problem. When a more precise assessment is required, as for research purposes, a pad test is necessary (Abrams *et al.,* 1990). This is done by measuring the changed weight of a pad that the subject has been wearing during standard activity for 1 hour. Although accurate in a laboratory setting, this test was found to have a 68% error in clinical practice (Wilson, *et al*., 1980). This basic evaluation will be sufficient to start a management plan. If the patient reports irrigative symptoms such as urgency, frequency, or dysuria in the sense of urinary infection, an urethrocystoscopy may be warranted.

A stronger indication for urethrocystoscopy is the association of the above symptoms with microscopic hematuria or a history of smoking. Further evaluation with urodynamic tests is necessary with failure of conservative management, severe pelvic relaxation with urogenital prolapse at the level of the vaginal introits or lower, previous anti-incontinence surgery, history of radiation therapy, history or physical findings of neurologic dysfunction or when surgical correction is planned (Bo k *et al.,* 1994).

Treatment

Treatment for urinary incontinence should be based on the main symptoms of the individual patient. If the main problem is urinary incontinence during exercise, lifestyle measures and various devices may help. Pelvic muscle strengthening is also helpful for many patients with stress urinary incontinence, whether the condition is exercise related or not (Elia *et al.,* 1993).

Lifestyle Measures

Voiding before starting exercise is practiced by many women with incontinence. In some patients, however, a voiding dysfunction may be present as indicated by a high post void residual and such patients do not gain any benefit unless they perform self-catheterization after voiding. These patients should be referred for urodynamic testing (Elia *et al.,* 1993). Avoiding coffee and other caffeinated beverages for 2 to 3 hours before exercise will prevent dieresis, thus decreasing bladder filling. Some women tend to dramatically reduce their fluid intake before exercise. This habit should be strongly discouraged because it may cause severe complications from dehydration (Sherman *et al.,* 1997).

Intravaginal Support Devices: Intravaginal support devices can be used during exercise or at other times as necessary. In two clinical trials (Bhatia *et al.,* 1983; Niggard, 1995), intravaginal pes-sary use was found to vary in effectiveness from 36% to 83% individuals participating (5 of 14 and 10 of 12). The use of a vaginal tampon was found to be effective in 57% of subjects (8 of 14) (Niggard, 1995). Success with the use of intravaginal devices, whether tampon or pes-sary, was correlated with the severity of urinary incontinence as measured by pad test (Niggard, 1995). An innovative intravaginal device is the intro-bladder neck support prosthesis (UroMed Corporation. Needham, Massachusetts). This device resembles a pes-sary but has two projections that fit under the urethra to support it. The device was effective in 83% (25) or 30 physically incontinent active women involved in a clinical trial (Davila & Oysterman, 1994). The hammock

theory may explain the success of intravaginal devices for preventing urinary incontinence during exercise. These devices support the urethra and bladder neck preventing descending of these structures and reconstituting the continence mechanism. Unfortunately, this type of treatment is not universally effective.

Barrier Devices: Among the most recent treatment options for stress urinary incontinence during exercise are three barrier devices. Impress Softpach (UroMed, Needham, Massachusetts), FEMASSIST personal urinary control device (Insight Medical Corporation, Bolton, Massachusetts) and CapSure continence shield (Bard Urological Division, Covington, and Georgina) These disposable devices are placed at the external urethral meatus and kept in place by an adhesive surface (impress) or by suction (FemAssist and CapSure). They prevent urine loss by obstructing the external urethral meatus; the devices must be removed to void.

Pelvic Muscle Strengthening: Pelvic muscle exercises are a well-established treatment option for urinary incontinence and are effective in 50% of women with urinary incontinence (Elia *et al*., 1993). Exercise can be stopped without definite diagnosis so long as overflow incontinence is ruled out (Elia *et al.*, 1993). To do so, a post void residual measurement may be sufficient.

Contraction Exercises*:* The goal of pelvic muscle contraction exercises is to increase the tone and strength of the levator ani. For best results, patients should be instructed during the pelvic examination and should be involved in a program of close follow up and practice under observation at office visits (Morkved & Bo k, 1997).

Many methods of doing the exercise exist but the method favoured most, consists of a series of five second contractions followed by 10 seconds of relaxation, performed for 10 minutes, four times a day (Sampselle, *et al.,* 1998). This is an intensive program that should be continued for 3 months with frequent office visits. If the results are satisfactory, a maintenance regimen of exercises once or

twice a day should be continued indefinitely. It is essential to make sure that the pelvic muscle contraction is performed without Valsalva maneuver or accessory muscle involvement (Elia, *et al*., 1993).

Vaginal Cones*:* The use of vaginal cones is also aimed at strengthening the levator ani (Haken *et al.,* 1991). The patient buys a set of cones of the same size but different weights. She is instructed to start with the lightest cone and hold it in the vagina for about 20 minutes once or twice a day. As her levator ani becomes stronger she uses heavier cones. This method has the advantage of requiring less instruction and reinforcement, but it can be used only in a private environment.

Biofeedback*:* Another technique is biofeedback (Burgio *et al.,* 1986), a signal that makes the individual aware of physiologic changes in response to a voluntary action. The simplest biofeedback technique is a statement about the strength of the patientôs contraction of the pelvic floor muscles, made by the examiner during a pelvic examination. Slightly more sophisticated feedback is achieved with a perineometer. This instrument measures increased intravaginal pressure in response to pelvic muscle contraction. The measuring probe is a small cylindrical balloon placed in the vagina. The pressure gauge is placed in front of the patient so that she can observe the magnitude of her effort. More complex biofeedback units measure electrical changes in pelvic muscle fibres and display the data on a high resolution monitor.

Electrical Stimulation*:* This is a relatively new technique for the treatment of urinary incontinence. It usually involves a device that is inserted into the vagina and delivers a faradic current whose amplitude and frequency can be adjusted according to patient sensation and comfort. The current causes an involuntary contraction of the pelvic floor muscles, allowing retraining and strengthening of the structures. The results with this technique have been reported to be promising (Sand *et al.,* 1995; Meyer, et al., 1992).

Beyond Conservative Treatment

If a diagnosis of urinary incontinence has been confirmed and conservative management has been unsuccessful, and if further treatment is desired, surgical management should be discussed extensively with the patient (Mc Ewan, 2006).

2.1.4 Childbirth/Labour

Child bearing is an established risk factor for urinary incontinence among young and middle aged women (Sottner, 2006). It has been suggested that vaginal delivery is the main contributory factor possibly because of damage to the important muscle tissue or nerves. However, pregnancy itself may cause mechanical, hormonal changes or both that can lead to urinary incontinence (Sottner, 2006). Labour and delivery is the focus and climax of the reproductive process. They are both a physical and emotional challenge for the mother and a hazardous journey for the fetus (Baker & Louise, 2011). There is interplay between the ñpowersò of the uterus (contraction), the ñpassagesò of the birth canal (the bony pelvis and the pelvic floor muscle and the perineum) and the ñpassengerò (the fetus) (Baker & Louise, 2011).

The Process of Labour

The Onset of Labour

This is defined as regular contraction bringing about progressive cervical change (Baker & Louise, 2011). This is characterized by loss of ñshowò (a blood stained plug of mucus passed from the cervix) or spontaneous rupture of the membrane (SROM). This can occur well after labour has being established.

Stages of Labour

Labour is divided into 3 stages which rely on anatomical criteria.

First Stage: This is the time from the diagnosis of labour to full dilatation of the cervix (10cm) (Baker & Louise, 2011). This can be further divided into two:

1. **Latent Phase:** Time between the onset labour and 3 ï 4cm dilatation. Here the cervix is effaced that is shortens in length as it becomes included into the lower segment of the uterus.

2. Active Phase: Time between the end of latent phase and full dilatation (10cm).

Second Stage: This is the time from full dilatation of the cervix to delivery of the fetus or fetuses (Baker & Louise, 2011). It has two phases.

- **Passive Phase:** Where there is no maternal urge to push and the fetal head is still relatively high in the pelvis.
- **Active Second Stage:** Here the maternal urge to push prompts the midwife to perform a vaginal examination. Conventionally a normal second stage should last no longer than 2 hours in primiparous women and one hour in multipara.

Third Stage: This is the time from delivery of the fetus or fetuses until delivery of the placenta (Baker & Louise, 2011). The third stage last for not more than 30 minutes.

Duration of Labour

The duration of labour determines the impact of child birth, particularly on mothers but also on babies and those that care for them (Baker & Louise, 2011). Longer labours can lead to greater incidence of fetal hypoxia, overstress of the pelvic flow muscles and need for operative delivery. Prolonged labour is labour lasting longer than 12 hours in nulliparous women and 8 hours in multiparous women.

Mechanism of Labour

This refers to series of changes in position and attitude that the fetus undergoes during it passage through the birth canal. The relationship of the fetus head and the body of the maternal pelvis changes as the fetus descends through the pelvis.

Engagement: This is when the widest part of the presenting part has passed successfully through the inlet. It occurs prior to labour in most nulliparous women and opposite in majority of multiparous women (Baker & Louise, 2011).

Descent: This occurs during first stage and voluntary use of abdominal musculature and the valsalva maneuver (pushing) aids descend of the fetus.

Flexion: Flexion occurs on the head descends into the narrower mid cavity. It is important in minimizing the present diameter of the fetal head.

Internal Rotation: Anterior rotation of the fetus flexed head on reaching the sloping gutter of the levator ani muscles is necessary in order that the sagittal suture laid the anterior posterior diameter of the pelvic outlet. Any malposition here can lead to prolonged labour, obstructed labour and the need for instrumental or even caesarean section.

Extension: After internal rotation, because of the resistance offered by the perineum, the wall flexed head is extended and occiput escapes from underneath the pubic symphysis to distend the vulva. This is known as ñcrowingò of the head. Extension and movement minimize soft tissue trauma by utilizing the smallest diameters of the head for birth (Baker & Louise, 2011).

Restitution: As soon as his occiput escapes from the vulva, the head aligns itself with the shoulders which have entered the pelvis in the oblique position. Restitution is the slight rotation of the occiput through $1/8^{th}$ of a circle.

External Rotation: Here the shoulder rotates into the direct anterior posterior plane; the occiput rotates through a further $1/8^{th}$ of a circle to the transverse rotation.

Delivery of the shoulder and the fetal body: The anterior shoulder under the pubic symphysis is delivered first and then the posterior shoulder. Normally the

rest of the fetal body is delivered easily with the posterior shoulder guided over the perineum by traction in the opposite direction, thus, sweeping the baby onto the motherôs abdomen.

2.2.1 Conceptual Model

Below is a logical design that shows risk factors associated with urinary incontinence in women after childbirth. The impact of obesity (Rasmusse *et al.,* 1997), parity (Marshal, Thompson, Walsh and Baxter, 1998), operational vagina delivery (Meyer*, et al.,* 1998), episiotomy (Wilson *et al.,* 1996) and duration of labour (Brown & Lumley, 1998) on the pelvic floor muscle resulting to postpartum incontinence in mothers. The risk of urinary incontinence is increased by a combination of pelvic floor trauma and occult damage to the pudenda nerve (Sultan *et al.,* 1993; Brown & Lumley, 1998).

Caesarean section appears to reduce the incidence of pudenda nerve damage and incontinence but only if it performed before labour or in the early stages of labour (Fynes *et al.,* 1998). The impact of pregnancy per second has not being examined fully and thoroughly. It is important to develop an antenatal scoring system to identify women at high risk of incontinence (Beighton *et al.,* 1984).

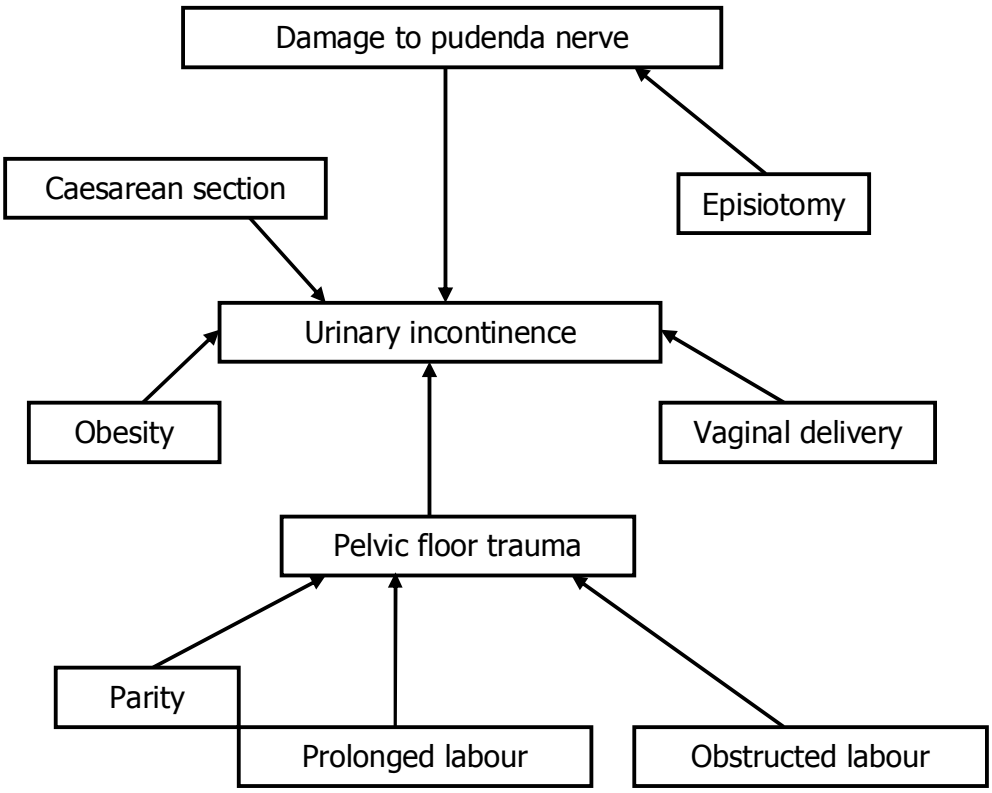

Fig. 2: Conceptual model on causes of urinary incontinence

Identification of high risk women could provide the opportunity to study the effect of antenatal pelvic floor physiotherapy or even elective caesarean section (Sultan et al., 1996). Effective interventions for the treatment of postpartum urinary incontinence are available but there is no much evidence to confirm their effectiveness at prevention. Pregnancy and childbirth are major risk factors for subsequent urinary incontinence; specifically vaginal delivery and prolonged labour all increase the risk of postpartum urinary incontinence (Tincello *et al*., 2008). Less is known whether there is a constitutional factor or factors which may predispose individuals to increase risk independently from trauma of delivery. A method identification of high risk individuals has been advocated to allow appropriate intervention to be offered (Tincello *et al*., 2008).

The findings of this study may highlight the prevalence of postpartum urinary incontinence in women after child birth, its predisposing factors and the poor

baseline knowledge of postpartum urinary incontinence as a complication of child bearing and the role or effectiveness of physiotherapy in the management of urinary incontinence.

2.2.2 Theoretical Framework

There are various theories associated with urinary incontinence such as the musculo elastic theory of urogenital function and dysfunction in the female by Petros and Swash (1990), the theory of strong and fast reflex contraction by Delancey *et al.,* (1998), the theory of urethral hyper mobility by Kalaiz & diez (1988), the theory of joint hyper mobility by Tincello *et al*., (2000) and the theory of neuromuscular dysfunction by Gunnarsson *et al.,* (1991). Some believe that incontinence is a part of aging and doesnôt appear in every woman. Researches have shown that women experience stress urinary incontinence following menopause due to changes in hormones and decreased elasticity in the pelvic floor (Wilson *et al.,* 1996).

The Musculo-Elastic Theory of Urogenital Function and Dysfunction in the Female by Petros and Swash (1990) stated that urogenital dysfunction in the female is mainly caused by lax suspensory ligaments inactivating urogenital muscle forces. A series of 13 works were done and was divided into two parts. Part one states the theory and present 7 works which test scores aspect of the theory, in particular, the role of the suspensory ligament and muscle forces. Part two directly challenges the theory with 5 different surgical works which track the fate of urogenital and other pelvic symptoms following repair of specific suspensory ligaments and their related fascia.

In this research apparently divergent concepts for the causation of urinary incontinence in female, the muscle damage theory and the ligament/connective tissue damage theory were brought together. Data for the theory was collected from a blinded muscle biopsy/mid urethral sling study. This research was based

on the historical background that stress and urgency urinary incontinence are both derived from laxity in the vagina or its supporting ligament (Petros and Swash, 1990; Petros and Uimsten, 1990). In 1993, the theory was expanded to include abnormal bladder emptying, nocturia and pelvic pain, a consequence of uterovaginal prolapse (Petros and Uimsten, 1993). These functional problems, including prolapse, were cured or substantially improved after a posterior sling procedure (Petros, 1997).

In 1999, simultaneous cure of urinary incontinence (88%) was reported at 6 months review in a group of 25 patients with mid urethral sling (Petros, 1999). Three of these patients were nulliparous. Though these findings emphasized the role of pelvic floor muscle damage in the causation of urinary incontinence, these muscles form an essential and integral part of the urogenital closure mechanism. Their research indicated that where there are lax ligaments, there was histological evidence of muscle damage of varied causation. Weakened muscles whether caused by partial denervation, due to stretch injury to perinea nerves in childbirth, often itself associated with direct injury as shown by sphincter tearing, are further prevented from developing normal tension by these weakened, stretched and eventually non elastic ligaments. A muscle cannot develop normal tension if its ligamentous attachment is lengthened or as in the case of the pelvic floor, the elastic ligamentous structure of the pelvis floor is deranged by loss of normal ligamentous elasticity (Petros, 1999). Karl Popperôs guidelines for scientific theories were used (Popper, 1980).

The Theory of Strong and Fast Reflex Contraction was proposed by Delancey, Constantine and Koebil, (1998) as the theory behind pelvic floor muscle exercise in the treatment of urinary incontinence. They showed that strong and fast reflex contraction usually clamps the urethra thereby increasing intra-abdominal pressure. Delancey suggested that during pelvic floor muscle activity, reflex contraction is an anticipator control mechanism.

The Theory of Urethral Hyper Mobility Proposed by Kalai and Hans (2008) was used to explain stress urinary incontinence; traumatic damage to urethral supports during vaginal childbirth may be an important contributor. The aim of the study was to study urethral mobility in order to determine the urethral motion profile in a cohort of young nulliparous women and to determine changes in urethral mobility after childbirth. Ultrasound volume datasets of 44 nulligravidae and the 40 ante partum and postpartum dataset of 73 nulliparous women were assessed using post processing software. Volumes were acquired Trans labial at rest and on valsalva, after voiding while supine.

Reproducibility was determined in a pretest series of 21 patients. Changes in urethral mobility after delivery were determined by comparing ante partum and postpartum mobility vectors. Result showed a highly reproducible intraclass correlation co-efficient of 0.80 (CI ï 0.73 ï 0.86) for mobility vector. The distal urethra was consistently found to be less mobile than the proximal part ($p < 0.0001$). After childbirth, urethral mobility was significantly increased in five out of six segments. There was a trend towards more marked changes in mobility after vaginal operative delivery. This increase seems to affect the entire urethra.

The Theory of Joint Hyper Mobility by Tincello *et al*., (2000) was based on the hypotheses that joint hyper mobility in early pregnancy would be associated with an increased risk of pregnancy related urinary incontinence. The result of a prospective cohort study of women in their first pregnancy was reported.

The aim of the study was to examine the utility of joint mobility scoring as a screening test for predicting postpartum urinary incontinence. The setting was antenatal clinics and urodynamic clinic of a large tertiary referral teaching hospital. 150 nulliparous Caucasian women from different ethnic groups participated. Exclusion criteria were based on history of prolapse, incontinence surgery or connective tissue disease. 103 women were followed up until at least

21 days after delivery. Results reported at 20 weeks showed incidence of urinary incontinence at 32 and 38 weeks gestation and post natally at the end of the study period (42 days).

Also ante natal incontinence occurred in 43.7% of the subjects, postpartum incontinence in 12.6% the subjects with 2.9% prevalence at study end. Total joint mobility was normally distributed with no differences between continents and incontinent women. Elbow hyper extension (>180%) was associated with postnatal incontinence at the end of the study (odds ratio 12.2; 95% CI 1.3, 114.2). The researchers concluded that elbow hyper extension carries an estimated relative risk of post natal urinary incontinence.

The Theory of Neuromuscular Dysfunction by Gunnarsson and Matiasson (1999) was used to investigate if vaginal surface electromyography (EMG) activity changes are age dependent and whether healthy parous women in general might show an age related decrease of vaginal and pelvic neuromuscular activity. 317 women participated, 144 with urinary incontinence and 173 healthy volunteers who are between the ages of 20 and 76 years. The maximum EMG activity during repeated short contractions (2 s) was measured results showed that parous women who have maintained continence through the years had a normal pelvic floor function as estimated with vaginal surface EMG.

In contrast, all three groups of incontinent women showed a successive decrease of the EMG activity with increasing age. This difference was highly significant ($P < 0.001$) in women above the age of 50. No significant difference could be seen between groups when stress, urge and mixed incontinent women were compared. They conclude that a chronic and progressive deterioration of the pelvic vaginal neuromuscular function occurs in women who develop urinary incontinence. The results support the view that a common path physiological mechanism in patients with stress, urge and mixed incontinence might exist.

2.3 Review of Empirical Literature

In the course of this research, the researcher discovered related work done previously. These works were reviewed in this section.

Validation of a severity index in female urinary incontinence and its implementation in an epidemiological survey by Sandvik*, et al*, (1991).

The aim of the study was to validate a simple severity index in female urinary continence for subsequent use in epidemiological survey. The index was created by multiplying the reported frequency (four levels) by the amount of leakage (two levels) the resulting index value (1 ï 8) was further categorized into slight (1 ï 2), moderate (3 ï 5) and severe (6 ï 8). It was validated against a 48 hour ñpad weighingò test.

Thereafter, an anonymous postal questionnaire survey was performed and the index was used to assess the severity of the leakage. A question about the impact of incontinence was included. The setting was in an outpatient clinic of Obstetrics and Gynecology department, Trondheim university hospital, Rissa Norway. Participants included 116 incontinent women referred to the clinic by their general practitioner and all 2366 adult women leaving in Rissa. Result showed that the difference in median pad weights between moderate and slight incontinence was 9g/24h (95% CI 5-30). The corresponding difference between severe and moderate incontinence was 17g/24h (95% CI 5 ï 30).

In the epidemiological survey 29.4% reported urinary incontinence (response rate 77%). The prevalence tended to be highest in middle life and old age. Forty six percent were classified as slight, 27% moderate, and 27% severe. There was a strong correlation between severity and impact ($R = 0.59$, $P < 0.001$). They concluded that there is a high prevalent rate of urinary incontinence in adult women but most women should be regarded as potential patients.

This survey was based on female in general who suffered from urinary incontinence. This research is localized to women after child birth and used more than just one hospital.

Prevalence, Incidence and Correlation of Urinary Incontinence in Healthy, Middle Aged Women by Burgio, Malthew and Engel, (1992).

The prevalence, incidence and correlates of urinary incontinence was studied in a community based sample of 541 healthy middle aged women 42 to 50 years old. Participants were evaluated on two occasions approximated 3 years apart. Of the participants 58% reported urine loss at some time and 30.7% reported incontinence on a regular basis at least once per month, during 3 years the cumulative incidence of regular incontinence in previously continent women was 8.0%. Among those with regular incontinent 64.9% said the volume of loss was 1 or 2 drops, while 35.1% reported that they needed to change their garments. Only 25.5% of the patient had sought treatment.

Continence status was significantly related to body mass index and race but not to patientôs age, parity, caffeine or alcohol intakes, smoking, physical activity, and prior gynecological surgery of several psychological variables. The result indicates that urinary incontinence is common among middle aged women. That a few seek treatment suggest a need for more information about womenôs attitude towards incontinence and more attention to this problem by health care providers. This research was delimited to middle age women; their parity was not taken into consideration.

Urinary Incontinence in the Community by Brokelhurst, (1999). This research was to investigate the prevalence of urinary incontinence among people living at home, their responses to it, and itôs emotional and social effects. A random sample of 4007 adults interviewed in their homes, random sample of 178 constituency sampling points throughout great Britain, 1883 men, 2124 women aged 30 and

over. Responses to questionnaire showed 6.6% (125) men and 14.0% (297) women had been incontinent of urine at some time. 2.8% (52) men and 7.5% (159) women in the previous months and 61% (124) of these for more than four years. 52% (108) had consulted their general practitioner at the onset of incontinence and a further 31% (65) later.

Doctors commonly took a urine sample of 163 (54%); referred 127 (42%) of the patients to a specialist and prescribed tablets to 109 (36%) of them; only 66 (22%) carried out an abdominal, rectal and vaginal examination. Patients were not embarrassed in seeing their doctor and most thought they were treated sympathetically. About 605 of all those affected were concerned or worried about their incontinence, and in almost half of the population with incontinence limited their daily social activities.

They concluded that more people with urinary incontinence seem to be consulting their doctors about it than has been found in previous studies.

Also urinary incontinence has a profound effect on the day to day lives of most of those who suffer from it. This research also concentrated on both male and female and level of parity in the female was not considered.

Leaking Urine: Prevalence and Associated Factors in Australian Women by Chiarelli, Brown and Mc Elduff, (1997).

This research examined the prevalence of leaking urine and associate variable in three large cohorts of Australian women 18 ï 23 years of age (ñyoungò N = 14,761), 45 ï 50 (ómid ageò N = 14,070) and 70 ï 75 (ñolderò N = 12,893). The proportion of women reporting leaking urine was 12.8% (95 CI: 12.2 ï 13.3), 36.1% (35.2 ï 37.0) and 35% (34.1 ï 35.9) in each of the three cohorts respectively.

Logistic regression analysis showed significant association between parity in the young and mid age women and leaking urine and constipation, other bowel symptoms, body mass index, and urine that burn or stings in all the three groups. In the mid age and older cohorts, women who reported having both hysterectomy and prolapsed repair, or prolapse repair alone, were also more likely to report leaking urine.

Lower scores on the physical and mental component summary scores of the medical outcomes survey short form (36 items) questionnaire suggest lower quality of life among women who report leaking urine, compared with those who do not. This research considered parity but then the prevalence of urinary incontinence in women after child birth was not considered that is rate of urinary incontinence due to child bearing was not considered and it was more of a comparative study between young and middle age women.

The Prevalence of Urinary Incontinence during Child Birth in the Czech Republic by Kargar, (2006)

The aim of the study was to explore the prevalence of urinary incontinence during child birth in Czech Republic. 474 primiparous who gave birth at their maternity ward from June 14, 2004 through January 31, 2005 received a questionnaire. The questionnaire concentrated on the occurrence and presentation of urinary incontinence before and during pregnancy. 339 women (72%) completed the questionnaire.

Urinary incontinence and the length of pregnancy were significantly related. They found baseline urinary incontinence prevalence before pregnancy 17% but before delivery one of 64%. They did not find any statistically significant relation between the prevalence of urinary incontinence during pregnancy and body mass index before pregnancy as well as before delivery, weight gain during pregnancy,

age and birth weight. They concluded that pregnancy is a risk factor for the development of urinary incontinence.

This was based on primiparous women only and urinary incontinence was assessed only during pregnancy. This research however was carried out using women with urinary incontinence after child birth as subject and involved both primiparous and multiparous women.

Anal and Urinary Incontinence in Multiparous Women Nine Months After Child Birth by Arya, Bugg, Hoskner and Kiff, (2005).

The aim of the study was to investigate whether questionnaires posted to women nine months after child birth can facilitate the identification and assessment of women with anal and / or urinary incontinence that would not have sought help. Other aims were to determine the prevalence of urinary incontinence in women after child birth, to measure how fecal and urinary incontinence affects womanôs quality of life and to compare quality of life scores of mutiparous and primiparous women.

Mutiparous women who delivered more than nine months ago were selected consecutively from the birth register in a district general hospital. If urinary symptoms were present, she was asked to complete the Kingôs health questionnaire. The women all delivered at least nine months prior to the study to avoid including those who may have had symptoms postpartum which have since spontaneously resolved. The data of non-parametric comparism of the medians were made using a Mann Whitney U. test. Result showed 189 (38%) of the five hundred multiparous women responded. This compares to 65% of respondent from the initial study on primiparous women. In all, 118 (63%) were symptomatic, 71 (37%) stated that they were asymptomatic, 35 women requested help with their symptoms. The mean age of the respondents was 31 years (19 ï

42).s the parity of the respondents ranged between 2 and 6 with a mean of 2.48 (SD = 0.7).

The mean gestational age of the last pregnancy at delivery was 39 weeks and the mean birth weight was 3475g (SD = 515.13). 84.9% had a vaginal delivery. 2.4% had a ventouse delivery, 7.8% an emergency caesarean section and 4.8% an elective section. Only one woman suffered a third degree tear. In most cases, there was no significant difference in the social limitation domain in patient with urinary incontinence (P = 0.003). Patients with anal incontinence showed significant differences in the emotions domain (P = 0.02).

They concluded a higher number (65%) of primiparous women responded to the initial study compared with 38% of multiparous women. This could infer that multiparous women have more demands on their time. Incontinence symptoms are not uncommon amongst women in the reproductive age group. 62% of the respondents were asymptomatic but only 35 (30%) requested help. This suggests that women may not find their symptoms to be functionally or socially troublesome. This research compared the prevalence and impact of urinary incontinence between primiparous and multiparous women and included anal incontinence as part of the case study.

2.4 Summary of Literature Review

Pelvic floor dysfunction is a disorder predominantly affecting females. It is common and undermines the quality of lives of at least one third of adult women and is a growing component of women health care needs. There is a paucity of data investigating the true prevalence, incidence, correlation, association, specific risk factors, poor outcome of treatment and subsequent prevention strategies for women with multiple pelvic floor symptomatologies. Given the significance of the aetiological contribution of factors like pregnancy and obstetric trauma, ageing, hormonal status, hysterectomy and lifestyle in the development of pelvic floor

disorders, the assessment, management and prevention of pelvic floor dysfunction remains a neglected part of many health care professionals.

A lot have being written on the prevalence of urinary incontinence in women after child birth in other part of the world. Sandvik *et al* (1991) noted that prevalence tend to be highest in middle life and old age. Burgio *et al* (1982) also showed in their work that urinary incontinence is common among middle aged women and a few seek treatment, which suggests a need for more attention to this problem by health care providers. Brokelhurst (1999), in his work concluded that more people with urinary incontinence seem to be consulting their doctors about it than have been found in previous studies.

Chiarelli *et al.* (1997) in their research showed significant association between leaking urine and parity in the young and mid age women, constipation, other bowel symptoms, body mass index. Kargar (2006) concluded that pregnancy is a risk factor for the development of urinary incontinence. Arya *et al* (2005) suggests that women may not find their symptoms to be functionally or socially troublesome. None of these works correlated nor associated urinary incontinence with waist-hip ratio, percentage body fat, and percentage body water.

CHAPTER THREE

RESEARCH METHOD

Introduction

This study was a cross sectional survey (non-experimental) research design.

3.1 Subjects/Sample

3.1.1 Subject Description

The participants for this study were postpartum mothers within 1-9 months after child delivery, who attended post-natal clinic immunization in the area of study and were willing to participate.

3.1.2 Inclusion Criteria

This study included:

1. Postpartum mothers within 1-9 months after delivery;
2. Women of the age 16-45years old;
3. Women residing in Enugu Metropolis.

3.1.3 Exclusion Criteria

Exclusion criteria were based on:

1. Women who had multi fetal gestation;
2. Women who would not comprehend written or spoken English or Igbo language;
3. History of prolapse;
4. Incontinence surgery;
5. Connective tissue disease;

6. History of urinary incontinence before pregnancy.

3.1.4 Target Population

The target population for the study was post-partum mothers in Enugu metropolis.

3.1.5 Sampling Techniques

A non-probability convenience sampling technique was used based on the willingness of the subjects to participate in the research and also on meeting the inclusion criteria.

3.1.6 Sampling Size

This research work consisted of eight hundred and sixty four (864) post-partum mothers who came for post natal clinical immunization at the study location during the period of this study.

3.1.7 Location of Study

Study was carried out in the Department of Medical Rehabilitation, Faculty of Health Sciences and Technology, College of Medicine University of Nigeria Enugu Campus located in Enugu South Local Government of Enugu State Nigeria and the sample were collected in the following hospitals:

- University of Nigeria Teaching Hospital, Enugu.
- Enugu State University Teaching Hospital Parklane, Enugu.
- Polly Clinic Asata, Ogui New Layout Enugu.
- Uwani Health Centre, Amaigbo Lane, Uwani Enugu.
- Abakpa Nike Health centre Abakpa,Enugu
- Iji Nike Health centre Iji, Enugu
- Mother of Christ Specialist Hospital Ogbete, Enugu

- Saint Patrickôs Hospital Ogui, Enugu
- Balm of Gilead Hospital Maryland, Enugu.

3.1.8 Area of Study

Enugu metropolis: Enugu south local government area, Enugu north local government area and Enugu east local government area.

3.2 Materials/Instrument

The materials which were used in this study were:

a. **Self-Administered Questionnaire:** A self-continence questionnaire adapted from womenôs continence and pelvic health centre questionnaire) for investigating urinary incontinence prevalence in postpartum mothers was used to obtain information from the participants. The questionnaire is available in English and Igbo languages and it is made up of closed and open ended questions. A back translation of the Igbo version of the questionnaire was done to ascertain if the contents convey the same meaning.

The questionnaire consists of two sections. Section A sought information on date, age, height, weight, hip circumference, waist circumference, percentage body fat, percentage body water, percentage body muscle, percentage body bone, number of vaginal births and number of caesarian section; while Section B, contained general question relating to prevalence of urinary incontinence.

b. **Weighing Scale/Body Fat-Hydration Monitor**: A weighing scale/body fat-hydration monitor (made in Germany by Bearuer, model: BG29) was used to measure the weight of the participant, percentage body fat and percentage body water.

c. Health-Meter: Health-meter calibrated in centimeters was used to measure the height of the participant.

d. Pen: A blue leo Smart Swiss tip made by R & D in Germany was used to record data.

e. HB Pencil: HB pencil was used by the participants to fill in data.

f. Measuring Tape: Measuring tape was used to measure the waist circumference at a land mark of 2cm below the umbilicus while the circumference of the hip was taken using the greater trochanter as the land mark.

g. Perineometer: Cardio design model, probe size 10.8cm by 2.8cm, calibrated in cmH_2O and made in Australia by peritron, was used to measure strength of the pelvic floor muscle (pre and post) six weeks treatment

h. Multipurpose electrotherapy mechine: made by Sonopuls, modelé 992+é serialnumberé 13928é 2600AVé 220-240V used for administering interferential current.

3.3. Ethical consideration/Procedure

Ethical Consideration

1. An ethical approval certificate was obtained from the ethical review committee of the University of Nigeria Teaching Hospital Ituku Ozalla Enugu.
2. The purpose and procedure of the study was explained to the prospective participants and informed consent obtained before participation.

Procedure

An introductory letter explaining the purpose of the research was presented to the Chief Medical directors in the various hospitals. The respondents were assured

and informed in the introductory letter that the information obtained will be strictly for the research purpose.

The researcher was given a permission letter, indicating that he has been granted permission to carry out the research using client from the hospitals. An informed consent forms were obtained from the participants and copies of the questionnaires were distributed by the researcher and his assistants. The questionnaires were completed and returned to the researcher and his assistants the same day. Both subjective and objective techniques of data collection were adopted.

Subjective: Questionnaires were administered to postpartum mothers within one to nine months of child delivery. The questionnaires were administered on face to face basis. Respondents were allowed to ask the researcher questions in areas not well understood. Both English and Igbo version of the questionnaires were available.

Objective: The heights of the participants were obtained using a standard health-meter calibrated in centimeters. The health-meter was placed on a flat surface and the participants were asked to remove their footwear and stand on the platform of the health-meter in an upright position with their heels in contact with the vertical bar of the health-meter. The readings were traced and the measurement was recorded using the pen.

To obtain the weight, percentage body fat and percentage body water of the participants, the weighing scale/fat/hydration monitor was placed on a flat surface and the reading was adjusted to zero. The participants were asked to remove their footwear and climb gently on the scale/monitor after keying in their age and height obtained from the health meter in the monitor. The researcher ensures that the participants stood upright and then the readings were taken.

The waist and hip circumference of the participants were measured using measuring tape at 2cm below the umbilicus and the greater trochanter as the land mark respectively. The measurements were also recorded using the pen.

The pelvic muscle was measured before and after six weeks treatment using perineometer which is calibrated in cmH_2O. The assessment of the muscles of the pelvic floor was made with the patient in a gynecological position, with bare abdominal regions, pelvic floor and legs. This position provides a more accurate assessment of the contraction of isolated musculature. The intra-vaginal pressure generated by the contraction of the PFM of the participants was assessed using the perineometer, consisting of a vaginal probe (10.8cm by 2.8cm) that was connected to an electronic device, which indicates the values of contraction. Each volunteer was evaluated by a single examiner, with a single brand of perineometer (The Peritron$^{\hat{E}}$ (Cardio-Design, Australia)). The patients had been previously assessed by digital palpation, made aware of the procedure and advised on the correct way to maintain PFM contractions. Following the introduction of the catheter, the instruments were calibrated to zero before the measurement of the intra-vaginal pressure during vaginal muscle contraction.

During the assessment, the volunteers were required to pull (contract) their PFM in and up as strongly as possible 3 times and to sustain the contraction for 5 seconds. The researcher used an interval of 30 seconds between the contractions. The average peak value of the three contractions was used. The middle of the probe was inserted 3.5 cm into the vagina. The researcher only considered those contractions for which it was possible to observe the cranial movement into the vagina. Any contractions for which a retroversion of the hip or a Valsalva maneuver was noticed were discounted

Treatment Protocol

Those who participated were grouped into four (control and three treatment groups), comprising of five participants in each group.

Control Group (1): this group received placebo interferential therapy (same parameter with group three but no current).

Treatment Group (2): This group received Pelvic floor muscle exercise only. Many methods of doing the exercise exist, all of them are efficacious. The one we favour, consists of a series of five second contractions followed by 10 seconds of relaxation, performed for 10 minutes four times a day (Sampselle, *et al.,* 1998). This is an intensive program that should be continued for 3 months with frequent office visits. If the results are satisfactory, a maintenance regimen of exercises once or twice a day should be continued indefinitely. It is essential to make sure that the pelvic muscle contraction is performed without Valsalva maneuver or accessory muscle involvement (Elia, *et al.*, 1993).

Treatment Group (3): this group received a course of interferential therapy (bipolar technic, frequency of 1Hz, 10-40Hz and 40Hz at maximum current intensity, each for ten minutes) completing, on average, 15 treatments.

Treatment Group (4): this group received the same treatment with group two and three.

3.4 Data Analysis

The data was analyzed using SPSS statistics package of 20.0 versions. Descriptive statistics of frequency and percentages were used to present the data while association and effect was tested using chi-square and one way ANOVA respectively. The one way ANOVA was further tested using turkey post hoc.

CHAPTER FOUR

RESULTS

This chapter contains statically analyzed data presented in form of frequency distribution which was further explained in findings one to four. These findings stated answers to the research questions enumerated in this report in order to fulfill the research objective and deduce the correct hypothesis as it is found in this work. The results consist of quantitative data from 864 post-partum mothers.

4.1 **Results/Findings/Answer to Research Question 1:** What is the prevalence of urinary incontinence in post-partum mothers with respect to the level of educational qualification, baby weight, number of birth, age of the mother, mode of delivery, body mass index, waist-hip ratio, percentage body fat and percentage body water?

Table 1 show that 59.7% of the respondents experienced Urinary Incontinence after birth while 40.3% did not.

Table 1: Prevalence of urinary incontinence in postpartum mothers

Urinary incontinence	Frequency of occurrence	Percentage of occurrence
continence	348	40.3
incontinence	516	59.7
Total	864	100

Table 2 shows that 78.7% of the women who do not attend school , 52.2% of the women who attended primary school only, 59.0% who ended in secondary school and 59.5% who attended tertiary education suffer urinary incontinence.

Table 2: Prevalence of urinary incontinence with respect to education

Educational level	Continence	Incontinence	Total	Percentage incontinence
Nil	10	37	47	78.7
Primary	33	36	69	52.2
Secondary	158	227	385	59.0
Tertiary	147	216	363	59.5
Total	348	516	864	59.7

Table 3 shows that 61.3%, 62.3%, 54.8% of the mothers whose baby weight are within the range of < 2.6kg, 2.6-3.5kg, 3.6-5.0kg respectively suffer urinary incontinence.

Table 3: Prevalence of urinary incontinence with respect to baby weight

Baby weight	**Continence**	**Incontinence**	**Total**	**Percentage incontinence**
< 2.6	24	38	62	61.3
2.6-3.5	177	284	466	62.0
3.6-5.0	147	189	336	56.2
Total	348	516	864	59.7

Table 4 shows that 64.3% of the primiparous and 57.6% of the multiparous mothers suffer urinary incontinence.

Table 4: Prevalence of urinary incontinence with respect to parity

Parity	Continence	Incontinence	Total	Percentage incontinence
Primiparous	99	178	277	64.3
Multiparous	249	338	587	57.6
Total	348	516	864	59.7

Table 5 shows that 60.3%, 58.1%, and 75.0 % of the respondents who are between the age ranges of 16-25, 26-35, and 36-45 years respectively suffer urinary incontinence.

Table 5: Prevalence of urinary incontinence with respect to the age of the mothers

Age (Yrs)	Continence	Incontinence	Total	Percentage incontinence
16-25	95	144	239	60.3
26-35	239	332	571	58.1
36-45	14	40	54	74.1
Total	348	516	864	59.7

Table 6 shows that 53.7% and 59.6% of the respondents who gave birth through vaginal delivery and caesarian section respectively suffer urinary incontinence.

Table 6: Prevalence of urinary incontinence with respect to mode of delivery

Mode of delivery	**Continence**	**Incontinence**	**Total**	**Percentage incontinence**
Vaginal	287	426	713	53.7
Caesarian section	61	90	151	59.6
Total	348	516	864	59.7

Table 7 shows that 46.2%, 66.0%, 55.8%, and 61.3% of the mothers who are underweight, normal, overweight, and obese respectively suffer urinary incontinence.

Table 7: Prevalence of urinary incontinence with respect to body mass index

Body mass index	**Continence**	**Incontinence**	**Total**	**Percentage incontinence**
Underweight(<18.5)	7	6	13	46.2
Normal(18.5-24.99)	96	186	282	66.0
Overweight(25-29.99)	171	207	378	55.8
Obese(29.99<)	74	117	191	61.3
Total	348	516	864	59.7

Table 8 shows that 59.9%, 54.8% and 61.1% of the mothers whose Waist-Hip ratio are 0.8 and below, 0.81-0.85, and above 0.85 respectively suffer urinary incontinence.

Table 8: Prevalence of urinary incontinence with respect to waist-hip ratio

Waist-hip ratio	**Continence**	**Incontinence**	**Total**	**Percentage incontinence**
<0.81	67	100	167	59.9
0.81-0.85	70	85	155	54.8
>0.85	211	331	542	61.1
Total	348	516	864	59.7

Table 9 shows that 75.0%, 63.8%, 69.7%, 55.1% and 58.7% of the mothers whose percentage body fat are within the range of 4-16(too lean), 16.1-20.5(lean), 20.60-25(normal), 25.1-30.5(fat), and 30.6-60(too fat) respectively suffer urinary incontinence.

Table 9: Prevalence of urinary incontinence with respect to body fat

Body fat	**Continence**	**Incontinence**	**Total**	**Percentage incontinence**
Too lean(4-16)	2	6	8	75.0
Lean(16.1-20.5)	17	30	47	63.8
Normal(20.6-25)	23	53	76	69.7
Fat(25.1-30.5)	44	54	98	55.1
Too fat(30.6-60)	262	373	635	58.7
Total	348	516	864	59.7

Table 10 shows that 57.4%, 67.8%, 66.7%, 56.5% and 100% of the mothers whose body water are within the range of 27.5 - 47.7, 47.8 - 51.5, 51.6 - 54.6, 54.7 - 57.7 and 57.8 - 66% respectively suffer urinary incontinence.

Table 10: Prevalence of urinary incontinence with respect to body water

Body water	**Continence**	**Incontinence**	**Total**	**Percentage incontinence**
27.5-47.7	269	362	631	57.4
47.8-51.5	38	80	118	67.8
51.6-54.6	21	42	63	66.7
54.7-57.7	20	26	46	66.7
57.8-66	0	6	6	100
Total	348	516	864	100

4.1.2 **Result/Finding/Answer to Research Question 2-** what is the treatment measure taken by the affected mothers?

Table 11 shows that 96.0% did not seek for medical nor physiotherapy attention, 2.2% sought medical attention, 0.5% sought medical and physiotherapy attention and 1.3% sought physiotherapy attention only.

Table 11: intervention measure

Intervention	**Incontinence**	**Percentage incontinence**
Nil/self	495	96.0
Medical	11	2.1
Physiotherapy	7	1.3
Medical and physiotherapy	3	0.6
Total	516	100

4.1.3 **Result/Finding/Answer to Research Question 3**: is there a significant association between urinary incontinent in post-partum mothers and the following risk factors; the level of educational qualification, Baby weight, the number of children delivered, Age of the mother and Mode of delivery.

Table 12 below shows that there is a significant association between urinary incontinence and the level of educational qualification, Baby weight, parity and motherôs age ($p<0.05$) while there is no significant association between urinary incontinence and mode of delivery ($p>0.05$)

Test Statistic: Chi Square

Judgment: The null hypothesis is rejected for the association between urinary incontinence and the level of educational qualification, Baby weight, parity and motherôs age and accepted for the association between urinary incontinence and mode of delivery.

Table 12: **Association between urinary incontinence and the various predisposing factors**

Factors	Chi square value	P value
Education	8.789	0.032*
Baby weight	93.188	0.000*
Parity	19.870	0.006*
Motherôs age	49.890	0.002*
Mode of delivery	0.001	0.974

4.1.4 **Result/Finding/Answer to Research Question IV**: is there a significant association between urinary incontinent in post-partum mothers and obesity using body mass index, waist-hip ratio, percentage body fat and percentage body water as outcome measure.

Table 13 below shows that there is significant association between urinary incontinence and obesity ($p<0.05$) using BMI, waist-hip ratio, percentage body fat and percentage body water as outcome measure.

Test Statistic: Chi Square

Judgment: the null hypothesis is rejected.

Table 13: Association between urinary incontinence and obesity

Factors (outcome measure)	Chi square value	P value
Body mass index	726.028	0.000*
Waist-hip ratio	700.747	0.000*
Body fat	535.418	0.000*
Body water	520.182	0.000*

4.1.5 **Result/Finding/Answer to Research Question V:** What is the effect of physiotherapy intervention in the management of postpartum urinary incontinence?

Table 14 showed significant effect of a six weeks period of physiotherapy intervention ($P<0.05$).

ANOVA Test

Difference	Df	Sum of square	Mean square	F value	P Value
Between group	3	3089.688	1029.896	5.012	0.012
Within group	16	3288.082	205.505		
Total	19				

Table 16 demonstrated a significant effect for the various physiotherapy modality used in each group compared to the control group ($p<0.05$) while no significant difference between the various treatment group ($p>0.05$) indicating that none of the physiotherapy modality used is better than the others.

Table 16:Turkey Multiple Comparison (Post hoc)

Modality	**Mean dif**	**Std error**	**P value**	**Lower limit**	**Upper limit**
Control- PFME	-29.13800	9.06654	0.025	-55.0776	-3.1984
IFC	-28.70200	9.06654	0.035	-54.6416	-2.7624
PFME/IFC	-28.24400	9.06654	0.030	-54.1836	-2.3044
PFME- IFC	-0.43600	9.06654	1.000	-26.3756	25.5036
PFME/IFC	-0.89400	9.06654	1.000	-25.4816	26.3976
IFC- PFME/IFC	-0.45800	9.06654	1.000	-26.3976	25.4816

CHAPTER FIVE

DISCUSSION

5.0 This part set out to outline and discuss major findings made in the course of this study and to link them to studies elsewhere based on the numerous literature reviewed.

5.1 Considering the prevalence of urinary incontinence postpartum in Enugu metropolis and the risk factors involved.

Findings from result 4.1 showed that the prevalence rate of urinary incontinence is high in post-partum mothers. The result showed that, of eight hundred and sixty four mothers in the sample, as high as 59.7 percent of them had incontinence. High rate of UI could be attributed to factors such as: the age of the mothers, mode of delivery and number of women whose incontinence started at pregnancy. Of importance also were multiparous women who had their babies through a combination of spontaneous vagina delivery (SVD) and caesarean section (CS), which is one of the limitations of this study. According to Sottner (2006), child bearing is an established risk factor for UI among young and middle aged women. It was suggested that vaginal delivery was the main contributory factor for UI possibly because of the damage to the important muscle tissues or nerves. Altman (2006), Arrue (2010) and Baydock (2009), argued that some studies which include only women having SVD will give a higher prevalence estimate of UI than if the study also had included CS. Sottner (2006) continues to argue that pregnancy itself may cause mechanical, hormonal changes or both which can lead to urinary incontinence.

The result of this study showed that there was a high incident and prevalence of UI postpartum in Enugu metropolis as it is observed in studies elsewhere. In a large questionnaire based cross-sectional study of 5,599 primiparous American

women by Boyles *et al.* (2009), they investigated prevalence of UI postpartum. The prevalence of UI was 17% at 6 months postpartum. A similar questionnaire based cross-sectional study was performed in Turkey (Ege *et al*., 2008). One year postpartum 20% of the parous women had UI. A large cohort study on 2,390 Swedish women recruited in pregnancy assessed stress UI at 2 and 12 months postpartum by questionnaire (Schytt *et al*., 2004). The authors found that 18% of primiparous women and 24% of multiparous women had stress urinary incontinence at 12 months postpartum. The largest study in 2011 on UI during pregnancy and postpartum found a prevalence of UI of 31% among 12,679 primiparous women at 6 months postpartum. All the participants were continent before pregnancy (Wesnes *et al*., 2011). Other studies have also found out that 11% of nulliparous women had UI before pregnancy (MacLennan *et al*., 2000; Brown *et al*., 2010). Prevalence of UI increases considerably in pregnancy due to increased incidence of stress and mixed UI (Solans-Domenech et al., 2010).

The results in tables 2 to 10 showed several risk factors associated with the prevalent of UI postpartum. It was observed in Table 2 that women with non-formal education have the highest UI cases than those with primary or higher education. Considering studies done by others, not having a college education was documented as one of the predisposing factors of UI postpartum (Groutz *et* al., 2004, Goldberg *et al.,* 2005). The prevalence of UI in other studies increased with age and was associated with low educational level (Hannestad et al. 2003; Danforth et al. 2006). From the words of Caldwell (1979), ñmaternal education is the single most significant determinant of these marked differences in maternal morbidity and mortality. These are also affected by a range of other socio-economic factors, but no other factor has the impact of maternal education and in their totality they do not even come close to explaining the effects of maternal educationò. This means that educated women have higher autonomy to make decisions on the quality of health care they receive during pregnancy and child

birth, have better employment which enhances their economic power and the ability to cater for their needs, and also marry educated husbands who understands their basic needs especially at pregnancy and childbirth. They are able to know the right period to register and attend antenatal, take proper medication and exercise prescribed by health personnel and also can decide her mode of delivery. Cleland (1990) concluded this by saying that ñeducation may have a modest effect on health knowledge and beliefs, but a pronounced effect on the propensity to use modern medical facilities, and adopt modern health practices, because of a closer social identification with the modern world, greater confidence at handling bureaucracies or a more innovative attitude to life among women who have some experience of schoolò.

Result from table 3 showed that UI was high and common among the participants in this study irrespective of baby weight, the highest number of participants (61.3 percent) who delivered baby of weight < 2.6 had UI, followed by (61.0 percent) of those with baby weight 2.6-3.5 kg. Result showed that UI postpartum was less among mothers (56.3 percent) with the highest baby weight. The studies by Arya *et al* (2005) showed that the weight of a baby is a predisposing factor to urinary incontinence which did not agree with the result of this research work. The common cause of UI postpartum among women irrespective of baby weight is that the tissue and muscles that support the uterus (womb), bowel and bladder can become stretched in pregnancy. This is due to pregnancy hormones and the weight of a growing baby. When a woman gives birth to her baby, the muscles and tissues (pelvic floor muscles) are stretched even more, this would have further even weakened them. Having a weak pelvic floor makes it harder for a woman to squeeze the muscles and sphincters at the bottom of her bladder. This means that she may have trouble controlling urine. She may leak urine when she cough, sneeze, laugh or move quickly. Lifting things can also make her urinate. The amount lost can vary from a few drops, to enough to wet her clothes. Incontinence

among these women may have started during pregnancy, which is the result of an overactive bladder. Women who have an overactive bladder (OAB) need to urinate more often than usual because their bladders have uncontrollable spasms, in addition, the muscle surrounding the urethra (the tube via which urine passes from the bladder) can be affected (Sottner, 2006). These muscles are meant to prevent urine from leaving the body, but they may be ñoverriddenò if the bladder has a strong contraction. After pregnancy, incontinence problems may continue due to the following conditions:

- damage to the nerves that control the bladder
- the fact that the urethra and bladder have moved during pregnancy
- an episiotomy, a cut made in the pelvic floor muscle during delivery of a baby to allow the fetus to come out more easily (Sottner, 2006).

The result in table 4 showed that UI is common among all mothers irrespective of the number of birth. Going by the result of this study, greater percentage of Primiparous mothers (64.3%) have incontinent than the multiparous women (57.6%). Based on the results of other studies, Crist (1972) showed that women having given birth two or more times showed a substantially increased risk of having urinary incontinence. In a clinical neurophysiological study, Snooks *et al* (1984) found that most urinary incontinence following vaginal delivery was caused by injury not to the pelvic floor muscles themselves but to their innervation, which is most evident in multiparous women and in those who had experienced a prolonged second stage of labour or a forceps delivery. At five year follow up, occult disturbances of the pudendal innervation of the external anal sphincter persisted, eventually more marked with time since delivery (Snooks *et al.,* 1990). Comparable results were obtained by Swash (1985) who furthermore concluded that the injury to the innervation of the pelvic floor is worsened by succeeding deliveries and is then exacerbated by repeated straining of stool with traction on the pelvic floor, leading to further stretch induced injury to the

pudendal nerve. This agreed with finding by Mommsen (1992) of a definite trend in UI with increasing parity, suggesting a cumulative effect of additional childbirths. Also an association is reported in the literature between the number of the deliveries and UI (Hannestad et al. 2003).This agrees with the most obvious pathophysiological explanation of urinary incontinence associated with parity, namely that it may be based on perineal muscular or neuromuscular dysfunction caused by childbirth. The result of this study showed that greater percentage of primiparous mothers suffered UI than the multiparous women which disagreed with the results of other studies. The discrepancies might be as a result of age of mothers at first birth as well as their mode and type of delivery.

Table 5 showed that urinary incontinence increased with age of mothers, a greater percentage of participants (74.1%) age 36- 45 years had more prevalence and incidence of urinary incontinence, than younger mothers (60.3%) aged 16- 25 years. From other studies; a study completed a 2- hour in-person interview of 3205 women in the Boston area, done by Connolly and colleagues (2007) to assess association between number of pregnancies, mode of delivery, and subsequent urinary symptoms. The authors found that women having at least one vaginal delivery (VD) were significantly more likely to report moderate to severe UI than those who had never been pregnant or who had delivered only by caesarean section (CS). According to these studies, the effect was more pronounced in women aged 30- 39 years old than those younger postpartum mothers which agreed with the result of this study.

Table 6 showed the prevalence of UI with respect to motherôs mode of child delivery. It was discovered that participants had urinary incontinence irrespective of mode of delivery. Based on the result of this study 59.6% of participants who delivered through CS suffered UI which is a little less than the percentage (59.7) who delivered vaginally. The margin between these modes of delivery and percentage of women suffering UI was not significant ($P>0.05$), meaning that

urinary incontinence was common irrespective of mode of delivery. Vaginal delivery is an important and well documented risk factor for UI postpartum, also when compared with cesarean section. If a woman delivers by caesarean section only, a protective effect on UI compared with vaginal delivery is documented 12 years after delivery (MacArthur *et al*., 2011). The population based cross sectional EPINCONT study found that women aged 50ï 64 years who had delivered by cesarean section or vaginal only had similar UI prevalence, suggesting that any protection from caesarean section might be lost with advancing age (Rortveit *et al*., 2003). Urinary incontinence at 6 months postpartum was found to be 31.3% in women delivering vaginally and 22.9% in those delivering by CS, in Sweden, Altman and colleagues (2007) surveyed 395 women 10 years after their first vaginal or caesarean delivery to assess the development of urinary symptoms. Two hundred women with a mean age of 39.9years delivered only by vaginal delivery, whereas, 195 women with a mean age of 41.5years delivered only by caesarean. Forty percent of women delivering vaginally compared with 28% of those delivering by caesarean reported stress incontinence (odds ratio (OR) 3.1), but these difference were largely caused by discrepancies reported by women complaining of mild symptoms. Handa and colleagues (2004) surveyed 1293 Maryland women undergoing elective hysterectomies. They found that 36% of all those surveyed reported stress incontinence and 35% reported urgent incontinence. When mode of delivery was examined, they found out that 28.7% of women who had delivered exclusively by caesarean complained of stress incontinence compared with at least one vaginal delivery. Groutz and colleagues (2004) concluded that labour itself, not just delivery, may play an important role in the development of postpartum urinary incontinence, they performed a prospective cohort study of 363 primiparous Israeli women. The authors evaluated symptoms of stress UI one year after child birth in women who delivered vaginally, women who underwent elective CS, and women who underwent caesarean delivery for obstructed labour. The prevalent of stress UI was similar in

women who had vaginal deliveries and women who underwent CS for obstructed labour (10.3% and 12% respectively). A systematic analysis was performed by Press and colleagues (Press *et al.,* 2007) to resume data on mode of delivery and its association with the development of postpartum UI. Increased UI among mothers who delivered through CS might have been influenced by pregnancy and obstructed labour.

Tables 7 to 10 determined urinary incontinence with respect to obesity using body mass index (BMI), waist-hip ratio; percentage body fat and percentage body water as outcome measure. Result revealed that 66.0 percent of women who had normal weight of 18.5 to 24.99 suffered UI, followed by 61.3 percent of those with body weight 29.99 and above. Study found out that participants who were categorized as normal, overweight, and obese had greater percentage of incontinence than women who were underweight. Weight and weight gain are two sides of the same story. Weight can be registered as a single static data point as in a cross sectional study, while weight change is a dynamic variable relying on several observations; as in a cohort study. Few studies have investigated the association between weight gain and UI (Mishra, 2008; Townsend, 2007). The Nurses Health Cohort Study found that 1kg/m2 weight gain increased the risk of frequent UI with 7% (Townsend, 2007). The results indicate that there is a linear association, not only with absolute weight and UI, but also between weight gain and UI. Body mass index (BMI) is an established risk factor for urinary incontinence, both cross sectional studies by (Hannestad, 2003; Hunskaar, 2004; Melville, 2005) and longitudinal studies by (McGrother, 2006; Mishra, 2008; Phelan, 2009; Townsend, 2007) have found an association between high weight and urinary incontinence. Generally, overweight leads in general to an odd ratio (OR) for urinary incontinence of 1.5 ï 3.0 compared to normal weight women, while obesity leads to an odd ratio of 3.0 ï 5.0. A random control trials (RCTs) on weight loss among obese women have found decreasing prevalence of UI after

increasing weight loss (Brown, 2006). The severity of UI, estimated by Sandvikôs severity index (Sandvik, 2006) and other severity indexes based on frequency and volume escalates with increasing BMI (Danforth, 2006; Hannestad, 2003; Kuh, 1999; Melville, 2005; Sampselle, 2002). Townsend *et al.* reported that the OR for severe UI increase with 3% for every kg weight gained (Townsend 2007). Weight gain in pregnancy is mainly due to a growing foetus, placenta and uterus, enlarged breasts and oedema. Weight gain appears to have a different impact on UI in pregnancy than in other time periods of life (Townsend, 2007). In contrast however, several articles present results indicating that a large weight gain in pregnancy does not lead to urinary incontinence (Diez-Itza, 2009; Eason, 2004).

5.2 Considering the Treatment Measures taken by women with Urinary incontinence

The findings in result two showed that most of the participants (96.0%) presented with urinary incontinence after child birth did not report to medical expert. This study agreed with the finding of Burgin *et al* (1991) but disagreed with the result of the research conducted by Brokelhurst (1999) in England. The disagreement may have resulted from the difference in sample population and the area involved. Believing that high percentage of people living in England may have been educated. According to Fritel *et al.* (2010), conservative therapy or perineal rehabilitation by pelvic floor muscle exercise (PFME) is the first-line intervention to treat stress urinary incontinence (SUI) during pregnancy and postpartum. Pregnant women are often instructed to perform PFME to prevent the development and treat symptoms of UI that may develop during pregnancy or after birth (Brostrom *et al*., 2008). An American gynecologist, named Arnold Kegel first introduced this method of PFME for treatment of postpartum UI and improving the function and tone of PFM following childbirth. Pelvic floor muscle exercises have been successful because postpartum women who have performed these exercises have reported cure rate as high as 84% and improvement rates as

high as 100% (Kegel *et al*; 1946). Glazener et al (2001) studied the effect of PFME on the severity of UI at 12months after delivery in 747 mothers who still had UI three months postpartum, they found out that mothers in the intervention group had significantly less UI than the control group. PFME is a specific exercise for PFM and is different from exercise of other muscles in the body. Thus, PFME requires a strong commitment from women. Moreover, this form of exercise requires dedication, endurance, and efforts on the part of women in order to result in effective UI treatment (Newman et al; 2001). The above statement by Newman *et al.* might have resulted to lack of UI treatment among participants in this study considering the rigorous nature of the exercise involved.

5.3 Considering if there is an association between urinary incontinence and the following factors: mode of delivery, level of educational qualification, baby weight, parity and age of mothers.

Findings showed that there was no significant association between urinary incontinence and mode of delivery while there was a significant association between urinary incontinence and the level of educational qualification, baby weight, parity and age of the mother. These did agree with the result of the study conducted by Dalency (1994) and Abraham *et al.* (1990) which showed a significant association between urinary incontinence and baby weight. It also agreed with the report of Elia (1993) and marshal (1998) which stated that the prevalence rate of urinary incontinence is high for mothers who have had many children. It also agreed with the report of Wilson *et al*. (1996), Makeinen *et al* (1992), Hoist *et al* (1998), US department of health and human resources (1992) and Sandvik *et al* (1993) which showed a significant association between urinary incontinence and the age of the mothers. There is also a disagreement between this finding and the finding of Arya *et al* (2005) and fynes *et al* (1998) which showed a significant association between urinary incontinence and mode of delivery. This

disagreement may have been as a result of low sample size and asymmetrical distribution of data.

5.4 considering if there is an association between postpartum UI and obesity using body mass index (BMI), waist-hip ratio, percentage body fat and percentage body water as outcome measure.

The findings of result four showed significant association between Urinary incontinence and obesity, the findings agree with the report of Elia (1993) which states that women who are obese are about four times likely to have incontinence, the work of Burgio (1991) which showed that Urinary incontinence is related to BMI and the work of Rasmusen *et al* (1997) showed the impact of obesity on the pelvic floor muscle. According to Pregazzi *et al*. (2001) and Greer *et al* (2008) physiological weight gain during pregnancy may lead to increased pressure on the PFM and bladder which may result in greater urethra mobility. Furthermore, excess maternal weight gain may impair blood flow and innervations to the bladder and urethra (Bump et al., 1992). Several other studies showed an association between obesity and UI. Zhu *et al.* (2012) reported that women with BMI > 30kg/m^2 were at increased risk of developing UI. Increased maternal weight correlates with increase urinary incontinence at pregnancy and postpartum periods (Van Kessel *et al.,* 2011 and Wesnes *et al.,* 2009).

5.5 Considering the effect of physiotherapy intervention in the management of postpartum urinary incontinence

This study showed that physiotherapy intervention is effective in the management of postpartum urinary incontinence and none of the physiotherapy modality or mode of treatment is better than the others. This agree with the work done by others, for example, a survey of therapists involved in treating stress urinary incontinence found that 144 of 189 (76%) of respondents used interferential current in treatment (Mantle and Versi, 1991). The clinical problem solving (CPS)

guideline on the treatment of stress urinary incontinence contain several evidence statements about the usefulness of electrical stimulation in the treatment of this condition, although some concerns are noted about using interferential current due to possible effects on cellular activity in the pelvic and abdominal organ (Laycock *et al.,*2001). Wilson *et al* (1987) found that women with genuine stress incontinence (GSI) significantly improved with a regimen of supervised pelvic floor exercises (PFE), whether or not they were combined with interferential current or faradic stimulation when compare with home pelvic floor exercise. Dumoulin et al. (1995) investigated the effect of interferential current and pelvic floor exercise in 8 women with postpartum genuine stress incontinence. Frequency of incontinence, volume of urine loss and maximal pelvic floor muscle pressure all improved with treatment. No control group was included, however, the effectiveness of the program and the relative effectiveness of each component cannot, therefore, be clearly ascertained. Laycock and Jerwood (1993) reported two separate trials of the effectiveness of interferential current in the treatment of genuine stress incontinence. The first trial found both interferential current and pelvic exercise to be equally effective, although the second study demonstrated active interferential current to be significantly better than the placebo stimulation on a range of outcome measures. Interferential measure may therefore be effective, but no more so than active exercises. In another uncontrolled study (Dougall, 1995) descriptive analysis found that there was a reduction in frequency of voiding, nocturial and incontinence following treatment with interferential current alone. Vahtera et al. (1997) used a regimen of interferential current stimulation and pelvic floor exercise in patients with low urinary tract dysfunction due to multiple sclerosis and included a control group. Power and endurance of the pelvic floor increased and symptoms associated with dysfunction were significantly better in the treatment groups. Again, the relative effectiveness of the two interventions cannot be determined, but the combination of interferential current stimulation and pelvic floor exercise seems to be effective in this

population. A small uncontrolled pilot study investigating the effectiveness of interferential current in anorectal incontinence found no evidence of long term improvement in symptoms (Sylvester and Keilty, 1987). Overall, therefore, evidence for the effectiveness of interferential current in the treatment of incontinence may not be fully clear.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Summary

The literature reviewed and the research work done by other researchers, shows that the prevalence of urinary incontinence in women is high after child birth and a lot of factors were reported to predispose the women to this condition. Due to the paucity of research work done in the topic in this part of the country, there arise a need to carry out the research work on the topic ñpostpartum urinary incontinent and its predisposing factors in Enugu metropolis.

A self-administered questionnaire with items adapted from women continence and pelvic health centre questionnaire, was used to obtain information from the participant, eight hundred and sixty four questionnaires were distributed, duly completed and return. The finding was analyzed using SPSS 20.0 version package, descriptive statistics (frequency and percentage) were used to present the result and inferential statistics of chi square and one way anova was used to determine the association between stated factors and urinary incontinence and the effect of physiotherapy intervention in the management of postpartum urinary incontinence.

The finding showed that urinary incontinence is common in post-partum mothers in Enugu Metropolis, especially mothers without educational qualification, mothers who gave birth to baby within 2.6-3.5kg, mothers within the age range of 36 years and above, mothers who gave birth through caesarian section, and mothers who are obese using waist hip ratio as outcome measure. These also showed significant association between urinary incontinence in postpartum mothers and the various stated factors except mode of delivery and that physiotherapy intervention is effective.

5.2 Conclusions

The following conclusions could be drawn based on the finding of the study:

- There is a high prevalence rate of urinary incontinency in post-partum mothers in Enugu Metropolis, especially in those without formal educations who are centrally obese and are within the age of 36 and above.
- There is a significant association between postpartum urinary incontinence and, educational qualification, weight of the baby, parity, age of the mother, and obesity. These may be a predisposing factor to urinary incontinence in postpartum mothers.
- There is no significant association between postpartum urinary incontinence and mode of delivery.
- Most women affected do not seek for medical attention, higher percentage of those who sought are not referred to physiotherapist.
- Physiotherapy intervention is effective in the management of postpartum urinary incontinence.

5.3 Recommendations

Å Women health physiotherapy unit should be instituted in every primary, secondary and tertiary health institution

Å The role of women health physiotherapist should be recognized in every antenatal and post natal care programme.

Å Causes and factors predisposing women to urinary incontinence after child birth, should be discussed during ante-natal classes

Å Awareness programme should be organized to enlighten the public especially women in the rural areas about urinary incontinence, It causes, sign, symptom, prevention and the treatment measure available.

Å Other health practitioners should be enlightened on the efficiency of physiotherapy intervention measures in the management of urinary incontinence and on the need to refer their patient presented with urinary incontinent to a physiotherapist.

Å Urinary incontinence assessment/ examination should be conducted before and after birth by the medical experts.

Å Government policy on maternal and child health should be included as part of the health care policy programme.

Å The research should be further investigated using a larger sample size to correlate urinary incontinence in postpartum mothers and the risk factors stated above especially level of educational qualification and mode of delivery and other risk factor.

REFERENCES

Abrams, P., Blavias, J.G. and Staton, S.L. (1988). óThe Standardization of terminology of lower urinary tract function recommend by the international continence society,ô *International Urogynaecol Journal (IUJ),* 3(1); 45-48.

Allen, R.E., Warren J. and Sampsel M. (1990). óPelvic floor damage and childbirth: a neurophysiological studyô. *British journal of obstetrics and gynaecology,* 97(9); 770-779.

Altman D, Ekstrom A, Gustafsson C, Lopez A, Falconer C, Zetterstrom J. (2006). Risk of urinary incontinence after childbirth: a 10-year prospective cohort study. Obstet Gynecol 108: 873-878.

Altman D, Melin I, Falconer C, Rossner S. (2009). Weight reduction as treatment of urinary incontinence. Lakartidningen 106: 1826-1828.

American Uro-Gynaecology Society. (1992). óThe history and physical examination in women with urinary incontinence,ô *American Uro-gynaecologic Society Q Rep.* 7(1); 1-3.

Arya, R., Bugg, G., Hoskner, G. and Kiff, E. (2005), óAnal and urinary incontinence in multiparous women nine months after childbirth,ô *International Urogynaecologic Journal*, 16(5), 405 -408.

Arrue M, Ibanez L, Paredes J, Murgiondo A, Belar M, Sarasqueta C, Diez-Itza I. (2010). Stress urinary incontinence six months after first vaginal delivery. Eur J Obstet Gynecol Reprod Biol. Gastroenterol 102: 1998-2004.

Baker, P.N. and Louise, C.K. (2011). Obstetrics by ten teachers, eleventh edition. India: Macmillan. 95- 126.

Baydock SA, Flood C, Schulz JA, MacDonald D, Esau D, Jones S, Hiltz CB. (2009). Prevalence and risk factors for urinary and fecal incontinence four months after vaginal delivery. J Obstet Gynaecol Can 31: 36-41.

Beighton, P., Graham, R. and Bird, H. (1984). ó Joint hypermobility: methods of qualification and epidemiology,ô *Orthorpade*, 13:19-24.

Bergman, A., Elia, G. and Cheung, D. (1994). óBiochemical composition of collagen in continent and stress urinary incontinent woman,' *Gynecol Obstet inves.* 1: 48-51.

Bhatia, N.N., Bergman A. and Gunning, J.E. (1983). óUrodynamic effect of a vaginal pessary in women with stress urinary incontinence,ô *Amsterdam journal on reproductive medicine,* 171(1); 206-211.

Bo, K. Hagen, R. and Kvarstein B. (1989). óFemale stress urinary incontinence and participation in different sports and social activities,ô *Scandinavia journal of sports science*. 11, (3,); 117-121.

Bo, K. Hagen, R.H. and Kvarstein B. (1990). óPelvis floor muscle exercise for the treatment of female stress urinary incontinence: Effects of two different degrees of pelvis muscle exercise,ô *Neurological Urodynamic Journal,* 9 (5): 489-502.

Bo, K., Mahlums, O. Ogeid, S. and Larsen S. (1989). óPrevalence of stress urinary incontinence among physically active and sedentary female students,ô *Scandinavia journal of sports science.* 11(3):113-116.

Bo, K., Stein, R. and Kulseng ï Hassen, S. (1994). óClinical and urodynamic assessment of nulliparous young women with or without stress incontinence symptom: A case control study,ô *Obstet Gynecol*, 84 (6):1028-1032.

Boyles SH, Li H, Mori T, Osterweil P, Guise JM. (2009). Effect of mode of delivery on the incidence of urinary incontinence in primiparous women. Obstet Gynecol 113: 134-141

Brown JS, Wing R, Barrett-Connor E, Nyberg LM, Kusek JW, Orchard TJ, Ma Y, Vittinghoff E, Kanaya AM. (2006). Lifestyle intervention is associated with lower prevalence of urinary incontinence: the Diabetes Prevention Program. Diabetes Care. 29: 385-390.

Brown SJ, Donath S, MacArthur C, McDonald EA, Krastev AH. (2010). Urinary incontinence in nulliparous women before and during pregnancy: prevalence,

incidence, and associated risk factors. Int Urogynecol J Pelvic Floor Dysfunct 21: 193-202.

Brincat, M., versi, E. and Moniz C.F. (1987). óSkin collagen changes in post-menopausal women receiving different regimens of oestrogen therapy,ô *Obstetrics and Gynaecology*, 7 (1): 123-127.

Brokelhurst, J.C. (1999). óUrinary incontinence in the community: analysis of a MORI pollô, *Neurological Urodynamic Journal,* 18 (6): 567-577.

Brown, S. and Lumley, J. (1998). óMaterial health after childbirth: result of an Australian population based survey,ô *British journal on obstetrics and gynaecology.* 105: 156-161.

Burgio, K.L., Mathew, K.A. and Engel, B.T. (1982). óPrevalence, incidence and correlation of urinary incontinence in healthy, middle aged women,ô *Journal of American Medical Association*, 248 (10): 1194-1198.

Burgio, K.L., Robinson, J.C. and Engel, B.T. (1986). óThe role of biofeedback in Kegel exercise training for stress urinary incontinence,ô *Amsterdam journal of obstetrics and gynaecology* 154 (1): 58-64.

Burgio KL, Borello-France D, Richter HE, Fitzgerald MP, Whitehead W, Handa VL, Nygaard I, Fine P, Zyczynski H, Visco AG, Brown MB, Weber AM. (2007a). Risk factors for fecal and urinary incontinence after childbirth: the childbirth and pelvic symptoms study. Am J Obstet Gynecol; 157: 292-296.

Bump, R.C, Sugarman, H., Fanti, J.A., Mcclish, D.M. (1992). Obesity and lower urinary tract function in women: effect of surgically induced weight loss AMJ Obstet Gynecol; 166: 392-399.

Brostrom S., Lose G., (2008). Pelvic floor muscle training in the prevention and treatment of urinary incontinence in women- what is the evidenence? Acta obstet Gynecol scand; 87 (4): 384-402

Caldwell, J.C. (1979). From ñEducation as a Factor in Mortality Decline: An examination of the Nigerian dataò (p.408)

Celik, Y., Hotchkiss, D.R. (2000). The socio-economic determinants of maternal healthcare utilization in Turkey. Soc sci med; 50 1797- 804

Chaurasia, B.D. (2010). Human Anatomy fifth edition. India: CBS Publisher (P.609)

Chiarelli, P., Brown, W. and Elduff, P. (1997). őLeaking urine; prevalence and associated factors in Australian Women,' *British Journal of Obstertric and gynecology,* 104, (12): 1374-1379.

Connolly TJ, Litman HJ, Tennstedt SL, Link CL, McKinlay JB. (2007). The effect of mode of delivery, parity, and birth weight on risk of urinary incontinence. Int Urogynecol J Pelvic Floor Dysfunct 18: 1033-1042.

Crist T, Shingleton HM, Koch F, Koch GG.(1972). Stress incontinence and the nulliparous patient. Obstet Gynecol; 13-17.

Danforth KN, Townsend MK, Lifford K, Curhan GC, Resnick NM, Grodstein F (2006). Risk factors for urinary incontinence among middle-aged women. Am J Obstet Gynecol 194:339ï 345.

Davila, G.W. and Oysterman, K.V. (1994). őThe bladder neck support prosthesis: a non-surgical approach to stress incontinence in adult women,ô *Amsterdam journal of obstertrics and gynaecology.* 171 (1): 206-211.

Davis, K.and Kumar, D. (in press) (2003). pelvic floor dysfunction: a conceptual framework for collaborative patient centered care.

Delancey, C. and Koebil, E. (1988). őTheory of strong and fast reflex contraction,ô *Amsterdam journal of obstetrics and gynecology,* 171 (6); 1713-1720.

Delancey, J.O. (1994). őStructural support of the urethra as it relates to stress urinary incontinence: the hammock hypothesis,ô *Amsterdam journal of obstetrics and gynecology,* 170 (6): 1713-1720.

Diez-Itza I, Ibanez L, Arrue M, Paredes J, Murgiondo A, Sarasqueta C. (2009). Influence of maternal weight on the new onset of stress urinary incontinence in pregnant women. Int Urogynecol J Pelvic Floor Dysfunct 20: 1259-1263.

Dougall DS (1985). The effects of interferential therapy on incontinence and frequency of micturition. Physiotherapy 71(3): 135-136.

Dumoulin C, Seaborne DE, Quiran-DeGirardi C et al. (1995). Pelvic-floor rehabilitation, part 2: pelvic-floor reduction with interferential currents and exercise in the treatment of genuine stress incontinence in postpartum women-a cohort study. *Phys Ther* 75(12):1075-081.

Eason E, Labrecque M, Marcoux S, Mondor M. (2004). Effects of carrying a pregnancy and of method of delivery on urinary incontinence: a prospective cohort study. BMC Pregnancy and Childbirth. 4: 4.

Elia, G. and Bergman, A. (1993). ôPelvic muscle exercise: when do they work?ô *Amsterdam journal of obstetrics and gynecology,* 18 (2): 283-286.

Fritel X., Fauconnier A., Bader G. (2010). Diagnosis and Management of adult female stress urinary incontinence: guidelines for clinical practice from the French college of and obstreticians. Eur J obstet Gynacol Reprod Biol. 151 (1): 14-19

Fritel X. (2010). Pelvic floor and pregnancy. Gynecol Obstet Fertil 38: 332- 346.

Foldspang, A. Mommsen, S. and Lam, G.W. (1992). ôParity correlates of adult female urinary incontinence prevalence,ô *Journal of epidemiology of community health,* 46 (6): 595-600.

Fynes, M., Donnelly, V.S., OôConnel, P.R. and OôHertihy, C. (1998). ôCaesarean delivery and anal sphineter injury,ô *Obstet and gynecol,* 92: 496-500.

Glazener CM., Herbison GP., Mac Arthur C. (2006). New postnatal urinary incontinence: Obstetrics and other risk factors in primiparae Br J obstet Gynacol; 113 (2): 208-217

Greer WJ., Ritcher H.E., Bartolucci A.A, Burgio K.L. (2008). Obesity and pelvic floor disorders: a systematic review. Obstet Gynacol; 112(2 pt 1); 341-349.

Goldberg RP, Kwon C, Gandhi S, Atkuru LV, Sand PK. (2005). Urinary incontinence after multiple gestation and delivery: impact on quality of life. Int Urogynecol J Pelvic Floor Dysfunct 16: 334-336.

Groutz A, Rimon E, Peled S, Gold R, Pauzner D, Lessing JB, Gordon D. (2004). Cesarean section: does it really prevent the development of postpartum stress urinary incontinence? A prospective study of 363 women one year after their first delivery. Neurourol Urodyn 23:2-6.

Gunnarsson, M. and Mattiasson, A. (1991). óFemale stress, urge and mixed urinary incontinence are associated with chronic and progress pelvic floor/vaginal neuromuscular disorder: an investigation of 317 healthy incontinence women using vaginal surface electromyography,ô *Obstet and gynecol,* 93: 490-500.

Guyton, A.C. and Hall, J.E. (2000). medical physiology tenth edition. United State of America: WB Saunders.

Haken, J. Beness, C. and Cardozo, L. (1991). ñA randomized trial of vaginal cones and pelvic floor exercise in the management of genius stress incontinence: abstracted,ò Neurological urodynamic, 10 (5): 373-3994.

Hannestad Y, Hunskaar S. (2005). Waist-hip ratio associated with urinary incontinence in women. ICS annusal congress 2005, Montreal Abstract no 168

Hojberg, K.E., Salvig, J.D., Winslow, N.A., Lose, G. and Secher, N.J. (1999). óUrinary incontinence: prevalence and risk factors at 16 weeks of gestation,ô *British journal of obstetric and gynaecology,* 106: 842-850.

Holst, K. and Wilosn, P.D. (1988). óThe prevalence of female urinary incontinence and reasons for most seeking treatment,ô *New Zealand Medical Journal.* 101 (857): 756-758.

Jolleys, J.V. (1998). óReported prevalence of urinary incontinence in women in general practice,ô *British medical journal.* 296: 1300-1302.

Kalai, S. Han, P.D. (2008). óThe urethral motion profile: a novel method to evaluate urethral support and mobility,ô *Australian and new Zealand journal of obstetrics and gynaecology,* 48 (3): 337-342.

Kargar, A.G. (2006). ôThe prevalence of urinary incontinence during childbirth in the Czech Republic,ô *Obstet Gynecol,* 50: 111-220.

Karram, M.M., Yeko, T.R., and Sauer, M.V. (1989). ôUrodynamic changes following hormonal replacement therapy in women with premature ovarian failure,ô *Obstet Gynecol,* 70 (1): 123-127.

Kegel N. (1948). Progressive resistance exercise in the functional retroration of the perineal muscle. AM J obstet Gynacol 9: 121-134.

Kuh D, Cardozo L, Hardy R. (1999). Urinary incontinence in middle aged women: childhood enuresis and other lifetime risk factors in a British prospective cohort. J Epidemiol Community Health 53: 453-458.

Laycock J, Jerwood D (1993). Does pre-modulated interferential therapy cure genuine stress incontinence? Physiotherapy 79(8):553-560

Laycock J, Standley A, Crothers E *et al.* (2001). Clinical guideline for the physiotherapy management of female aged 16-65 with stress urinary incontinence. London Chartered Society of Physiotherapy.

Iosif, S. (1981). Stress incontinence during pregnancy and in puerperium. *Int J Gynaecol Obstet,* Vol.19, (Mar 1981), pp. 13-20, ISSN 0020-7292

Makinen, J.I., Gronroo, S.M. and Kilholma, P.J.A. (1992). ôThe prevalence of urinary incontinence in a randomized population of 5247 adult finish women,ô *International urogynaecology journal,* 3, (2): 110-113.

Marshal, K., Thompson, K.A., Walsh, D.M. and Baxter, G.D. (1998). ôIncidence of urinary incontinence and constipation during pregnancy and past partum: survey of current findings at Rotunda lying in hospital,ô *British journal of obstetric and gynaecology,* 105: 400-402.

MacArthur C, Glazener C, Lancashire R, Herbison P, Wilson D. (2011). Exclusive caesarean section delivery and subsequent urinary and faecal incontinence: a 12-year longitudinal study. BJOG

MacLennan AH, Taylor AW, Wilson DH, Wilson D. (2000). The prevalence of pelvic floor disorders and their relationship to gender, age, parity and mode of delivery. Bjog 107: 1460-1470.

Mantle J, Versi E (1991). Physiotherapy for stress urinary incontinence: a national survey. *Br med J* 302: 753-755.

McGrother CW, Donaldson MM, Hayward T, Matthews R, Dallosso HM, Hyde C. (2006). Urinary storage symptoms and comorbidities: a prospective population cohort study in middle-aged and older women. Age Ageing 35: 16-24

McEwan, A. (2011). Labour in Baker, P.N. and Louise, C.K. (eds.), ten teachers nineteenth edition. India: Macmillan. 231- 252

Meyer, S., Dhenin, T. and Schmidt, N. (1992). ôSubjective and objective effects of intravaginal electrical myostimulation and biofeedback in patients with stress urinary incontinence,ô British journal of urology, 69 (6): 584-588.

Meyer, S., Schreyer, A., De grandi, P. and Hohlfeld, P. (1998). ôThe effects of birth on urinary incontinence mechanism and other pelvic floor characteristicsô, *Obstetrics and Gynaecology,* 92: 613-618.

Morkved, S. and Bo, K. (1997). ôThe effect of postpartum pelvis floor muscle exercise in the prevention and treatment of urinary incontinence,ô *International urogynecology journal,* 8: 217-222.

Morkved, S .and Bo, K. (1999). ôPrevalence of urinary incontinence during pregnancy and postpartum,ô *International urogynaecology journal,* 10: 394-398.

Melville JL, Katon W, Delaney K, Newton K. (2005). Urinary incontinence in US women: a population-based study. Arch Intern Med 165: 537-542.

Mishra GD, Hardy R, Cardozo L, Kuh D. (2008). Body weight through adult life and risk of urinary incontinence in middle-aged women: results from a British prospective cohort. Int J Obes (Lond) 32: 1415-1422

Newman D.K., (2001). Conservative management of urinary incontinence in women. Prim care update obstet gynacol; 8(4): 153-162.

Nygaard, I. (2006). Urinary incontinence: is cesarean delivery protective? *Semin Perinatol,* 30 (5): 267-271, ISSN 0146-0005

Nygaard, I. (1995). óPrevention of exercise incontinence with mechanical devices,ô*Journal on reproductive medicine,* 40 (2): 89-94.

Nygaard, I., Delancey, J.O. and Arnsdorf, L, (1990). óExercise and incontinence,*' Obstet and Gynecol,* 75 (5): 848-851.

Petros, P. and Swash, M. (in press) (1990). óA musculo elastic theory of anorectal function and dysfunction in the female,ô *Scandinavia journal of urology and nephrology;* 28 (151): 1-93.

Petros, P.E. and Ulmsten, U. (1990). óAn integral theory of female urinary incontinence,*' ACTA obstet and gynecol Scandinavia,*69 (153):1-79.

Petros, P.E. and Ulmsten, U. (1993). ó An integral theory and itôs method for the diagnosis and management of female urinary incontinence,ô *Scandinavia journal of urology and nephrology,* 27 (153): 1-93.

Petros, P.E. and Ulmsten, U. (1997). óNew ambulatory surgical methods using anatomical classification of urinary dysfunction to improve stress, urge and abnormal emptying,*' International journal of urogynaecology,* 27: 270-278.

Petros, P.E. (1999). óCure of urinary and faecal incontinence via pelvic ligament reconstruction suggest a connective tissue etiology for both,ô *International journal of urogynecology,* 10: 356-360.

Popper, K.R. (1980). A survey of fundamental problems on the problems of theory of scientific method, Theories falsibility, The problem of the empirical basis, Degrees of testability simplicity and the logic of scientific discover. London: Unwin and Hyman.

Pregazzi R, Sartore A, Troiano L, Grimaldi E, Bortoli P, Siracusano S, Guaschino S. (2002). Postpartum urinary symptoms: prevalence and risk factors. Eur J Obstet Gynecol Reprod Biol 103: 179-182.

Rasmussen KM, Abrams B, Bouchard C, Butte N, Catalano PM, Gillman M, Guerra FA, Johnson PA. (2009). Weight gain during pregnancy: reexamining the guidelines Washington (DC): Institute of medicine.

Rortveit G, Daltveit AK, Hannestad YS, Hunskaar S. (2003). Urinary incontinence after vaginal delivery or cesarean section. N Engl J Med 348: 900-907.

Rortveit G, Daltveit AK, Hannestad YS, Hunskaar S. (2003). Vaginal delivery parameters and urinary incontinence. The Norwegian EPINCONT study. Am J Obstet Gynecol 189: 1268-1274.

Rasmussen, K.L., Krue, S., Johansson, L.E., Knudsen, H.J. and Agger, A.O. (1997). óObesity as a predictor of post partum urinary symptoms,ô *ACTA obstetrics and gynaecology Scandinavia,* 76: 357-362.

Sampselle CM, Harlow SD, Skurnick J, Brubaker L, Bondarenko I. (2002). Urinary incontinence predictors and life impact in ethnically diverse perimenopausal women. Obstet Gynecol 100: 1230-1238

Sandvik H, Espuna M, Hunskaar S. (2006). Validity of the incontinence severity index: comparison with pad-weighing tests. Int Urogynecol J Pelvic Floor Dysfunct 17: 520-524.

Sampselle, C.M., Miller, J.M., Mims, B.L., Delancey, J.O., Ashton-miller, J.A. and Antonakos, C.L. (1998). óEffect of pelvic floor exercise on transient incontinence during pregnancy and after childbirth,ô *Obstet gynaecology,* 91: 406-412.

Sand, P.K., Richardson, D.A. and Staskin, D.R. (1995). óPelvic floor electric stimulation in the treatment of genuine stress incontinence: a multicenter, placebo-controlled trial,ô *Amsterdam journal of obstetrics and gynaecology,* 173 (1): 72-79.

Sandvik, H., Hunskaar, S., Seim, A., Hermstead, R., Vanvik, A. and Brah, H. (1993). óValidation of a severity index in female urinary incontinence and its

implementation in an epidemiological survey,ô *Journal of Urology,* 146: 1255-1259.

Schytt E, Lindmark G, Waldenstrom U. (2004). Symptoms of stress incontinence 1 year after childbirth: prevalence and predictors in a national Swedish sample. Acta Obstet Gynecol Scand 83: 928-936.

Schussler, B. (1994). óPelvic floor re-education: principle and practice,ô *London-New York City Springer-Verlag,* 1: 45-46.

Sherman, R.A., Davis, G.D. and Wrong, M.F. (1997). óBehavioral treatment of exercise induced urinary incontinence among female soldiers,' *Military medicine* 162 (10): 690-694.

Snooks, S.J., Badenoch, D.F. and Tiptaft, R.C. (1985). óPerineal nerve damage in genuine stress urinary incontinence: An electrophysiological study,ô *British journal of urology,* 57 (94): 422-426.

Snooks SJ, Setchell M, Swash M, et al (1984). Injury to innervations of pelvic floor sphincter musculature in childbirth. Lancet; 546-50.

Snooks S.J., Swash M., Mathers S.E. (1990). Effects of vaginal delivery on the pelvic floor: 5-year follow-up. Br Surg; 1359-60.

Sotter, O. (2006). óStrategies for prevention and management of stress urinary incontinence in childbearing and community dwelling older women,ô *Gynaecology and obstetrics investigation,* 62 (1): 21-77.

Solans-Domenech M, Sanchez E, Espuna-Pons M. (2010). Urinary and Anal Incontinence During Pregnancy and Postpartum: Incidence, Severity, and Risk Factors. Obstet Gynecol 115: 618-628.

Sottner O, Zahumensky J, Krcmar M, Brtnicka H, Kolarik D, Driak D, Halaska M. (2006). Urinary incontinence in a group of primiparous women in the Czech Republic. Gynecol Obstet Invest 62: 33-37.

Staton, S.L. Kerr, W.R. and Grant, H.V. (1980). óThe incidence of urological symptoms in normal pregnancy,ô *British journal of obstetrics and gynaecology,* 87: 897-900.

Stewart, W.F., Van Rooyen, J.B., Cundiff, G.W., Abrams, P., Herzog, A.R., Corey, R., Hunt, T.L. and Wein, A.J.(2003). Prevalence and burden of over reactive bladder in the United State. United states of America: Bio infobank Institute.

Sultan, A.H. and Stanton, S.L. (1996). ôPreserving the pelvic floor and perineum during childbirth ï elective caesarean section,ô *British Journal of Obtertrics and Gynaecology,* 103: 731-734

Swash M, Snooks S.J., Henry M.M. (1985). Unifying concept of pelvic floor disorders and incontinence. R Soc Med; 906-11.

Sylvester KL, Keilty SEJ (1987). A pilot study to investigate the use of interferential in the treatment of ano-rectal incontinence. Physiotherapy 73(4): 207-208.

Tincello, D.G., Adams, E.J. and Richmond, D.H. (2008). óAntenatal screening for postpartum urinary incontinence in nulliparous women: result of a pilot study,ô *British journal of clinical and health research.*

Townsend MK, Curhan GC, Resnick NM, Grodstein F. (2008). BMI, waist circumference, and incident urinary incontinence in older women. Obesity (Silver Spring) 16: 881-886.

Townsend MK, Danforth KN, Rosner B, Curhan GC, Resnick NM, Grodstein F. (2007). Body mass index, weight gain, and incident urinary incontinence in middle-aged women. Obstet Gynecol 110: 346-353.

Urogynecol J. (2009). Pelvic floor disfunct., 20(10):1223-1231

U.S. Department of health and Human Resources, Public Health Service, Agency for Health Care Policy and Research. (1992). Urinary incontinence in adults: Clinical practice guidelines. AHCPR Publication No 92-0038 Rockville MD.

, US Department of Health and Human Services, public service, agency for health care policy and research. (1997). Urinary incontinence in adults: clinical practice guideline. AHCPR publication no 92-0038 Rockville MD.

Vahtera T, Haaranen M, Viramo-Koskela AL et al. (1997). Pelvic floor rehabilitation is effective in patients with multiple scleriosis. *Clin rehab* 11:211-219

Wesnes, S.L.; Hunskaar, S.; Bo, K. & Rortveit, G. (2009). The effect of urinary incontinence status during pregnancy and delivery mode on incontinence postpartum. A cohort study. *BJOG,* 116 (5) 700-707, ISSN 1471-0528

Wilson, P.D., Al-Summarai, M.T. and Brown, A.D. (1980). ñQuantifying female incontinence with particular reference to urilos system,ò Urology international, 35 (4): 298-302.

Wilson PD, Herbison RM, Herbison GP. (1996). Obstetric practice and the prevalence of urinary incontinence three months after delivery. Br J Obstet Gynaecol;154-61.

Wilson PD, Al Samarrai T, Deakin M *et al.*(1987). An objective assessment of physiotherapy for female genuine stress incontinence. Br J Obstet Gynaecol 94:575-582.

Zhu L., Li L., Lang J.H., Xu T., (2012). Prevalence and risk factors for peri- and postpartum urinary incontinence in primiparous women in China: a prospective longitudinal study. Int Urogynacol J. 23(5): 563-572.

http://www.healthhype.com/bladder-control-mechanism-for-urination-and-micturition-reflex.html

APPENDIX 1

INFORMED CONSENT FORM

TOPIC: postpartum urinary incontinence and its predisposing factors in Enugu metropolis.

INTRODUCTION: My name is Chukwu Sylvester Caesar. I am a post-graduate student of medical rehabilitation, faculty of health science and technology, college of medicine, University of Nigeria Enugu campus. I am carrying out a research work on the above mentioned topic and seek your consent in order to participate in the study.

VOLUNTARY NATURE OF PARTICIPATION: Your participation in this study is voluntary. You have the right to withdraw consent or discontinue at any time you wish to.

STUDY PROCEDURE: This research work entails the use of questionnaires, in which you are expected to supply the correct information as required by the questionnaire.

RISK: This research work will pose no hazard to you.

CONFIDENTIALITY: I wish to affirm that any information encountered in the course of this study will be treated as confidential and the necessary ones will be strictly for the sole purpose of this study.

FEEDBACK: In case of clarification, you can contact me on 08035421158.

RESPONSE: The study has been well explained to me and fully understood the content of the study process. I will be willing to participate in the research work described above.

_____ _____

Name and signature of participant Name and signature of researcher

(With Date) (With Date)

_____

Name and signature of witness

(With date)

APPENDIX 2

Questionnaire

Department of Medical Rehabilitation,

College of Medicine,

University of Nigeria Enugu Campus,

Enugu State.

Dear Respondent,

I am a post-graduate student of Department of Medical Rehabilitation (Physiotherapy) in University of Nigeria Enugu Campus, conducting a research study on the topic **"POST PARTUM URINARY INCONTINENCE AND ITS PREDISPOSING FACTORS IN ENUGU METROPOLIS"**. I will be grateful if you supply the correct information as required by this questionnaire.

Please note that this is purely an academic study and most importantly, the confidentiality of all the information obtained is guaranteed.

Thanks for your sincere cooperation.

Chukwu Sylvester C.

08035421158

A post-graduate student

Of The Department Of Medical Rehabilitation

Urinary Incontinence Questionnaire

Section A

Date _____

Age _____ Height _____Weight _____ Hip circumference_____ Waist circumference_____ Percentage body fat_____ No of Vaginal Births _____No of Caesarean Sections _____

Level of education qualification:

a) First school leaving certificate (FSLC) [ ]
b) WASSCE/NECO [ ]
c) Teaching certificate I (TC I) [ ]
d) Teaching certificate II (TC II) [ ]
e) OND [ ]
f) NCE [ ]
g) HND [ ]
h) BSc [ ]
i) MSc [ ]
j) PhD [ ]

Section B

1. In general, how would you rate your bladder control:

Good _____

Fair _____

Poor _____

Terrible _____

2. How often do you urinate during the day time?

Approximately every _____ hrs.

3. How much fluid do you usually drink: (Please estimate in liters)

During the day? _____Liters

After dinner? _____Liters

4. Do you ever accidentally lose your bladder control and wet your clothing

yes _____

No_____

If yes, how often does this occur? (Check one)

Rarely _____

Occasionally____

Weekly _____

Daily _____

If yes, estimate the volume of accidental urine loss: (Check one)

Clothing is slightly damp? ____

Clothing is wet? _____

Clothing is soaking wet? _____

5. Do you wear a pad for protection against urinary accidents?

Yes _____No

If yes, how often do you wear a pad (check one)

All day _____

Only when away from the house _____

Only with exercise or strenuous activities ____

Only with a cold and cough _____

If yes, approximately how many pads will you usually use each day?

Number of pads _____

6. Do you accidentally urinate during any of the following: (check each)

Coughing _____

Sneezing _____

Jumping_____

Laughing _____

Exercising _____

Walking _____

7. Do you usually have to hurry to the toilet, or can you take your time?

Hurry _____

Take time _____

8. If you have a strong urge to urinate, can you suppress the feeling?

Usually ____

Occasionally _____

Rarely _____

9. Do you ever have the urge to urinate and accidentally lose urine before reaching the toilet?

Yes ____ No _____

10. When you get the urge to urinate, is it usually painful?

Yes ____ No _____

If yes, is the pain relieved after urinating:

Yes ____ No _____

11. How many times at night do you usually get up to urinate?

Number _____

12. Upon awakening in the morning, do you usually hurry to the bathroom?

Yes ____ No _____

If yes, do you ever accidentally leak before reaching the toilet?

Yes ____ No _____

13. Are you ever unaware that you have urinated until you feel wet?

Yes ____ No _____

14. Do you feel you are wet most of the time?

Yes ____ No _____

15. Do you feel that you empty your bladder completely?

Yes ____ No _____

16. While you are urinating, are you able to stop the flow?

Yes ____ No _____

17. Do you notice any dribbling of urine when you stand up after urinating?

Yes ____ No _____

18. Have you ever been treated by dilation of the urethra?

Yes ____ No _____

19. Have you had a urinary infection during this past year?

Yes ____ No _____

If yes, more than twice?

Yes ____ No _____

20. Do you have symptoms of infection after intercourse?

Yes ____ No _____

21. Is your urine ever bloody?

Yes ____ No _____

22. Are there certain activities (sports, dancing, etc) which you have stopped because of your incontinence?

Yes _____

If yes, please describe:_____

23. Have you ever reported this condition to your doctor?

Yes ____ No _____

If yes, did your doctor refer you to a physiotherapist?

Yes ____ No _____

24. Were you aware of this condition before giving birth?

Yes ____ No _____

25. Did you have any of the following delivery? (Check any one)

Prolonged labour _____ obstructed labour _____

Epidural labour _____ episiotomy _____

Induced labour _____ forceps delivery _____

Emergency caesarean section _____

Elective caesarean section _____

26. What is the weight of the baby at birth? _____(kg)

Appendix 3

Igbo Version of the Questionnaire

Department of Medical Rehabilitation,

College of Medicine,

University of Nigeria Enugu Campus,

Enugu State.

Ezi enyim,

A bu m nwata akwukkwo na-eme oke mmuta (masters) ya na ngalaba omumu ihe gbasara inyere ndi noo nô akwa oria aka nô ulogwu nke ulo akwukwo mahadum Naijiria ngalaba nke di nô enugwu. A nam eme nyocha maka ichoputa **umu nwanyi ole na enwekari nsogbu gbasara amiri I napu ha na ahu oge obula na enweghi mgbochi n' otutu ulo ogwu enwere na Enugu ma ha muchaa nwa ya na ihe jikoro aro ahu ha**.

Biko o ga aso m ma ijiri eziokwu zaa ajuju di nôakwukwo iji.

Anam ekwusi ike na ajuju ndia nile bu naani maka iji nyere m aka nô agum akwukwo m. a gaghim eme ka aha gi puta ihe maobu gbaa aziza gi nôanwu nôụzo obula.

Dalu maka ndonye ukwu n enyemaka gi.

Aha m bu,

Chukwu Sylvester Caesar

08035421158

Na ngalaba na-ahu maka enyemaka ndi oria.

Ajuju gbasara amiri ipunahu nwanyi n'ahu nenweghi ike igbochibido ya.

Agba nke A

Kedu ihe ubochi taa bu _____

Afo ole ka idi _____

Ogo gi haa ole _____

Onyinyi arogi _____

Umuole ka imuru _____

Kedu ugboro ole e kuputara gi nawa nôafo _____

Ole ebe igu debere akwukwo

a) Asampudo (FSLC) ihe akwukwo isi [ ]
b) Asampudo WASSCE/NECO [ ]
c) Asampudo nkuzzi I (TC I) [ ]
d) Asampudo II (TC II) [ ]
e) Asampudo OND [ ]
f) Asampudo NCE [ ]
g) Asampudo HND [ ]
h) Asampudo BSc [ ]
i) Asampudo MSc [ ]
j) Asampudo PhD [ ]

Agba nke B

1. Kedu ka I ga esi kowaa otu akpa amiri gi si aluolu? Nkeoma _____

O nagbali _____

O jusighi afor ____

Odi okenjo _____

2. Ugboro ole ka I na anyu amiri nôubochi?

Ihe dika ugboro ole nôout awa _____

3. Ihe dika ugboro ole ka I na anu mmiri nôubochi?

Iko mmiri ole? _____

Iko mmiri ole nôehihie? _____

Iko mmiri ole nôoge abali? _____

4. Oge ufodu I na achoputa na amiri desia awka iyi nô ukwu na amaghi oge omere?

Ee _____

mba_____

O buru ee, kedu ihedika ugboro ole?

Amaghom _____

Oge ufodu _____

Kwa izuka _____

Kwa ubochi _____

O buru na izara ee, amiri gi ahu o na ebu ezigbo ibu?

Dika akwa gi idegbado mmiri _____

Dika akwa gi ide mmiri ntakiri _____

Dika akwa gi idika abanyere y nime mmiri _____

5. I na adi awanye akwa (pad) nô ukwu iji chebiri amiri ahu ipunahu gi na amagi ama? Ee _____

mba _____

Aziza gi buru ee, ugboro ole ka I na etinye ihe nôaputa gi

Oge obula _____

Ma inu apu apu _____

Ma I na alu olu siri ike _____

Ma oyi ma obu azuzu na eme gi ____

Oburu na aziza gi bu ee, o bu ihe ole (pad) ka I na etinye ebe ahu kwa ubochi? _____

6. Ya bu amiri ona apughi nôahu ma ina eme ihe ndia (ugboro ole)

I kwaa ukwara _____

I tie uzere _____

I malie elu _____

Ichia ochi _____

I gba egwu _____

I gaa ije ukwu _____

7. I na eji oso aga anyu amiri ka ina eji nwayoo ma owaba gi?

Iji oso _____

Ije ije _____

8. O buru na amiri na awasi gi ezigbo ike, I nwere ike kpia ya?

Oge obula _____

Mgbe ufodu _____

Odikata _____

9. O nwere mgbe ona abu igaba inyu amiri oputaba tupu I ruo ebe igba anoo nyuo ya?

Ee _____

mba _____

10. A miri guba gi ona adi afu gi ufu?

Ee _____

mba _____

O buru na ona afu gi ufu, ufu ahu o na akwusi ma I nyusia amiri?

Ee _____

mba _____

11. Ugboro ole ka ina apu anyu amiri nôabali obula?

Ole _____

12. I teta ura nôututu I na eji oso aga anyu amiri ututu?

Ee _____

mba _____

O buru na izara ee, amiri o na aputaba tupu iruo ulo mposi?

Ee _____

mba _____

13. I na enwe ike I maa na amiri na aputa gi na ahu tupu akwa gi ajuo oyi? _____

Ee _____

mba _____

14. O na adighi ka ahu gi ajuru oyi oge nile?

Ee _____

mba _____

15. O na adi gi ka inyusiri amiri digi nôafo ma nyuu amiri?

Ee _____

mba _____

16. I nwere ike ikpabi amiri oge ina anyu ya?

Ee _____

mba _____

17. I nyusia amiri kwuru oto, o na adigi ka amiri oka na atuputa gi nôahu? _____

Ee _____

mba _____

18. O nweela mgbe enyochara gi ahu, dika imetu akpa nwamiri gi aka? _____

Ee _____

mba _____

19. I nwere oria awamiri nôihe dika otu afo garage?

Ee _____

mba _____

Oburu na inwere oria ahu o gafere ugboro abua nôafo?

Ee _____

mba _____

20. I nwesia mmeko ona adigika I butere oria?

Ee _____

mba _____

21. O nweela mgbe amiri gi chara obara obara?

Ee _____

mba _____

22. Kedu ihe I di mbu eme ikwusigoro nihi onodu di otua? (dika imeegwumegwu, igba egwu, etc)

Oburu ee kowara anyi otu obu

_____

_____

23. Odila mgbe i mere ka dibia bekee gi maka ihe di otua?

Ee _____

mba _____

Aziza gi buru ee, dibia bekee ozigara gi nke ndi physiotherapy/

Ee _____

mba _____

24. I choputara maka onodu di otua tupu imuu nwa?

Ee _____

mba _____

25. ihe ndia onwere nke mere gi oge ina amu nwa?

Ime ometere gi aka _____

Nwa ekweghi iputa _____

Inye gi ogwu ga achuputa nwa _____

I wag i afo kuputa nwa na akwadoghi akwado _____

I gwa gin a aga awa gi afo ka obirriri gi ebiri n anti _____

26. kedu ka onyinyi aro nwa gi ha ogeamuru ya? _____kg