



Sudan University of Science & Technology



College of graduate studies

**Measurement of the Uterus size in Nulliparous and
Multiparous Sudanese women using Ultrasonography**

**قياس حجم الرحم في النساء السودانيات عديمات ومتعددات الولادة
باستخدام الموجات فوق الصوتية**

*A Thesis Submitted for Partial Fulfillment for the Requirements of (M.Sc.) Degree in
Medical Diagnostic Ultrasound*

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الآية

قال تعالى:

﴿فَتَعَالَى اللَّهُ الْمَلِكُ الْحَقُّ وَلَا تَعْجَلْ بِالْقُرْآنِ مِنْ قَبْلِ أَنْ يُقْضَىٰ

إِلَيْكَ وَحْيُهُ وَقُلْ رَبِّ زِدْنِي عِلْمًا﴾

صدق الله العظيم

سورة طه: الآية (114)

Dedication

My greatest appreciation and gratitude goes to my late father may Allah bless his soul and grant him eternal Jannah. He has been my light and guidance throughout this journey. You are dearly missed and this is my gift to you.

I would also like to dedicate my hard work in this research to my dear husband Musaab, my beloved children Selma and Arman, my mother, sister Samah and brother Ali who have supported me greatly in this study.

Acknowledgement

I would like to extend my gratitude to the Almighty Allah for enabling me to complete this master's course and research in good health and wellbeing.

Great appreciation to my supervisor Dr. Salah Ali Fadl Allah, without him I could not have completed this research. He has guided me wisely and with immense assistance throughout the preparation and completion of the study.

Abstract

This is a descriptive study to estimate the normal size of the uterus in Sudanese women and to compare the same variables amongst nulliparous vs multiparous ones. It was carried out in Khartoum state, during the period from September to October 2018.

The study is done for 50 women age between 20-50 years 28 of women (56%) were nulliparous and 22 women (44%) were multiparous and excluded women with uterine pathology, pregnancy and those below the age of 20 and above 50 years.

The data is collected by measuring the length, width and thickness of the uterus and Trans Abdomen Scan (TAS) is performed by placing the transducer in contact with the skin above the symphysis pubis and coupling gel is applied, 3.5 mHz ultrasound probe is used.

The collected data were analyzed using the SPSS statistical programme.

The result of this study showed that the mean uterine size found to be 6.92cm × 3.50cm × 2.50 cm (length × width × thickness) for overall total, (6.67cm × 3.29cm × 2.80 cm) for nulliparous and (7.25cm × 3.77cm × 3.15 cm) for multiparous. The mean age was 29.7 years this means the uterine size was significantly correlated with parity and age. And this agree with previous study done in Nigeria (journal of health, medicine and nursing 2015) .

The study showed that the range of length :8.52cm - 5.48cm ,width: 4.27cm - 2.56cm and the range of thickness is 3.50cm-2.30cm for over all cases

This study concluded that there is significant and direct correlation between uterine size and age, and also the size of the uterus in multiparous is larger than nulliparous women.

Future study in this topic using various methods, various technique and larger sample is highly recommended.

المستخلص

هذه الدراسة وصفية أجريت في ولاية الخرطوم في الفترة من سبتمبر إلى أكتوبر 2018 لقياس حجم الرحم ومقارنة حجم الرحم بين النساء عديمات ومتعددات الولادة.

أجريت هذه الدراسة لعدد (50) امرأة تتراوح أعمارهم بين (20-50) عام (28) من الحالات (56%) عديمات الولادة و (22) من الحالات (44%) متعددات الولادة. وتم استثناء النساء اللاتي لديهن إصابات أو أمراض في الرحم والحوامل والنساء الأقل من عمر (20) وأكثر من عمر (50) من هذه الدراسة.

تم جمع البيانات بقياس طول وعرض وسماكة الرحم بإجراء مسح بالموجات فوق الصوتية خلال البطن، تم استخدام الماسح بتردد (3.5 MHz) بوضعه فوق الجلد مباشرة، وتم تحليل البيانات المجموعة بواسطة برنامج التحليل الإحصائي SPSS ونتج هذا التحليل إلس أن متوسط حجم الرحم (6,92 سم × 3,50 سم × 2,50 سم) (الطول × العرض × السمك) لكل الحالات تحت الدراسة، و (6,67 سم × 3,29 سم × 2,80 سم) للنساء عديمات الولادة وللنساء المتعددات الولادة (7,25 سم × 3,77 سم × 3,15 سم) ومتوسط العمر لجميع الحالات (29,7) ووجدت الدراسة ان المدى لطول الرحم يتراوح بين 8,52 - 5,48 سم وللعرض يتراوح بين 4,27 - 2,56 سم ولسماكة الرحم يتراوح المدى بين 3,50 - 2,30 سم ووجدت هذه الدراسة أن حجم الرحم يزداد مع العمر وأن حجم الرحم في النساء متعددات الولادة أكبر من حجم الرحم في النساء عديمات الولادة وهذا يتوافق مع دراسة أجريت في نيجيريا عام 2015م.

وأوصت هذه الدراسة في البحوث المستقبلية بإجراءها بطرق وتقنيات مختلفة وعدد حالات وبيانات أكثر في فترة زمنية أطول لنتائج أفضل وأدق.

List of Contents

الآية	I
Dedication	II
Acknowledgement.....	III
English Abstract	IV
Arabic Abstract	VI
List of Contents	VIII
List of tables	X
List of Figures	XI
List of Abbreviation	XII
Chapter One: Introductions	1
1.1 Introduction:	1
1.2 Problem of the study	1
1.3 Objective of the study:.....	2
1.3.1 General objective:.....	2
1.3.2 Specific objectives:.....	2
1.4 overview of study	2
Chapter Two: Theoretical Review	3
2.1 Theoreticalbackground	3
2.1.1 Anatomy of the Uterus	3
2.1.1.1 Uterine Size and Shape.....	4
2.1.1.2 Uterine Positions.....	5
2.1.1.3 The Uterine Vessels.....	6
2.1.1.4 Embryologic Development ofthe Female Urogenital Tract	7
2.1.2 Histological Structure	7
2.1.3 Physiology(menstruation and ovulation):.....	8
2.1.4 Lymphatic drainage of the uterus	10
2.1.5 Congenital Malformations of the Uterus	10
2.1.6 Uterine Pathology	11
2.1.6.1 Adenomyosis	11
2.1.6.2 Uterine Leiomyoma.....	12
2.1.6.3 Leiomyosarcoma	14
2.1.6.4 Cervical Carcinoma	15

2.1.7 Definition of ultrasonography;	15
2.1.8 Propagation of Ultrasound.....	15
2.1.9 Ultrasound Bioeffects and Safety	15
2.2 Previous Study.....	17
Chapter Three: Materials and Methods.....	19
3.1 Materials	19
3.1.1 Sample population	19
3.1.2 Inclusion criteria.....	19
3.1.3 Exclusion criteria.....	19
3.1.4 Equipment used	19
3.2 method	19
3.2.1Technique	19
3.2.1.1 Transabdominal Sonography (TAS).....	19
3.2.1.2 Patient Preparation.....	19
3.2.1.3 Patient Position	20
3.2.1.4 Planes of Section	20
3.3 Data source	20
3.4 Data analysis.....	20
Chapter Four: results.....	21
Chapter Five: Discussion,conclusion&recommendations	25
5.1 Discussion.....	25
5.2 Conclusion.....	27
5.3 Recommendations	28
References	29
Appendices	30

List of tables

Table (4-1): shows the range , mean and std. Deviation of the age, length, width, thickness of the uterus and parity	21
Table (4-2): shows the Frequency Distrbuation of Nulliparous & Multiparous	21
Table (4-3): shows Correlations the age with length, width and thickness of the uterus.....	22
Table (4-4): shows the mean and Std. Deviation of the length, width and thicknees of uterus in Nulliparous & Multiparous	24
Table (4-5): shows T-test for Equality of means for length, width and thickness in Nulliparous & Multiparous	24

List of Figures

Figure (2-1):	Shows the Anatomy of the uterus.	3
Figure (2-2):	A. Illustration demonstrating an anteflexed, anteverted normal uterus.	5
Figure (2-3):	Illustration demonstrating a retroverted uterus.	6
Figure (2-4):	A. Illustration demonstrating an anteverted, retroflexed uterus.	6
Figure (2-5):	Sonographic appearance of the endometrium shortly after menses. Note how thin the endometrium appears in this image.	9
Figure (2-6):	Sonographic appearance of the endometrium during the late proliferative (periovulatory) phase, also referred to as the “three-line” sign.	9
Figure (2-7):	Sonographic appearance of the endometrium during the secretory phase. During this phase, the endometrium appears thick and echogenic.	10
Figure (2-8):	The more commonly diagnosed uterine anomalies.	11
Figure(2-9):	Adenomyosis. Sagittal (A) and coronal (B) of a uterus demonstrates adenomyosis (<i>arrowheads</i>) involving the posterior myometrium.	12
Figure (2-10):	Common locations of leiomyomas.	14
Figure(2-11):	Fibroid locations. A. Sagittal endovaginal view of an intramural fibroid (<i>between arrows</i>). B. Sagittal endovaginal view demonstrates a submucosal fibroid (<i>FB</i>). Note the distortion of the endometrium \ (<i>arrowheads</i>). C. Sagittal endovaginal view of a subserosal fibroid (<i>long arrows</i>).	14
Figure (4-1):	Shows the Frequency Distribution of Nulliparous & Multiparous.	21
Figure (4-2):	Shows Correlations the age with length of the uterus.	22
Figure (4-3):	Shows Correlations the age with, width of the uterus.	23
Figure (4-4):	Shows Correlations the age with thickness of the uterus.	23

List of Abbreviations

UA	Uterine artery
IIA	Internal iliac artery
EVS	Endovaginal Sonography
DES	Diethylstilbestrol
MRI	Magnetic Resonance Imaging
FDA	Food and Drug administration
TAS	Trans Abdominal Sonography

Chapter One:

Introduction

Chapter One

Introductions

1.1 Introduction:

The uterus is a pear-shaped, retroperitoneal organ that lies anterior to the rectum, posterior to the urinary bladder, and is bounded laterally by the broad ligaments.

Its primary function is to provide a place for the products of conception to implant and develop.

The various and normal positions of the uterus include anteversion, antiflexion, retroflexion and retroversion.

Each will be discussed further in detail in the research literature review section.

The size and shape of the uterus depends on the age of the patient, parity and presence of pathology or congenital anomalies that may alter its contour. (Penny,.2011),

Uterine length should be measured from the external os to the serosal surface of the fundus in an appropriate image through the centre of the uterus this measurement is more difficult to perform with endovaginal scan since the image display area is smaller than accorded with trans abdomen scan transducers. The mean length of the normal, non gravid, nulliparous uterus in a patient of reproductive age is about 7.5 cm. parity status has the greatest effect on the size of the non gravid, non diseased uterus, e.g. a woman who has given birth to four children (multiparous) will have a uterus which is significantly larger than a nulliparous uterus. (Berwin)

The normal postpubertal, or adult, uterus varies considerably in size. The maximal dimensions of the nulliparous uterus are approximately 8 cm in length, 5 cm in width, 4 cm in anteroposterior diameter. Parity (pregnancy) increases the normal size by more than 1 cm in each dimension.(Rumac,(2011)

1.2 Problem of the study

There is a lack of studies and literature concerning normal uterine size in nulliparous and multiparous Sudanese women to the best of the researcher's knowledge therefore necessitating prompt research and evaluation.

1.3 Objective of the study:

1.3.1 General objective:

To measure the size of the uterus in nulliparous and multiparous Sudanese women using ultrasonography.

1.3.2 Specific objectives:

- To compare uterus sizes in multiparous and nulliparous women.
- To correlate the size of the uterus with age.
- To compare results with international available data.
- To measure the size of the uterus in multiparous and nulliparous women to detect any pathology related to the size if present like hyperplasia or small uterine size.

1.4 overview of study

- chapter one : introduction
- chapter two : theoretical review
- chapter three : material and method
- chapter four : results
- chapter five : discussion conclusion and recommendation
- references
- Appendices

Chapter Two:

Theoretical Review

Chapter Two

Theoretical Review

2.1 Theoretical background

2.1.1 Anatomy of the Uterus

The uterus is a pear-shaped, retroperitoneal organ that lies anterior to the rectum, posterior to the urinary bladder and is bounded laterally by the broad ligaments. Its primary function is to provide a place the products of conception to implant and develop.

The uterus can be divided into four major division fundus, corpus, isthmus, and cervix. The fundus is the most superior and widest portion of the uterus. Each fallopian tube attaches to the uterus at the level of the uterine horns called the cornua. The largest part of the uterus is the corpus, or body. The corpus is located inferior to the fundus. The isthmus is the area located between the corpus and the cervix. During pregnancy the isthmus may be referred to as the lower uterine segment. The cervix is the rigid component of the uterus that is located inferior to the isthmus and it is the portion of the uterus that projects into the vagina. The cervix is marked superiorly by the internal os, which is in contact with the isthmus, and inferiorly by the external os, which is in close contact with the vagina. (Penny, (2011).

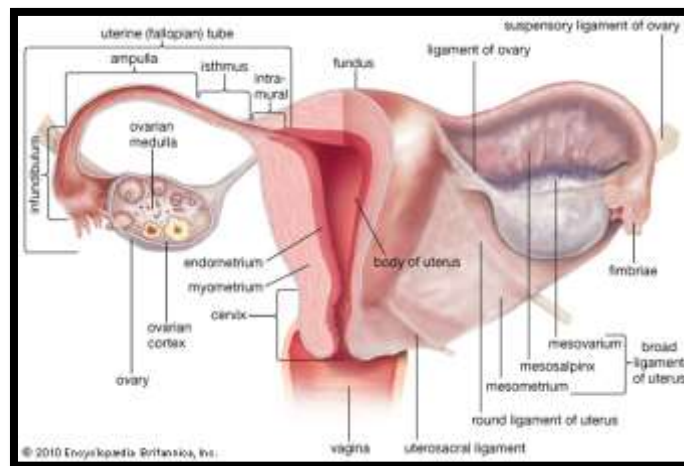


Figure: (2-1) Shows the Anatomy of the uterus. www.britannica.com

The vagina is a tubular organ, which extends from the external os of the cervix to the external genitalia. The vaginal fornices envelop the inferior aspect of the cervix. The vagina is composed of three layers: inner mucosal layer, middle muscular layer, and an outer layer that may be referred to as the adventitia. Sonographically, the divisions of the uterus can be demonstrated.

The uterine wall consists of three layers. The outer most layer is referred to as the serosal layer or perimetrium, which is continuous with the fascia of the pelvis. The middle layer is the myometrium or muscular layer, which constitutes the bulk of the uterine tissue, providing the area where contractile motion occurs. The inner mucosal layer of the uterus is referred to as the endometrium. The endometrium can be further divided into a deep or basal layer and a superficial or functional layer. The functional layer of the endometrium is the component that is shed during menstruation; thus, the thickness of the functional layer of endometrium will vary during the menstrual cycle as a result of hormonal stimulation. Between the two layers of the endometrium lies the endometrial (uterine) cavity, which is contiguous with the lumen of the fallopian tubes laterally, and the cervix inferiorly. (. Penny,. 2011).

2.1.1.1 Uterine Size and Shape

The size and shape of the uterus depends on the age of the patient, parity, and the presence of pathology or congenital anomalies that may alter its contour. The normal neonatal uterus is tubular in appearance and may exhibit distinct endometrial echoes in the first week of life as a result of maternal hormone stimulation. Following the neonatal period, the cervical antero posterior diameter is equal to or slightly greater than that of the uterine fundus. The normal prepubertal uterus has a cervix to uterus ratio of 2:1. The uterus grows minimally during prepubertal years, whereas after puberty the uterine fundus becomes much larger than the cervix, thus providing the pear-shaped appearance

of the normal adult uterus. Following menopause, the uterus typically becomes much smaller than the premenopausal uterus. (Penny, 2011).

2.1.1.2 Uterine Positions

The uterine position within the pelvis is variable. The normal position of the uterus is considered to be anteversion or ante flexion. Anteversion describes the uterine position in which the body tilts forward, forming a 90 degree angle with the cervix. Ante flexion of the uterus denotes the position in which the uterine body folds forward and comes in contact with the cervix, forming an acute angle between the body and the cervix. Retroflexion is the uterine position that results in the uterine body tilting backward and actually coming in contact with the cervix, thus forming an acute angle between body and cervix. Retroversion of the uterus is the position in which the uterine body tilts backward, without a bend where the cervix and body meet. The uterus may also be oriented more to the left or right of the midline, resulting in a variation between anatomic midline and functional midline. (Penny, 2011).

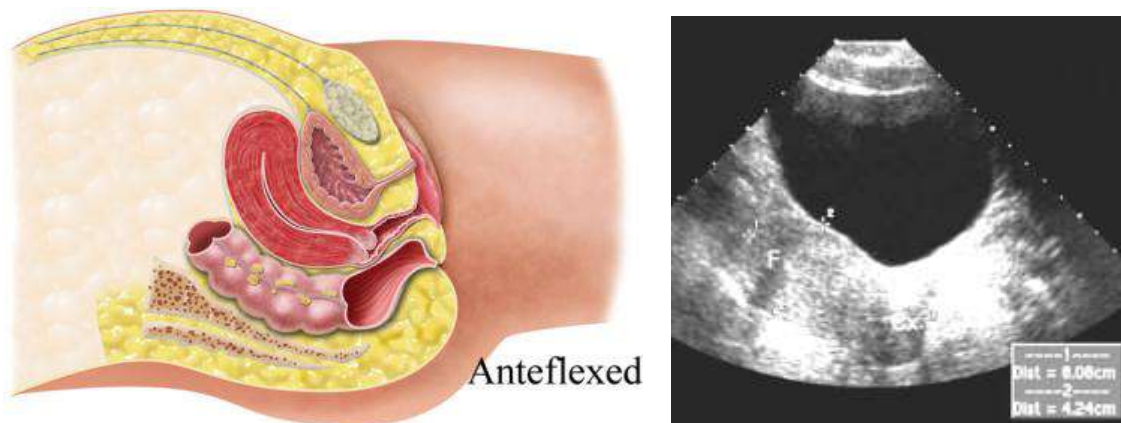


Figure: (2-2) A. Illustration demonstrating an anteverted, ante flexed normal uterus. (Callen, P. (2008)).

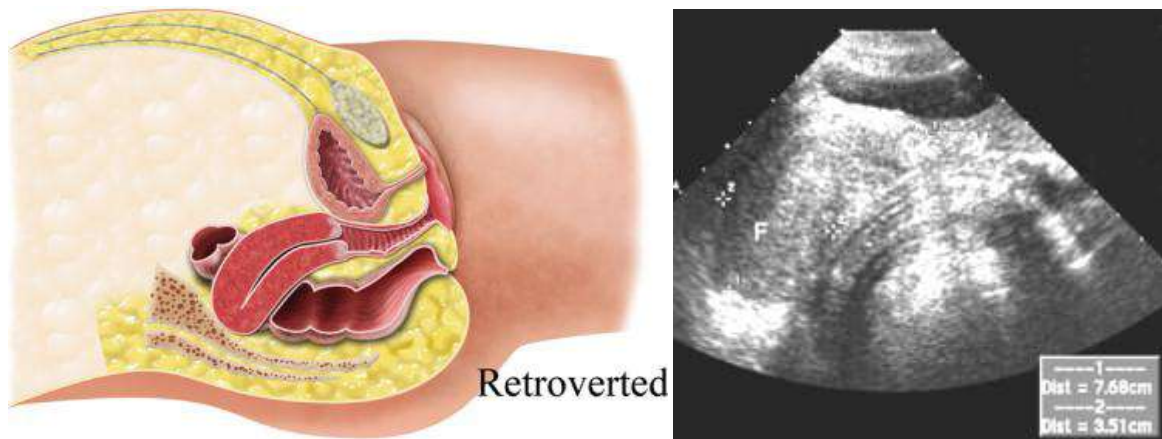


Figure (2-3): Illustration demonstrating a retroverted uterus. (Callen, P. (2008).

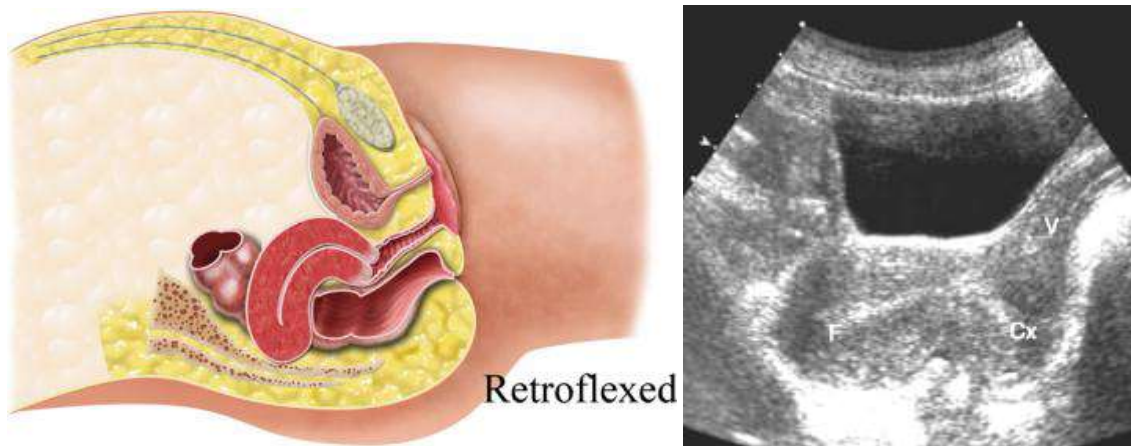


Figure: (2-4) A. Illustration demonstrating an anteverted, retroflexed uterus. (Callen, (2008).)

2.1.1.3 The Uterine Vessels

The uterine artery (right and left) is one of several anterior, visceral branches of the IIA. The uterine artery (UA) courses obliquely in the broad ligament toward the cervix where it gives off several branches and courses in a tortuous fashion along the lateral margin of the uterus towards the fundus. Near the cornua of the uterus, the UA forms an important anastomosis with the ovarian artery. The uterine vein parallels the UA.

The tortuous uterine vessels are commonly seen on either side of the cervix with EVS.

In the uterus, the UA divides into several branches - arcuate, radial, basal, and spiral. Near the margin of the uterus or in the outer layer of myometrium, the UA gives off arcuate branches at regular intervals on its way to the fundus, the arcuate arteries course horizontally in the uterus and give off numerous radial branches which course in a perpendicular fashion through the myometrium towards the endometrium. At the endometrium the radial arteries divide into basal and spiral arterioles which supply the basal and functional layers of the endometrium respectively. The venous arrangement is parallel to the arterial network.(Berwin: AAIMS)

2.1.1.4 Embryologic Development of the Female Urogenital Tract

During the embryonic period, the uterus and kidneys develop at essentially the same time. Therefore, it is safe to assume that when there are congenital anomalies recognized on a routine sonogram within the uterus, co-existing anomalies may be present in the kidneys. For this reason, patients who present with uterine anomalies may also require a urinary tract sonogram. The uterus, vagina, and fallopian tubes develop from the paired müllerian ducts (paramesonephric ducts). Thus, incomplete fusion, partial fusion, or agenesis of the müllerian ducts will result in an anatomic variant of the uterus, cervix, and/or vagina that may be recognized sonographically. (Penny,. 2011).

2.1.2 Histological Structure

The funds and body of the uterus are composed of three tissue layers;

- Peritoneum – a double layered membrane, continuous with the abdominal peritoneum. Also known as the perimetrium.
- Myometrium – thick smooth muscle layer. Cells of this layer undergo hypertrophy and hyperplasia during pregnancy in preparation to expel the fetus at birth.
- Endometrium – inner mucous membrane lining the uterus. It can be further subdivided into 2 parts:

- Deep stratum basalis: Changes little throughout the menstrual cycle and is not shed at menstruation.
- Superficial stratum functionalis: Proliferates in response to oestrogens, and becomes secretory in response to progesterone. It is shed during menstruation and regenerates from cells in the stratum basalis layer
(Berwin: AAIMS)

2.1.3 Physiology (menstruation and ovulation):

The uterus is a hollow, thick walled muscular organ. it is lined with mucosa the endometrium, which is will supplied with glands. the endometrium undergoes cyclic structural change that can be considered as periodic preparation for fertilization of the ovum and pregnancy. this cycle in primates is termed menstrual cycle. Events associated with this cycle in uterus and ovary. the menstrual cycle is conveniently dated from the first day of blood loss. during the four –to five day period of the menses, the secretory endometrium undergoes degenerative changes so that apart of the mucosa disintegrates and discharged with a quantity of blood. The amount of blood loss may vary from 20 to 200 ml and may be preceded or accompanied by severe pain, dysmenorrhea. over the span of active reproductive life, a cumulative loss of 40 liters of blood may be experienced ;this may explain in part why some women have a mild to moderate degree of hypochromic anemia. (Schottelius B, . and schottelius D, . (1978).).

After the flow has ceased ,there is a gradual thickening of the endometrium proliferative phase due to the influence of estrogens from the ovary. At about the fourteenth day ovulation takes place, and progestational or secretory phase changes ensue the endometrial glands become complicated and tortuous, and the submucosal layer become very vascular and endematous; these changes are induced by estrogens and progesterone from the corpus luteum. ovulation can be ascertained by the difference between the basal body temperature of the pre ovulatory period and the postovulatory period ;the latter is between 0.3 and 0.5 c

higher. if fertilization is not accomplished with in a period of a few days the ovum dies.

The period of greatest probability of conception extends from about the thirteenth to seventeenth day of the cycle. however, this is a statistical fact, and there is wide variation from one individual to another. (Schottelius, . and schottelius, D. (1978).



Figure: (2-5) Sonographic appearance of the endometrium shortly after menses. Note how thin the endometrium appears in this image.(. Penny., 2011).



Figure: (2-6) Sonographic appearance of the endometrium during the late proliferative (peri ovulatory) phase, also referred to as the “three-line” sign.(Penny., 2011).



Figure: (2-7) Sonographic appearance of the endometrium during the secretory phase. During this phase, the endometrium appears thick and echogenic.(Penny,. 2011).

2.1.4 Lymphatic drainage of the uterus

Lymphatic drainage of the uterus is via the iliac, sacral, aortic and inguinal lymph nodes. (Berwin: AAIMS)

2.1.5 Congenital Malformations of the Uterus

As stated at the beginning of this chapter, uterine malformations are a result of fusion anomalies of the müllerian ducts. While agenesis of the uterus is uncommon, the most common structural defect of the uterus is the bicornuate uterus a bicornuate uterus, also referred to as bicornisunicollis, is present when the endometrium divides into two endometrial cavities, with a prominent concavity noted in the outline of the uterine fundus.

The unicornuate uterus is present when the uterus has only one horn. The septate uterus describes a uterus that has two separate uterine cavities. The subseptate uterus has a normal uterine contour with an endometrium that branches into two horns. The uterus didelphys complete duplication of the vagina ,cervix, and uterus.

Some studies claim that intrauterine exposure to diethylstilbestrol (DES) has resulted in the formation of congenital malformation of the uterus. DES was a drug administered to pregnant woman from the 1940s to the 1970s to treat threatened abortions and premature labor. The female fetus exposed to DES in utero had an increased likelihood of developing a congenital uterine malformation. Congenital malformations have been linked to menstrual disorders, infertility, and obstetric complications. (Penny,. 2011).

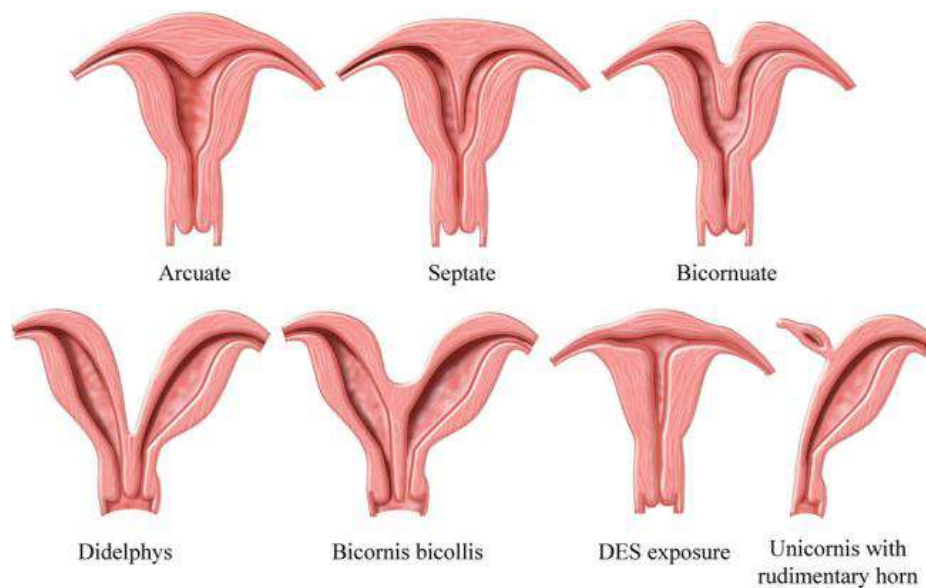


Figure: (2-8) The more commonly diagnosed uterine anomalies. (Callen, . (2008).)

2.1.6 Uterine Pathology

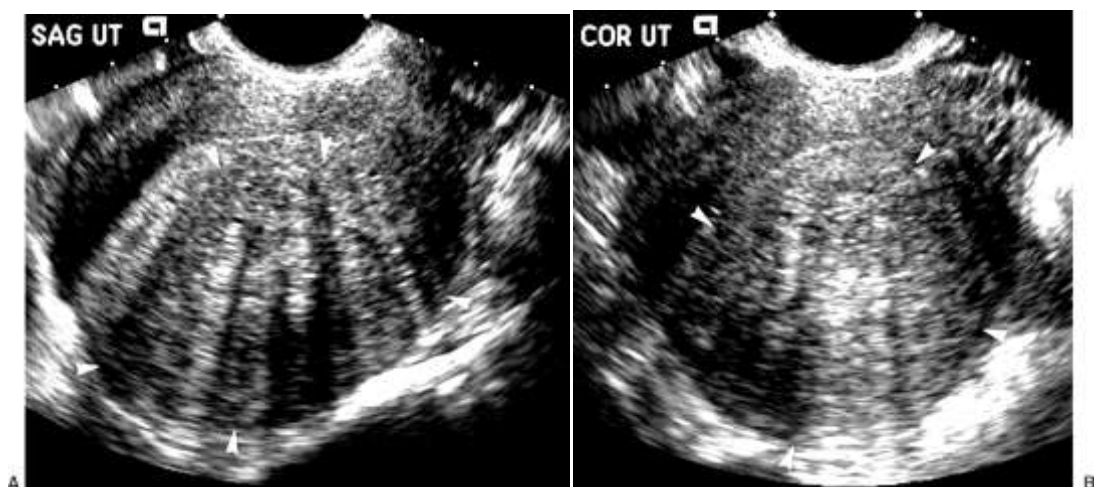
2.1.6.1 Adenomyosis

Adenomyosis is the invasion of endometrial tissue into the myometrium. The basal layer of the endometrium can often extend into the myometrium at depths of at least 2.5 mm. The involvement of adenomyosis may be either focal or diffuse and is typically found more often within the posterior portion of the uterus focal adenomyosis in the form of a mass is termed an adenomyoma.

Sonographically, the uterus will appear diffusely enlarged and heterogeneous.

There may be indistinct hypoechoic or echogenic areas scattered throughout the myometrium, with small myometrial cysts noted as well. Thickening of the

posterior myometrium can also be recognized. Adenomyosis is often present in the uterus afflicted with fibroid tumors .the clinical presentation of adenomyosis is varied and nonspecific, with most women experiencing dysmenorrhea, menometrorrhagia, pelvic pain, and dyspareunia. Patients often have a tender uterus upon physical examination. Although sonography is steadily becoming a valuable diagnostic instrument in the diagnosis of adenomyosis, MRI appears to provide important diagnostic information. Treatment for adenomyosis is hysterectomy or hormone therapy, with the latter often producing limited, if any, relief from symptoms. An important differentiation should be made between endometriosis and adenomyosis. Patients with endometriosis tend to be younger and have fertility troubles, while those with adenomyosis are often older and multiparous.(. Penny,. 2011).



Figure(2-9)Adenomyosis. Sagittal (A) and coronal (B) of a uterus demonstrates adenomyosis (arrowheads) involving the posterior myometrium. (Penny,. 2011).

2.1.6.2 Uterine Leiomyoma

A leiomyoma is a benign, smooth muscle tumor of the uterus that may also be referred to as a fibroid or uterine myoma. Leiomyomas are the most common benign gynecologic tumors and the leading cause of hysterectomy and gynecologic surgery. These tumors can vary in size and may alter the shape of the uterus and have varying sonographic appearances. Those who are at greater

risk for the development of fibroids are women who are obese, black, nonsmokers, and perimenopausal. Clinical findings include pelvic pressure, menorrhagia, palpable abdominal mass, enlarged uterus, urinary frequency, dysuria, constipation, and possibly infertility.

Sonographically, fibroids often appear as solid, hypoechoic masses that produce posterior shadowing. (. Penny,. 2011).

Degenerating fibroids may have calcifications or cystic components, while multiple fibroids may cause diffuse uterine enlargement and heterogeneity.

Fibroids are also described Sonographically by their location. The most common location for fibroids is intramural, or within the myometrium. A subserosal fibroid grows outward and distorts the contour of the uterus. Subserosal fibroids that are pedunculated (on a stalk), or those associated with the broad ligament, could resemble adnexal masses. Pedunculated fibroids may torsion, thus cutting off the blood supply to the mass. This lack of blood supply results in necrosis and clinically the patient will present with acute, localized pelvic pain. Submucosal fibroids are located adjacent to the endometrial cavity and often distort the shape of the endometrium. Intracavitary fibroids, the fibroids located within the uterine cavity, and submucosal fibroids usually lead to abnormal uterine bleeding because of their location in relationship to the endometrium. Intracavitary fibroids may also extend into the cervix when pedunculated. (Penny, 2011).

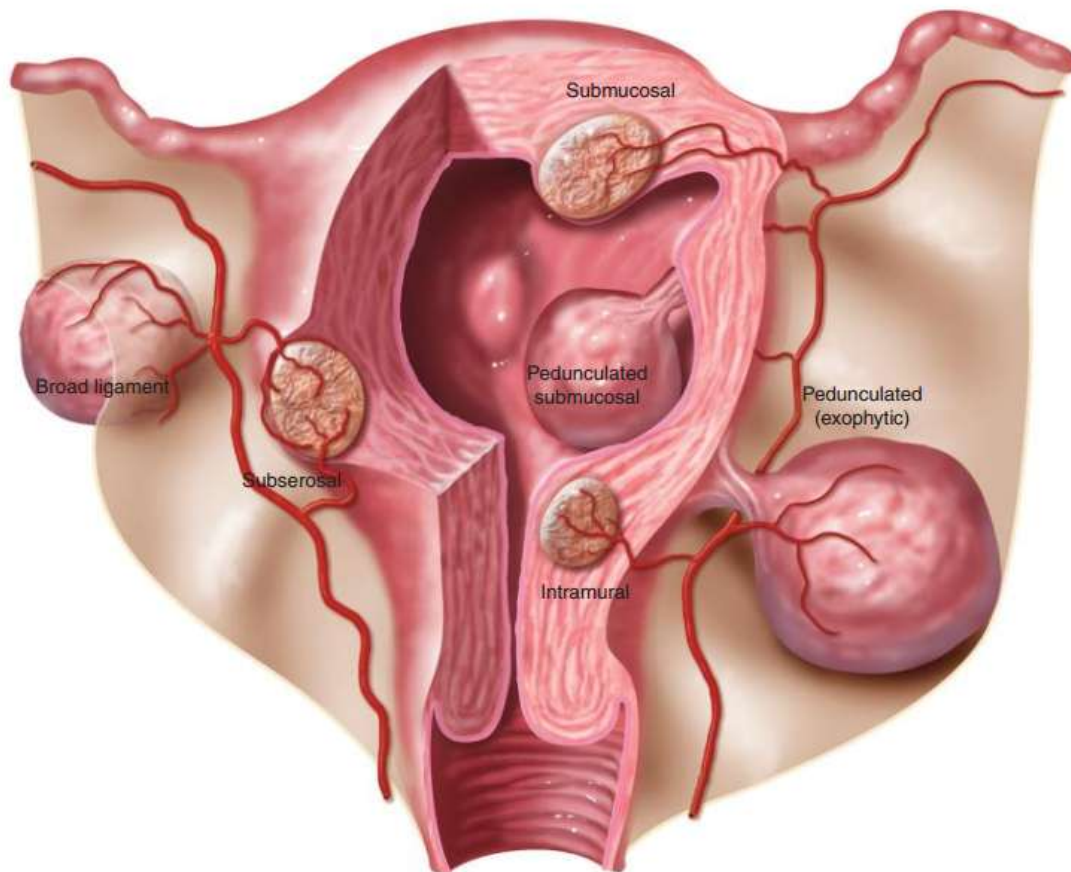


Figure (2-10) Common locations of leiomyomas. (Callen, . (2008).)



Figure (2-11) Fibroid locations. A. Sagittal endovaginal view of an intramural fibroid (*between arrows*). B. Sagittal endovaginal view demonstrates a submucosal fibroid (*FB*). Note the distortion of the endometrium (*arrowheads*). C. Sagittal endovaginal view of a subserosal fibroid (*long arrows*). (Penny, 2011).

2.1.6.3 Leiomyosarcoma

Leiomyosarcoma is the malignant counterpart of the normally benign leiomyoma. These masses are characterized by a rapid increase in growth and are more commonly found in perimenopausal or postmenopausal woman. Their sonographic appearance is variable and they may appear similar to a benign

fibroid, with some evidence of degeneration. Clinically, patients with leiomyosarcoma may be asymptomatic or may present with the same symptoms as benign leiomyoma. (Penny, 2011).

2.1.6.4 Cervical Carcinoma

Cervical carcinoma is the most common female malignancy in women younger than age 50. Although cervical carcinomas are not routinely diagnosed with sonography, they may be present as an inhomogeneous, enlarged cervix or as a focal mass within the cervix. Transvaginal and transrectal imaging are methods in which sonography can be used to better visualize the cervix (Penny, 2011).

2.1.7 Definition of ultrasonography;

Diagnostic ultrasound, also called sonography or diagnostic medical sonography is an imaging method that uses high frequency sound waves to produce image of structures within your body the image can provide valuable information for diagnosing and treating a variety of diseases and condition

2.1.8 Propagation of Ultrasound

- Sound travels through tissues at different speeds depending on the density and stiffness of the medium.
- Impedance determines how much of the wave will transmit to the next medium.
- Sound travels faster in media that are denser than air because of their reduced compressibility. (Reuter, and McGahan, . (2013).)

2.1.9 Ultrasound Bioeffects and Safety

Current knowledge indicates there is no evidence linking exposure to diagnostic ultrasound energies and the production of adverse bioeffects including cancers or congenital birth anomalies. The output power and intensities associated with Doppler studies are generally higher than those associated with greyscale imaging however they are within the acceptable

clinical range as defined by different agencies such as the Food and Drug Administration (FDA) in the United States of America (the FDA establishes policy and regulates the use of medical devices in the USA). Even though diagnostic ultrasound appears to be safe, it should be used prudently and only when clinically indicated.

In diagnostic ultrasound, the ALARA principle is implemented by the following practices:

- use diagnostic ultrasound only for a valid medical reason.
- use low power - high gain, whenever possible.
- use Doppler prudently and effectively.
- minimize exposure times:
- perform studies as efficiently as possible
- minimize repeat studies
- maintain equipment in good operating condition with an effective quality control program (Berwin: AAIMS)

2.2 Previous Study

- Cross-sectional study of normal uterine size of 70 women aged 20-40 years was conducted by ultrasonographic measurements. Mean uterine size was found to be 8.24cm x 4.75cm x 3.77cm (Length x width x AP diameter) for overall total, 7.46cm x 4.22cm x 3.30cm for Nulliparous women, 8.49cm x 4.87cm x 3.81cm for Primiparous women and 9.10cm x 5.36cm x 4.36cm for Multiparous women. Mean age was 27.99 ± 5.43 years. Uterine size was significantly correlated with parity and age. Linear multiple regression lines to predict uterine size (length, width and AP diameter) using parity and age were also modelled. Keywords: Ultrasonography, Uterine size, Nulliparous, Primiparous, Multiparous (2015). *Journal of Health, Medicine and Nursing*,
- Multiparas was $9.2\text{cm} \pm 0.8$ (SO) compared to 7.3cm of ± 0.8 (SO) nulliparous according to our finding, there is also a significant change in uterine size between primiparas and multiparous. in the present study mean uterine height in nulliparous $7.10\text{cm} \pm 1.05$ and $9.07\text{cm} \pm 1.22$ parous women. (Parmar, A. and Hathila, N. (2016). *International Journal Of Medical Science and Education*, 3.)

Chapter Three:

Materials and Methods

Chapter Three

Materials and Methods

3.1 Materials

3.1.1 Sample population

The study includes 50 females ranging in age between 20 – 50 years. the data used in this study was collected in Khartoum state from September to October 2018.

3.1.2 Inclusion criteria:

- Healthy females
- Ages 20-50
- Both multiparous and nulliparous women
- women from all social statuses

3.1.3 Exclusion criteria:

- Pregnant women.
- Women with known uterine pathology.
- Women under the age of 20 and above 50 years.

3.1.4 Equipment used:-

Alpinion medical system; model E –CUBE 7 and Mindary ultrasound machine, and a convex transabdominal probe of 3.5 MHz frequency is used.

3.2 methods

3.2.1 Technique:-

3.2.1.1 Transabdominal Sonography (TAS)

TAS is performed by placing the transducer in contact with the skin just above the symphysis pubis. TAS is also known as transvesical sonography.

3.2.1.2 Patient Preparation

A reasonably full urinary bladder is essential for TAS when it is used as the primary technique. Patients are instructed to arrive with a full bladder by

drinking 20 to 30 ounces of water or other liquids about one hour before the scheduled examination.

3.2.1.3 Patient Position

TAS study is generally performed with the patient in a supine or recumbent position.

3.2.1.4 Planes of Section

TAS scans are obtained in sagittal (longitudinal) and transverse (horizontal) planes. A true sagittal plane of section is an anterior to posterior vertical plane; a midline or midsagittal plane of section is one that cuts the body into equal right and left halves. A true transverse plane of section is an anterior to posterior horizontal plane of section that is perpendicular to the sagittal plane-To calculate uterine size, I must obtain the length, width and thickness of the uterus first and subsequently the length is calculated automatically by the US machine.

volume (cm³) = D1 (cm) x D2 (cm) x D3 (cm) x .523

D1 = anterior-posterior diameter (AP)

D2 = length or largest diameter (L)

D3 = width (W)

3.3 Data source

From direct ultrasound scanning of the population of study, from data sheet, internet and references.

3.4 Data analysis

It has been carried out by statically package for social sciences SPSS programme.

Chapter Four:

Results

Chapter four results

Table (4-1): shows the range , mean and std. Deviation of the age, length, width, thickness of the uterus and parity

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Age of female	50	20.00	50.00	29.7200	8.41534
Length of uterus	50	5.84	8.52	6.9286	.54296
Width of uterus	50	2.65	4.27	3.5032	.39822
Thickness of uterus	50	2.30	3.50	2.9588	.31654
Parity	50	1.00	2.00	1.4400	.50143
Valid N (listwise)	50				

Table (4-2): shows the Frequency Distribution of Nulliparous&Multiparous

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Nulliparous	28	56.0	56.0	56.0
	Multiparous	22	44.0	44.0	100.0
	Total	50	100.0	100.0	

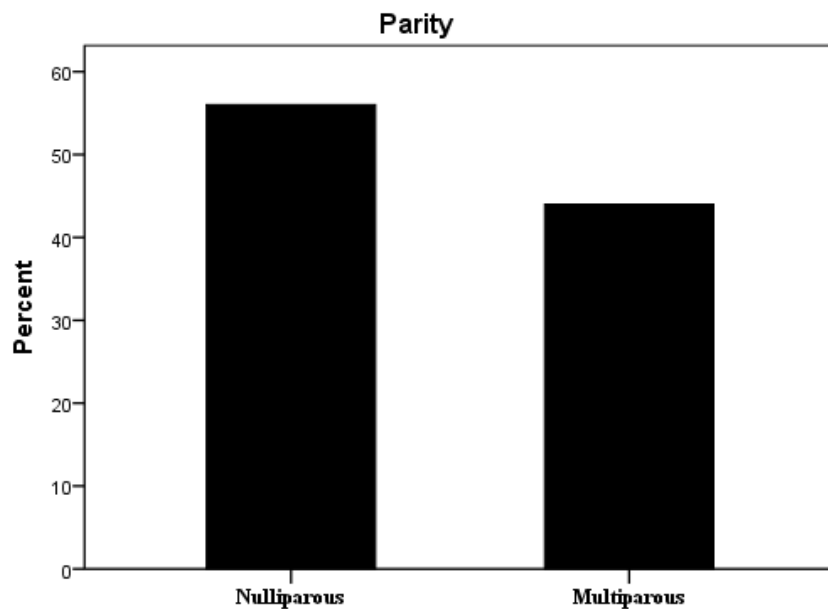


Figure (4-1): shows the Frequency Distribution of Nulliparous & Multiparous

Table (4-3): shows Correlations the age with length, width and thickness of the uterus

Correlations					
		Age of female	Length of uterus	Width of uterus	Thickness of uterus
Age of female	Pearson Correlation	1	.439**	.399**	.446**
	Sig. (2-tailed)		.001	.004	.001
	N	50	50	50	50
Length of uterus	Pearson Correlation	.439**	1	.685**	.694**
	Sig. (2-tailed)	.001		.000	.000
	N	50	50	50	50
Width of uterus	Pearson Correlation	.399**	.685**	1	.707**
	Sig. (2-tailed)	.004	.000		.000
	N	50	50	50	50
Thickness of uterus	Pearson Correlation	.446**	.694**	.707**	1
	Sig. (2-tailed)	.001	.000	.000	
	N	50	50	50	50

** . Correlation is significant at the 0.01 level (2-tailed).

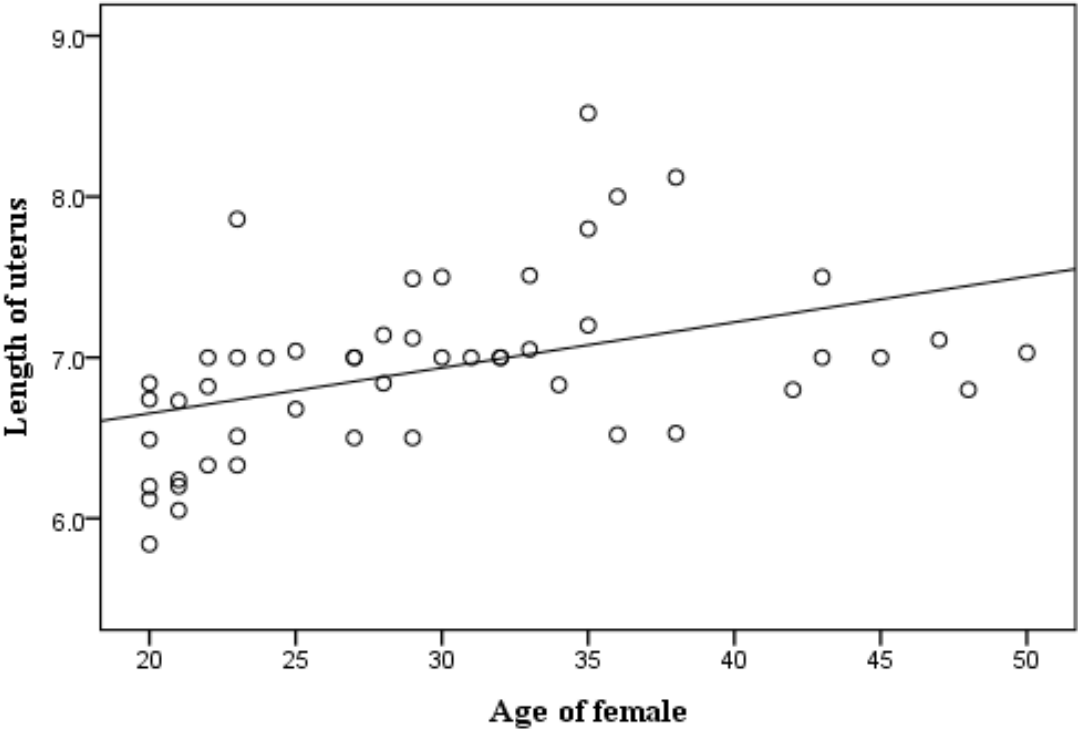


Figure (4-2): shows Correlations the age with length of the uterus

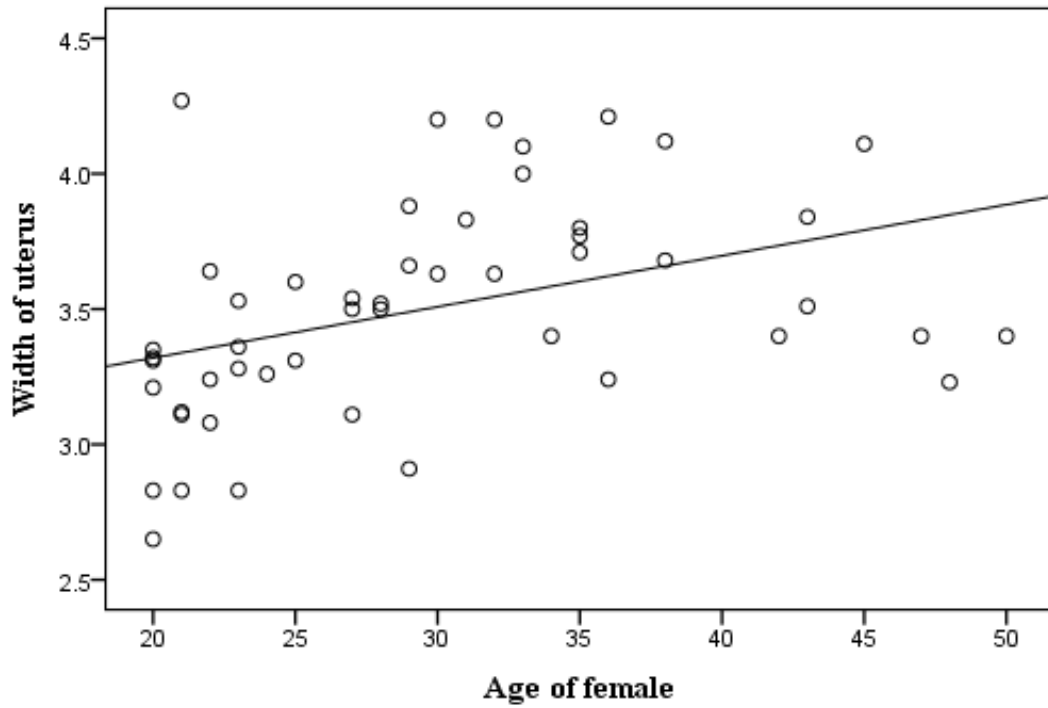


Figure (4-3): shows Correlations the age with, width of the uterus

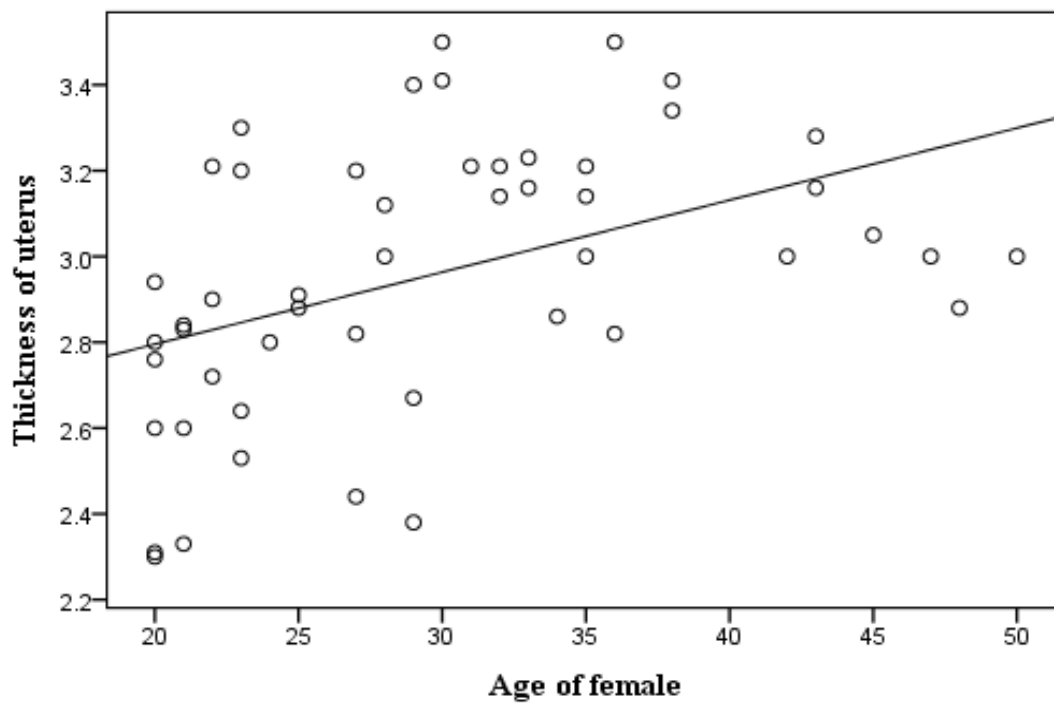


Figure (4-4): shows Correlations the age with thickness of the uterus

Table (4-4): showsthe mean and Std. Deviation of the length, width and thicknees of uterus in Nulliparous&Multiparous

Group Statistics				
Parity		N	Mean	Std. Deviation
Length of uterus	Nulliparous	28	6.676	.4970
	Multiparous	22	7.250	.4202
Width of uterus	Nulliparous	28	3.294	.3565
	Multiparous	22	3.770	.2710
Thickness of uterus	Nulliparous	28	2.806	.3101
	Multiparous	22	3.154	.1979

Table (4-5): shows T-test for Equality of means for length, width and thickness in Nulliparous&Multiparous

Independent Samples Test		
	t-test for Equality of Means	
	t	Sig. (2-tailed)
Length of uterus	4.339	.000
Width of uterus	5.195	.000
Thickness of uterus	4.576	.000

Chapter Five:

Discussion, Conclusion and Recommendations

Chapter Five

Discussion, Conclusion & Recommendations

5.1 Discussion:

The study is done for 50 women 26 of the women (56%) were nulliparous and 22 women were multiparous (44%) mentioned in Table (4.2). The mean of the age was 29.72 and range between 20-50 years also mentioned in table (4.1).

The mean of Length is 6.92cm, the mean of Width 3.50cm, the mean of thickness is 2.95cm for all cases .this is mentioned in table (4-1).

The range of length :8.52cm - 5.48cm ,width: 4.27cm - 2.56cm and the range of thickness is 3.50cm-2.30cm for over all cases in the study This is noted in Table (4.1).

The study shows the significant correlation between the age, length, width and thickness of the uterus.as showed in Table (4.3)

The length of the uterus increases with age as showed in scattered diagram Figure (4.2).the width and thickness of the uterus also increases with age this showed in scattered diagram figure(4-3) and (4-4).

The t-test for equality of the mean for length, width and thickness of the uterus in both multiparous and nulliparous women. Show that this result is significant and showing a direct correlation between uterine size and parity. This noted in Table (4.5).

The mean of the length of the uterus in nulliparous is 6.67cm and in multiparous 7.25cm. The mean of the width of the uterus in nulliparous is 3.29cm and in multiparous 3.77cm.The mean of the thickness of the uterus in nulliparous women is 2.80cm and in multiparous 3.15cm.mentioned in table (4-4) This means that the length, width and thickness of the uterus is increased in multiparous women which ultimately mean the overall size of the uterus is increased in those women. This agrees with previous studies done by Journal of Health, Medicine and Nursing in Nigeria 2015 and this study found that the mean uterine size for nulliparous women 7.46cmx4.22x.3.30cm

(length...width...thickness) and for multiparous 9.10cmx5.36x.4.36cm and also agree with other previous study done by international journal of Medical Science and Education (2016) this study found that there is significant change in uterine size between nulliparous and multiparous women .

5.2 Conclusion:

The study was done in Khartoum state from September to October 2018 to 50 women.

The main objective is to measure the size of the uterus in nulliparous and multiparous Sudanese women.

This study concludes that there is a significant and direct correlation between uterine size and age, as one increases the other does as well. This also applies to uterine size and parity showing a larger size in multiparous more than the nulliparous.

5.3 Recommendations:

The measurements must be done on a full bladder (shows best acoustic window) which reflects the uterus sizes accurately and correct measurements.

For a more accurate result, it is recommended that the study should be done with a larger sample size.

Future studies on this important topic, using various methods, various technique and larger sample is highly recommended.

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Appendices

Appendices

Appendices (1)



show transverse and longitudinal Image of the uterus





show transverse and longitudinal measurement of the uterus

Appendices (2)

Date Collection Sheet

NO	Age	Nulliparous			Multiparous		
		Length	Width	Thickness	Length	Width	Thickness
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
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