بسم الله الرحمن الرحيم

Sudan University of Science and Technology

College Of Graduate Studies

Measurement of Uterus Size of Multiparous Women Using Ultrasonography

قياس حجم رحم النساء متعددات الولادات بإستخدام التصوير بالموجات فوق الصوتية

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

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2020

الآيـة

قال تعالى :

بسم الله الرحمن الرحيم

﴿هوالذي يصوركم في الارحام كيف يشاء لا إلـه إلا هو الـعزيز الـحكيـم﴾

صدق الله العظيم

سورة آل عمران الآية **(6)**

Dedication

I dedicate this study

To my father

My Mother

And my Aunt

To my brother & Sister & my family & friends

To everyone who encouraged me to conduct this study.

Acknowledgement

First of all gate and thank for Allah to enabling me to do this thesis.

I would like to take this opportunity to express my profound gratitude and deep regard to supervisor:

Dr. BabikerAbdEwahab

For his exemplary guidance, valuable feedback and constant encouragement throughout the duration of the study. His valuable suggestions were of immense help throughout my study work. His perceptive criticism kept me working to make this study in a much better way. Working under him was an extremely knowledgeable experience for me.

Also thank to my family, friends, and department staff.

Abstract

This is a descriptive cross sectional study which was carried out during November 2018 to April 2019 in blue nile state in police hospital aldamazine Sudan. The aim of the study is to estimate measurement to of uterine size multiparous women scan. A total of 50 Female healthy arranged from 25 to 45 years, any female were examined by ultrasound Scanning using Esoade Scanners with 3.5-5 MHz probe trans abdominal scanning were performed to evaluate uterine size. Data was collected using data collecting sheet where it was analyzed using cross tabulation, correlation. The results of this Thesis states that the uterus length, width and thickness diameters mean values were (8.22±1) cm, (5±0.84) cm, and (3.99±0.54) cm respectively. The study also concludes that, there was no significant relationship between number of parity and uterus length, width and thickness diameters. Also, the study found out that there was no significant relationship between patient age, weight and height with uterus length, width and thickness diameters. There is another factors that might affect the uterus size were not included here such as the ethnic group, hormones levels, personal habits and environmental factors. There for other researches were recommended to cover these factors.

المستخلص

هذه دراسة وصفية مقطعية اجريت خلال شهر نوفمبر2018 وحتي ابريل 2019م بولاية النيل الازرق في مستشفى الشرطة الدمازين والهدف من هذه الدراسة هو قياس رحم النساء متعددات الولادة الاصحاء باستخدام التصوير بالموجات فوق الصوتية وقد تم اختيار ما مجموعه (50) من النساء بشكل عشوائى اعمارهن ما بين 25-45 سنة تم استبعاد اي مريضة تعانى من امراض فى الرحم. تم فحص جميع النساء الاصحاء عن طريق الموجات الصوتية باستخدام الماسحات الضوئية البطنية 3.5-5 ميقا هيرتز ثم اجراء المسح الضوئى لمنطقة الحوض لتقييم قياس الرحم. وقد تم جمع البيانات باستخدام ورقة جمع البيانات الرئيسية حيث تم تحليلها باستخدام الجداول المتقاطعة والارتباط. تشير نتائج هذه الرسالة إلى أن طول أقطار الرحم وعرضها وسمكها كانت (8.22 ± 1) سم و (5 ± 0.84) سم و (3.99 ± 0.54) سم على التوالي. وخلصت الدراسة أيضًا إلى عدم وجود علاقة بين عدد الولادة وطول الرحم وعرضه وسمكه. أيضا ، وجدت الدراسة أنه لا توجد علاقة ذات دلالة إحصائية بين عمر المريض ووزنه وطوله وأطوال الرحم وعرضه وسمكه. هناك عوامل أخرى قد تؤثر على حجم الرحم لم يتم تضمينها هنا مثل المجموعة العرقية ومستويات الهرمونات والعادات الشخصية والعوامل البيئية. أوصت الدراسة اجراء بحوث اخرى لتغطية هذه العوامل.

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ITEM	Meaning
FOV	Field of view
HSG	Hysterosalpingography
CT	Computed tomography
MRI	Magnetic resonance imaging
U\S	Ultrasound
SPSS	Statistical Package for social sciences
Cm	Centimeter

Chapter One

Introduction

1.1 Introduction:

Sonography plays an integral role in the evaluation of gynecologic disease. It can determine the organ or site of abnormality and provide a diagnosis or short differential diagnosis in the vast majority of patients. (Carol M Rumack.2011).

The uterus is a hollow, thick-walled muscular organ. It is internal structure consists of a muscular layer, or myometrium, which forms most of the substance of the uterus, and a mucous layer, the endometrium, which is firmly adherent to the myometrium. (Carol M Rumack.2011).

The uterus (womb, hysteria, or metra) lies between the bladder and rectum. It is a muscular pear-shaped structure measuring approximately 7.5 centimeters (cm) in length, 5 cm in width, and 2.5 cm in thickness. The uterus has three anatomic divisions: the fundus, body (or corpus), and cervix. The cervix is the lower portion of the uterus. It measures approximately 2.5 cm in length and has two openings: the external so, which opens into the vagina, and the internal so, which opens into the uterus. (Ultrasound atlas, 1993).

Uterine length should measured from the external os to the serosal surface of the fundus in an appropriate image through the center of the uterus. This measurement is more difficult to perform with endovaginal scan science the image display area is smaller than accorded with trans abdomen scan transducers. (Berwin).

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

The arterial blood supply to the uterus comes primarily from the uterine artery, a major branch of the anterior trunk of the internal iliac artery. The uterine plexus of veins accompanies the arteries. (Carol M Rumack.2011).

1.2 Problem of the study:

To the knowledge of the researcher there is no reference value for uterus measurement in Sudanese population. To show the position size and anatomic relations vary considerably with age and the physiologic changes of menstruation, pregnancy, and menopause.

1.3 Objectives:

1.3.1 General objectives:

The general objectives of this study to identify measurement uterine size multiparous women using ultrasonography.

1.3.2 Specific objectives:

1) To establish the standard uterus measurement in multiparous Sudanese women using ultrasound.
2) To measure uterus dimension.
3) To correlate these measurements with high and weight of the body.
4) To identify the relation between uterus measurements and age.

1.4 Over view of the study:

This study concerned with the measurement of uterus in multiparous Sudanese women. It divided into five chapters, chapter one which was an introduction deals with theoretical framework of the study. It represents the statement of the study problems, objectives of study. It also provides over view of the study, chapter two gives a comprehensive literature review(previous studies), chapter three deals with materials and methods used in this study, chapter four deal with(results) data presentation, chapter five discusses the data(discussion) recommendation, and references

Chapter Two

Literature Review and Previous studies

Chapter two

Literature review

2. Literature review:

2.1 Embryonic 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 kidney. 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 mullerian ducts (paramesonephric ducts). Thus, incomplete fusion, partial fusion, or agenesis of the mullerian ducts will result in an anatomic variant of the uterus, cervix, and\or vagina that may be recognized sonographically. (Steven. M. Penny. 2011).

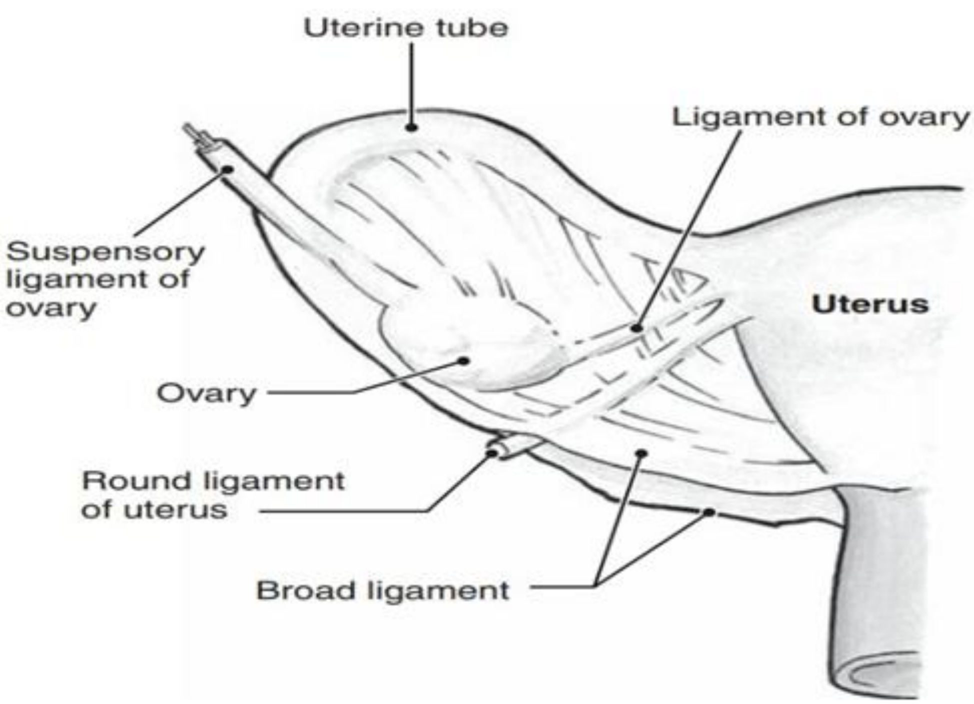

Fig (2. 1) The Uterus ligaments

2.2 Anatomy and physiology 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. (Steven.M.Penny.2011).

It is primary function is to provide a place for the products of conception to implant and develop. The uterus can be divided into four major divisions: fundus, corpus, isthmus, and cervix.

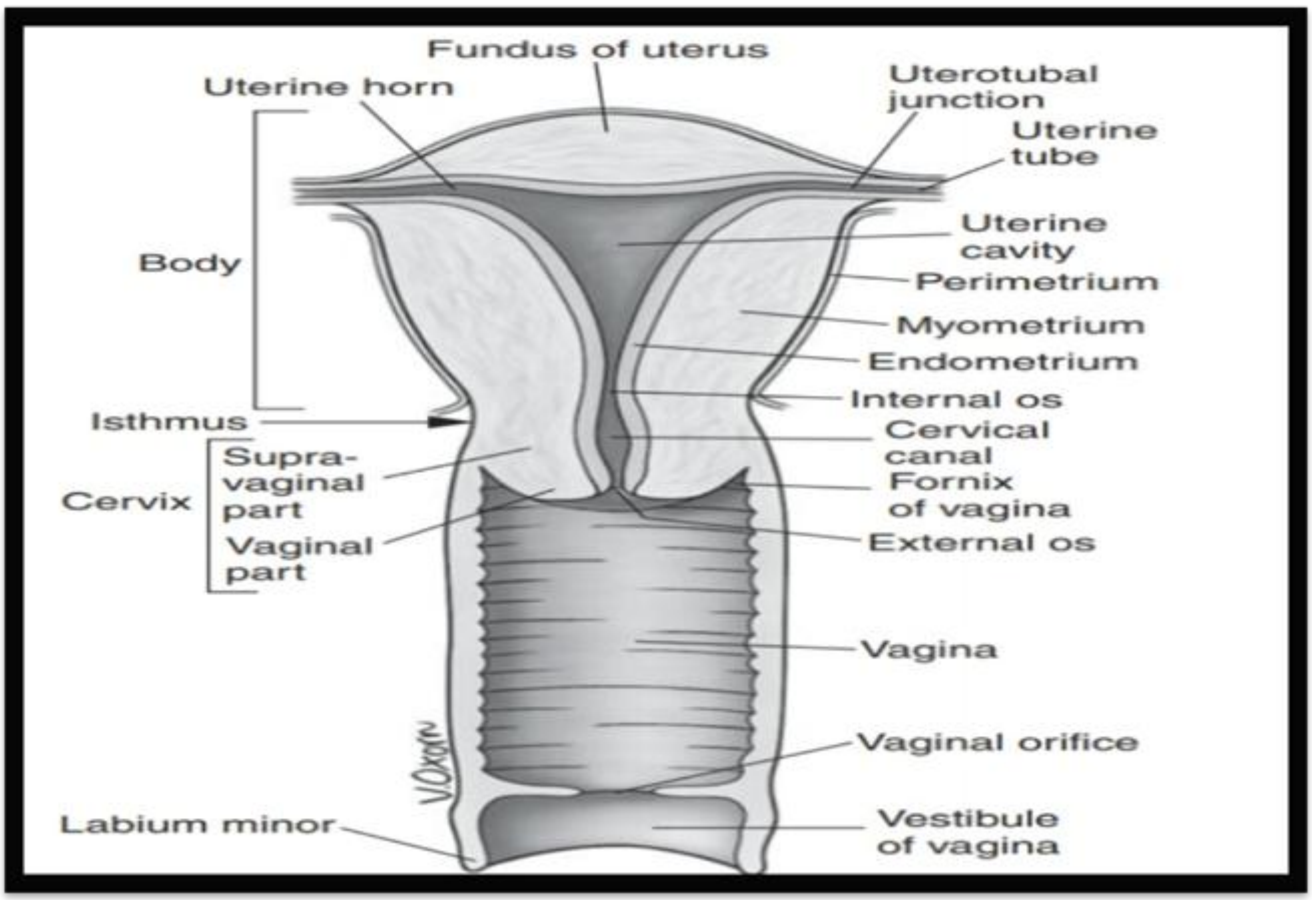

Fig (2. 2) The Coronal uterine anatomy

The fundus is the most superior and widest portion of the uterus. Each fallopian tubes 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 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.

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.

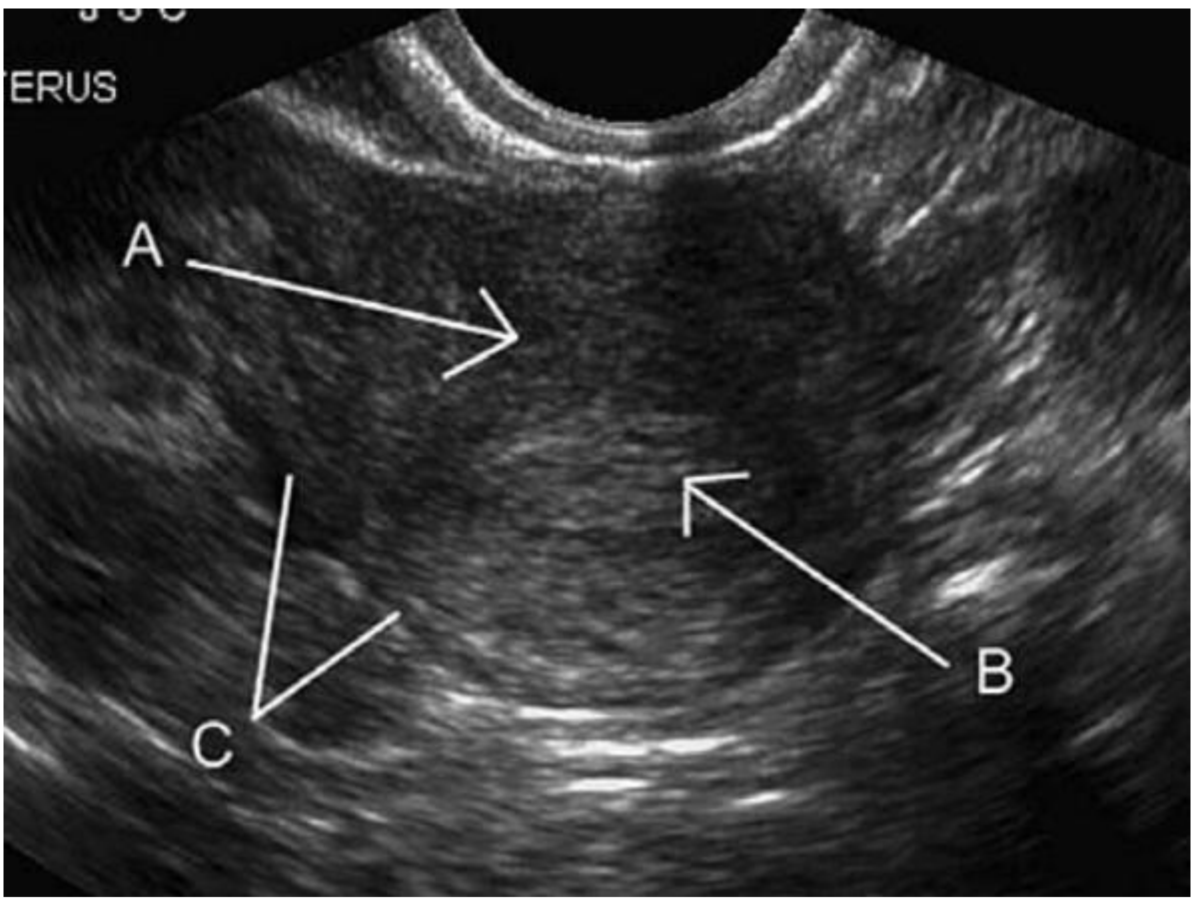

Fig (2. 3) The Myometrium

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 the 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 continuous with the lumen of the fallopian tubes laterally, and the cervix inferiorly.(Steven.M.Penny.2011).

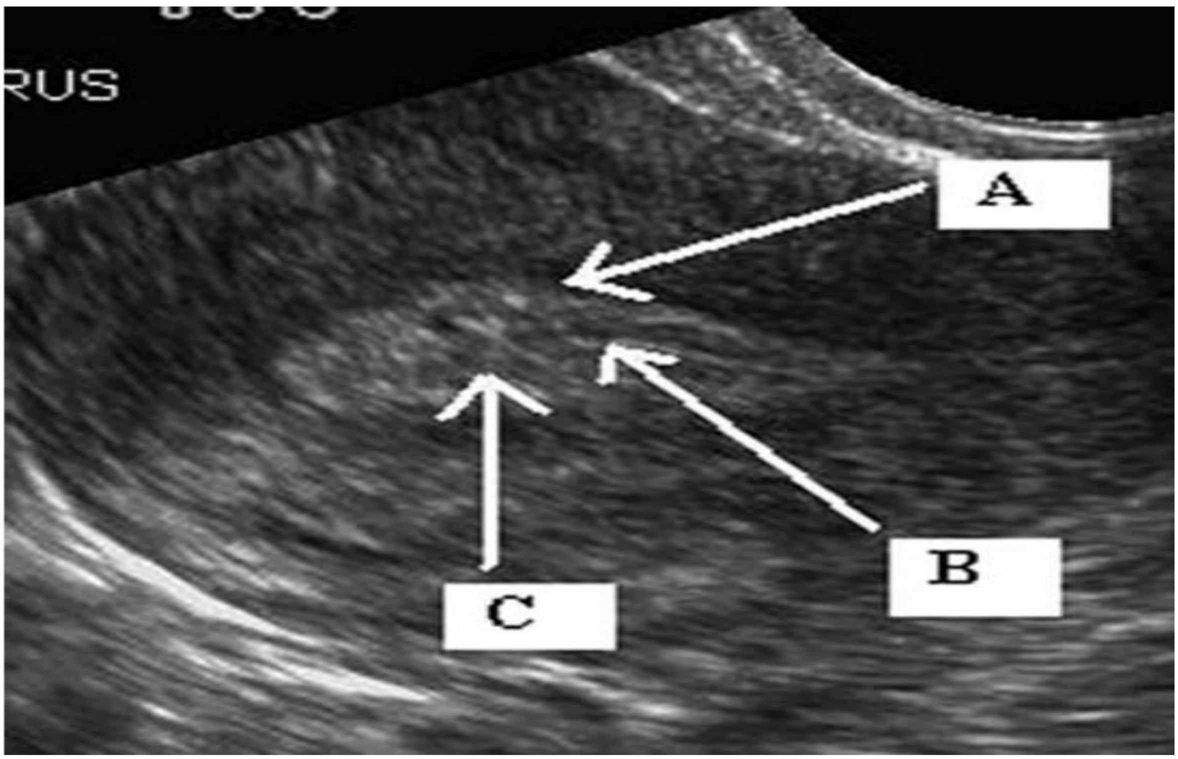

Fig (2. 4) The Endometrium

2.3 Uterine size and shape:

The size and shape of the uterus depend 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 anteroposterior 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.

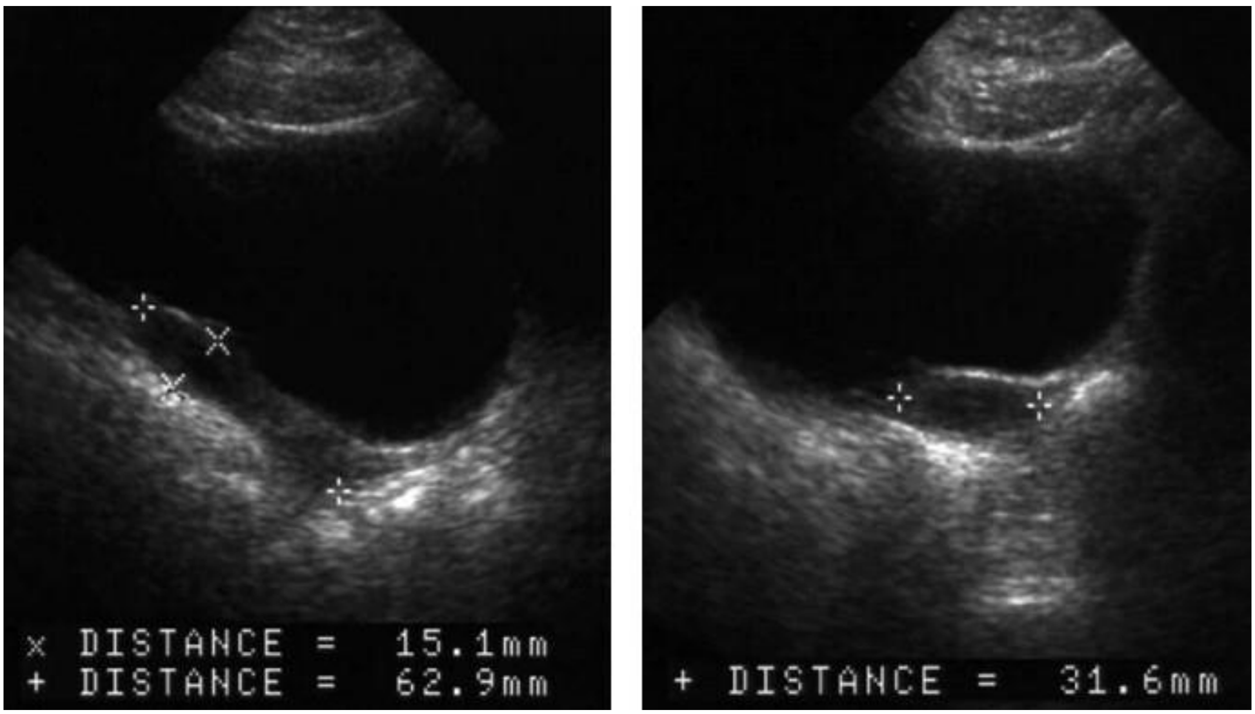

Fig (2. 5) The Postmenopausal uterus

2.4 Uterine position:

The uterine position within the pelvis is variable. The normal position of the uterus is considered to be anteversion or anteflexion. Anteversion describes the uterine position in which the body tilts forward, forming a 90- degree angle with the cervix. Anteflexion 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. (Steven. M. Penny .2011).

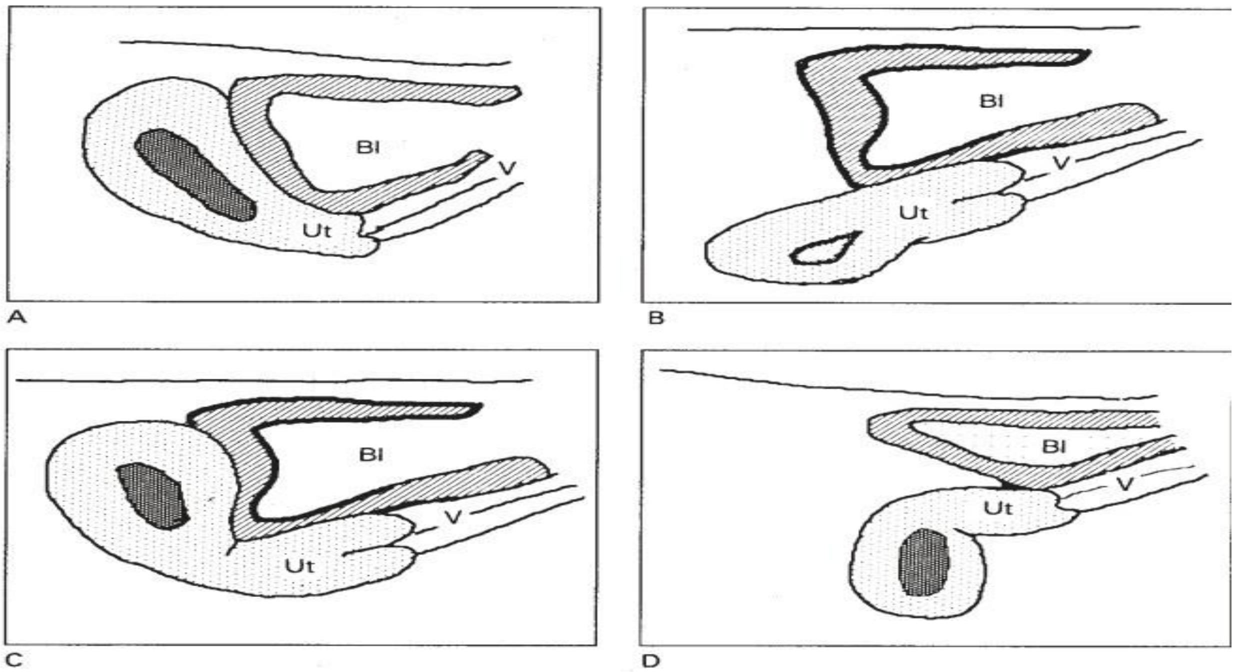

Fig (2. 6) The Uterine position

2.5 Congenital Malformations of the uterus:

Uterine malformations are a result of fusion anomalies of the mullerian 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 is complete duplication of the vagina, cervix, and uterus. (Steven.M.Penny.2011).

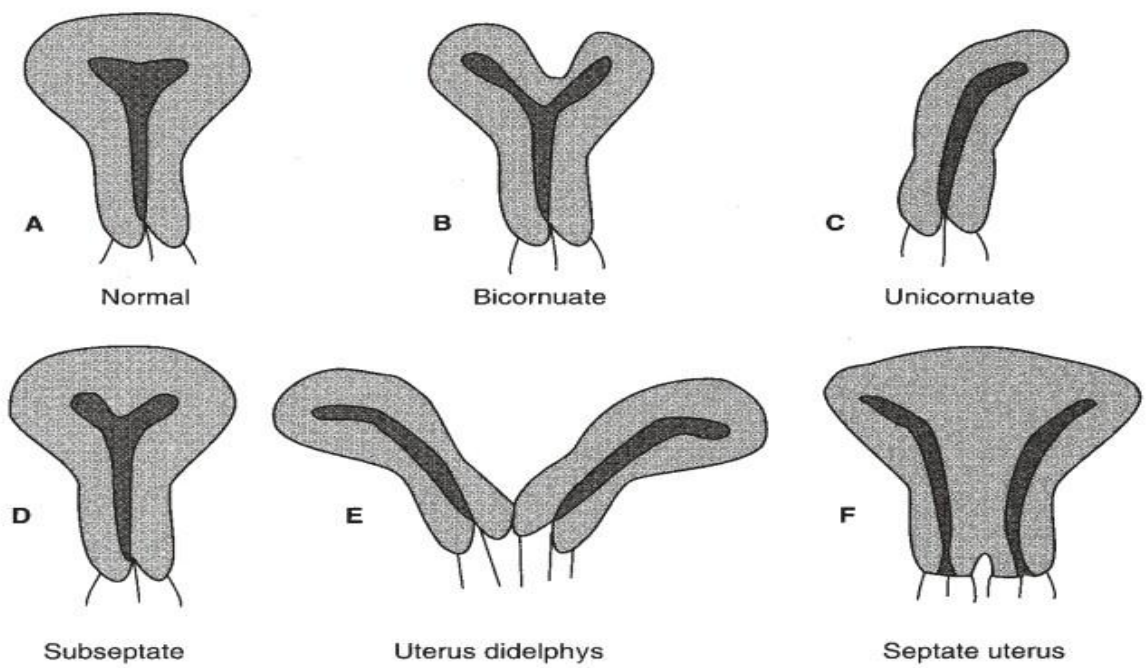

Fig (2. 7) The Congenital uterine anomalies

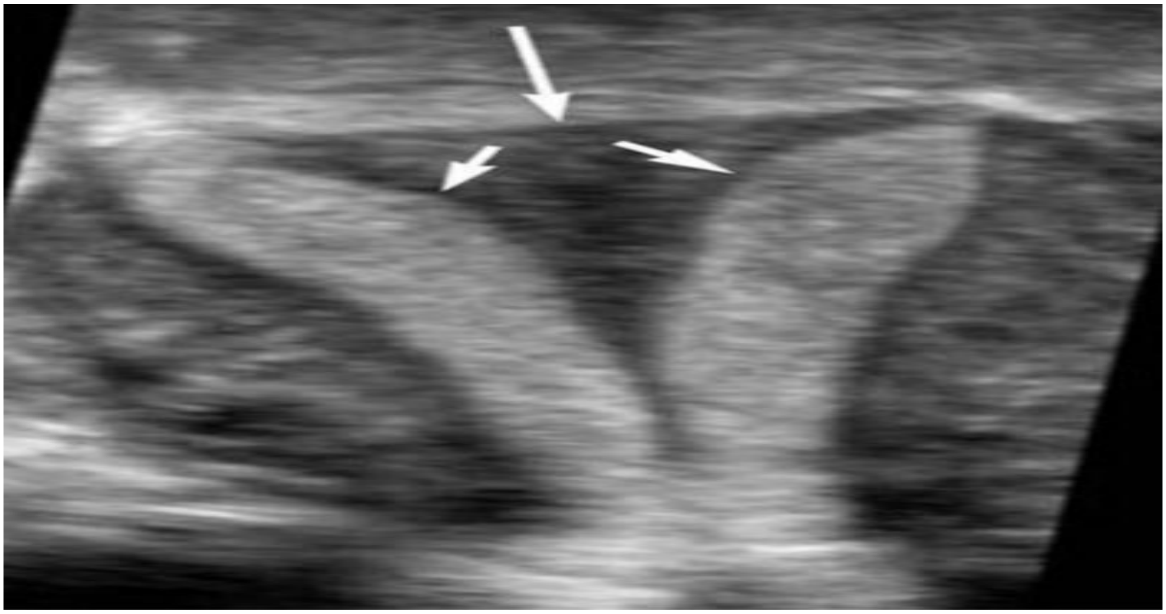

Fig (2. 8) The Septate Uterus

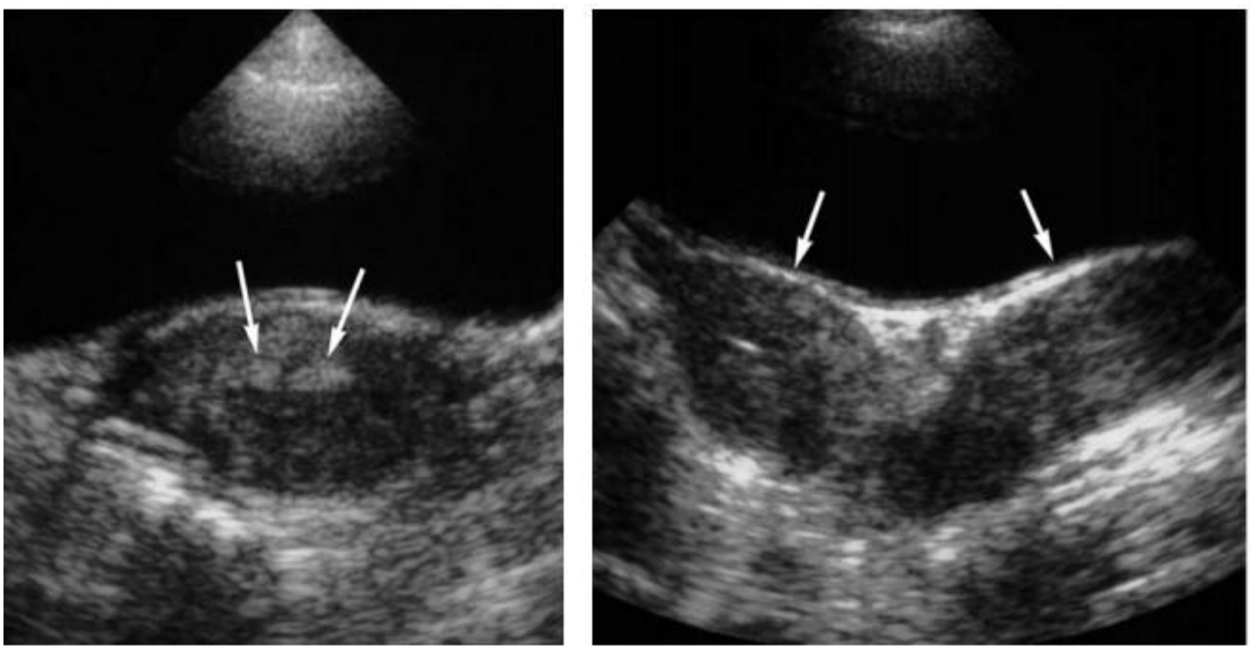

Fig (2. 9) The Didelphic uterus

2.6 Blood supply of the uterus:

Arteries: the arterial supply to the uterus is mainly from the uterine artery; a branch of the internal iliac artery. It reaches the uterus by running medially in the base of the broad ligament. It crosses above the ureter at right angles and reaches the cervix at the level of the internal os. The artery then ascends along the lateral margin of the uterus within the broad ligament and ends by anastomosing with the ovarian artery, which also assists in supplying the uterus. The uterine artery gives off a small descending branch that supplies the cervix and the vagina.

Veins: the uterine vein follows the artery and drains into the internal iliac vein. Lymph drainages: the lymph vessels from the fundus of the uterus accompany the ovarian artery and drain into the para-aortic nodes at the level of the first lumbar vertebra. The vessels from the body and cervix drain into the internal and external iliac lymph nodes. A few lymph vessels follow vessels follow the round ligament of the uterus through the inguinal canal and drain into the superficial inguinal

Lymph nodes. (Richard Snell. 2012).

2.7 Nerve supply of the uterus:

Sympathetic and parasympathetic nerves from branches of the inferior hypogastric plexuses. (Richard snell.2012).

2.8 Ultrasound Physics:

All diagnostic ultrasound applications are based on the detection and display of acoustic energy reflected from the interfaces provide the information needed to generate high-resolution, gray-scale images of the body, as well as display information related to blood flow.

Ultrasound imaging and Doppler ultrasound are based on the scattering of sound energy by interfaces of materials with different properties through interactions governed by acoustic physics. The amplitude of reflected energy is used to generate ultrasound images, and frequency shifts in the back scattered ultrasound provide information relating to moving targets such as blood.

2.8.1 Wavelength and Frequency:

Sound is the result of mechanical energy traveling through matter as a wave producing alternating compression and rarefaction. Pressure waves are propagated by limited physical displacement of the material through which the sound is being transmitted. A plot of these changes in pressure is as inusoidal waveform, in which the Y axis indicates the pressure at a given point and the X axis indicates time. Changes in pressure with time defied the basic units of measurement for sound. The distance between corresponding points on the time pressure curve is defined as the wavelength (λ), and the time (T) to complete a single cycle is called the period. The number of complete cycles in a unit of time is the frequency (f) of the sound. Frequency and period are inversely related. If the period (T) is expressed in seconds, f = 1/T, or f = T × sec–1. The unit of acoustic frequency is the hertz (Hz); 1 Hz = 1 cycle per second. High frequencies are expressed in kilohertz (kHz; 1 kHz = 1000 Hz) or megahertz (MHz; 1 MHz = 1,000,000 Hz). In nature, acoustic frequencies span a range from less than 1 Hz to more than 100,000 Hz (100 kHz).

Human hearing is limited to the lower part of this range, extending from 20 to 20,000 Hz. Ultrasound differs from audible sound only in its frequency, and it is 500 to 1000 times higher than the sound we normally hear. Sound frequencies used for diagnostic applications typically range from 2 to 15

MHz, although frequencies as high as 50 to 60 MHz are under investigation for certain specialized imaging applications. In general, the frequencies used for ultrasound imaging are higher than those used for Doppler (Peter, 2010).

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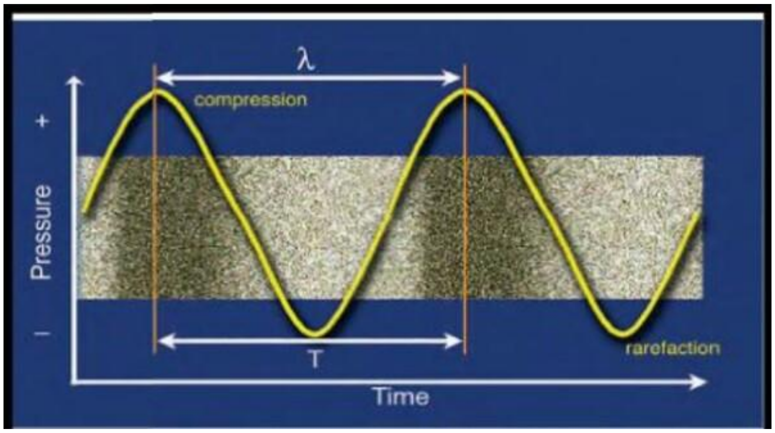

Fig (2. 10) The Sound wave

2.8.2 Propagation of Sound:

In most clinical applications of ultrasound, brief bursts or pulses of energy are transmitted into the body and propagated through tissue. Acoustic pressure waves can travel in a direction perpendicular to the direction of the particles being displaced (transverse waves), but in tissue and fluids, sound propagation is along the direction of particle movement (longitudinal waves). The speed at which the pressure wave moves through tissue varies greatly and is affected by the physical properties of the tissue. Propagation velocity is largely determined by the resistance of the medium to compression, which in turn is influenced by the density of the medium and its stiffness or elasticity. Propagation velocity is increased by increasing stiffness and reduced by decreasing density. In the body, propagation velocity may be regarded as constant for a given tissue and is not affected by the frequency or wavelength of the sound (Peter H.Kevin.2010).

2.8.3 Distance Measurement:

Propagation velocity is a particularly important value in clinical ultrasound and is critical in determining the distance of a reflecting interface from the transducer. Much of the information used to generate an ultrasound scan is based on the precise measurement of time and employs the principles of echo-ranging. If an ultrasound pulse is transmitted into the body and the time until an echo returns is measured, it is simple to calculate the depth of the interface that generated the echo, provided the propagation velocity of sound for the tissue is known (Peter H.Kevin.2010).

2.8.4 Acoustic impedance (Z):

Is determined by product of the density (ρ) of the medium propagating the sound and the propagation velocity (c) of sound in that medium ($Z = \rho c$). Interfaces with large acoustic impedance differences, such as interfaces of tissue with air or bone, reflect almost all the incident energy. Interfaces composed of substances with smaller differences in acoustic impedance, such as a muscle and fat interface, reflect only part of the incident energy (Peter H.Kevin.2010).

2.8.6 Reflection:

The way ultrasound is reflected when it strikes an acoustic interface is determined by the size and surface features of the interface. If large and relatively smooth, the interface reflects sound much as a mirror reflects light. Such interfaces are called specular reflectors because they behave as “mirrors for sound.” The amount of energy reflected by an acoustic interface can be expressed as a fraction of the incident energy; this is termed the reflection coefficient (R). If a specular reflector is perpendicular to the incident sound beam, the amount of energy reflected is determined by the following relationship: $R = (Z2-Z1)2 / (Z2 + Z1)2$ where Z1 and

Z2 are the acoustic impedances of the media forming the interface. Because ultrasound scanners only detect reflects that return to the transducer, display of specular interfaces is highly dependent on the angle of insonation (exposure to ultrasound waves). Specular reflectors will return echoes to the transducer only if the sound beam is perpendicular to the interface(Peter H.Kevin.2010). If the interface is not at a 90-degree angle to the sound beam, it will be reflected away from the transducer, and the echo will not be detected. Most echoes in the body do not arise from specular reflectors but rather from much smaller interfaces within solid organs. In this case the acoustic interfaces involve structures with individual dimensions much smaller than the wavelength of the incident sound. The echoes from these interfaces are scattered in all directions. Such reflectors are called diffuse reflectors and account for the echoes that form the characteristic echo patterns seen in solid organs and tissues. The constructive and destructive interference of sound scattered by diffuse reflectors results in the production of ultrasound speckle, a feature of tissue texture of sonograms of solid organs. For some diagnostic applications, the nature of the reflecting structures creates important conflicts. For example, most vessel walls behave as specular reflectors that require insonation at a 90-degree angle for best imaging, whereas Doppler imaging requires an angle of less than 90 degrees between the sound beam and the vessel (Peter H.Kevin.2010).

2.8.7 Refraction:

Another event that can occur when sound passes from a tissue with one acoustic propagation velocity to a tissue with a higher or lower sound velocity is a change in the direction of the sound wave. This change in direction of propagation is called refraction and is governed by Snell’s law:

Sin1/ Sin 2 = C1/C2 Where 1 is the angle of incidence of the sound approaching the interface, 2 is the angle of refraction, and c1 and c2 are the propagation velocities of sound in the media forming the interface (Peter H.Kevin.2010).

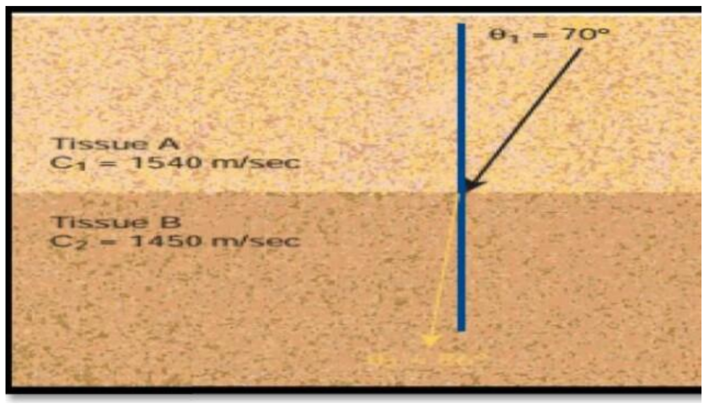

Fig (2. 11) The Refraction

2.9Sonographic Methods:

2.9.1 Transabdominal versus Transvaginal scanning:

Transabdominal and transvaginalsonography are complementary techniques; both are used extensively in evaluation of the female pelvis. The transabdominal approach visualizes the entire pelvis and gives a global overview. It is main limitations involve the examination of patients unable to fill the bladder, obese patients, or patients with a retroverted uterus, in whom the fundus may be located beyond the focal zone of the transducer. The trans abdominal technique also is less effective for characterization of adnexal masses.

Because of the proximity of the transducer to the uterus and adnexa, trans vaginal sonography allows the use of higher-frequency transducers, producing much better resolution, which provides better image quality and anatomic detail. However, because of the higher frequencies, the field of view (FOV) is limited, which is the major disadvantage of the trans vaginal technique. Large masses may fill or extend out of the FOV, making orientation difficult, and superiorly or laterally placed ovaries or masses may not be visualized. Trans vaginal sonography better distinguishes adnexal masses from bowel loops and provides greater detail of the internal characteristics of a pelvic mass because of it is improved resolution. Thus, trans abdominal and trans vaginal techniques complement each other.

Many women will require both trans abdominal and trans vaginal studies. If the initial study is completely normal; however, or if a well-defined abnormality is detected, no further study is usually necessary. The second study is added if the pelvic organs are not well visualized. At my laboratory, we begin with a trans abdominal scan to look for large masses or any obvious abnormalities, but we do not ask the patient to fill her bladder. If the bladder is full, we will do a complete scan. If the bladder is empty, we will proceed directly with the trans vaginal scan.

Trans vaginal sonography should always be performed in women with suspected endometrial disorders, in patients who have a high risk of disease (e.g. strong family history of ovarian cancer), and to assess the internal characteristics of a pelvic mass. For follow-up examinations, only the more efficient diagnostic technique is needed. (Carol M Rumack.2012).

2.10 Normal Sonographic Appearance:

The uterus lies in the true pelvis between the urinary bladder anteriorly and the rectosigmoid colon posteriorly.

Fig (2. 12) The Normal Uterus

Uterine position is variable and changes with varying degrees of bladder and rectal distention. The cervix is fixed in the midline, but the body is quite mobile and may lie obliquely on either side of the midline.

The size and shape of the normal uterus vary throughout life and are related to age, hormonal status, and parity. The infantile or prepubertal uterus range from 2.0 to 3.3 cm in length, with the cervix accounting for two thirds of the total length, and 0.5 to 1.0 cm in anteroposterior(AP) diameter. The prepubertal uterus has a tubular or inverse pear-shaped appearance, with AP diameter of the cervix greater than that of the fundus. In the immediate neonatal period, because of residual maternal hormone stimulation, the neonatal uterus is slightly larger, varying in length from 2.3 to 4.6 cm, and AP diameter from 0.8 to 2.1 cm. also, an echogenic endometrium seen in the neonatal uterus in almost all babies.

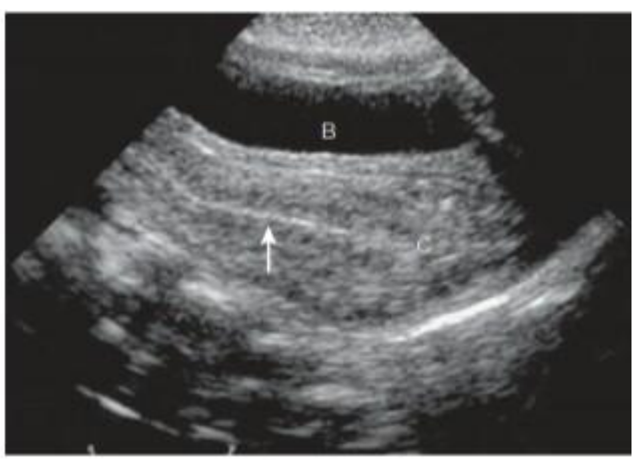

Fig (2. 13) The Neonatal Uterus

The normal postpubertal, or adult, uterus varies considerably in size. After menopause, the uterus atrophies with the most rapid decrease in size occurring in the first 10 years after cessation of menstruation.

The normal myometrium consists of three layers that can distinguished by sonography. The intermediate layer is the thickest and has a uniformly homogeneous texture of low to moderate echogenicity. The inner layer of myometrium is thin, compact, and relatively hypovascular. This inner layer, which is hypoechoic and surrounds the relatively echogenic endometrium, has also been referred to as the subendometrial halo. The third outer layer is slightly less echogenic than the intermediate layer and is separated from it by the arcuate vessel.(Carol M Rumack.2012).

2.11 Investigation done for uterus:

2.10.1 Laboratory investigation:

2.10.1.1 Complete Blood Count (CBC):

To evaluate the mother Hb because iron deficiency anemia is the major cause of death in developing country and platelet also important in bleeding which of serious complication during labor.

2.10.1.2 Blood grouping and cross matching:

These using for preparing the blood before delivery.

2.10.1.1.3 Urine General:

Because protein in the urine is indication of high blood pressure also glucose in urine is indication of gestational diabetes mellitus.

2.10.2 Radiological Investigation:

1. HSG

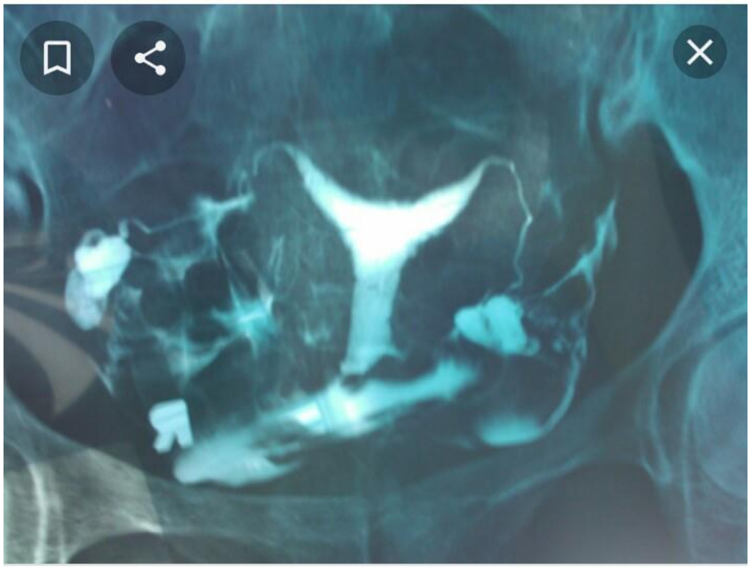

Fig (2. 14) The HSG Image

2. CT

3. MRI

4. U|S

2.12 Previous Studies:

J. Verguts, Timmerman (2013) study was to establish of uterine size to multiparous Measurements of 5466 non-pregnant uteri wereretrieved for analysis. The mean length was found toincrease to 72 mm at the age of 40 and decrease to42 mm at the age of 80 years. Gravidity was associatedwith greater uterine length, width and AP diameter.

Mean length/width ratio was found to be 1.857 at birth, decreasing to 1.452 at the age of 91 years. At the age of21 years, the mean ratio was found to be 1.618, i.e. equalto the golden ratio. Increasing gravidity was associatedwith lower mean length/width ratio. Seffah, J.D.; Adanu, R.M.K. 2004. The mean length of the uterus was 7.1±1.1 cm the mean width was 4.6±0.9 cm and the mean transverse diameter was 2.9±0.5 cm SirisenaU.A.I.1 JwanbotD.I.2, 2015 study included

A 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 x3.77cm (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.

Hum Reprod. 2013 Nov; 28(11):3000-6. Doi: 10.1093/humrep/det344. Pub 2013 Sep 5. Was study the Women at extremes of uterine length (<7.0 or >9.0 cm) were less likely to achieve live birth and women with

Uterine lengths <6.0 cm were also more likely to experience spontaneous abortion.

Esmaelzadeh. Haji Ahmadi 2004:

Northenislomc republic (Iram) Is usyemmeamuterssige 8.6m × 4.9cm × 4 mm Mean age. 31 – 40 y Multiparus (9 cm × 5 cm × 4mn)

Chapter Three

Materials and Methods

Chapter three

Materials and Methods

3.1 Materials:

3.1.1. Machine used:

Data was collected by scanning the patient using ultrasound machine (Esoate, model my lab20) with 3.5-5 MHz curvilinear transducer using coupling gel.

Fig (3. 1) The Machine Used

3.1.2 Design of the study:

This study was a cross sectional descriptive study was collected from multiparous who referred to ultrasound department for pelvic ultrasound.

3.1.3 Population of the study:

The population of this study were multiparous women with normal uterus measurement.

3.1.4 Sample size and type:

This study consist of 50 multiparous randomly female.

3.1.5 Place and duration of the study:

This study was carried out in period from November 2018 to April 2019 in Aldamazine city.

3.1.6 Included and Excluded:

This study included any multiparous female with normal uterus measurement and excluded any multiparous female with abnormal uterus measurement.

3.2 Methods: 3.2.1 Data Collection:

Using a special data collection sheet, sample of 50 multiparous women with normal uterus measurement.

3.2.2 Sonographic Technique:

3.2.2.1 Trans abdominal sonography:

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

3.2.2.2 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 two hours before examination.

3.2.2.3 Patient position:

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

3.2.2.4 Planes of scan:

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 uterus size, I must obtain the length, width, and thickness of the uterus first and subsequently the volume is calculated automatically by the U\S machine.

3.3 Data analysis:

The data of this study was analyzed by using Microsoft excel and SPSS program.

3.4 Ethical consideration:

The ethical approval was granted from the hospital and the radiology department, which include commitment of no disclose of any information concerning the patient identification.

Chapter Four

Results

Chapter four

The results

4-1 Results:

About 50 cases having neither complain nor was pathology related to multiparous uterus selected for this study. The results of this study are presented into tables and figures below.

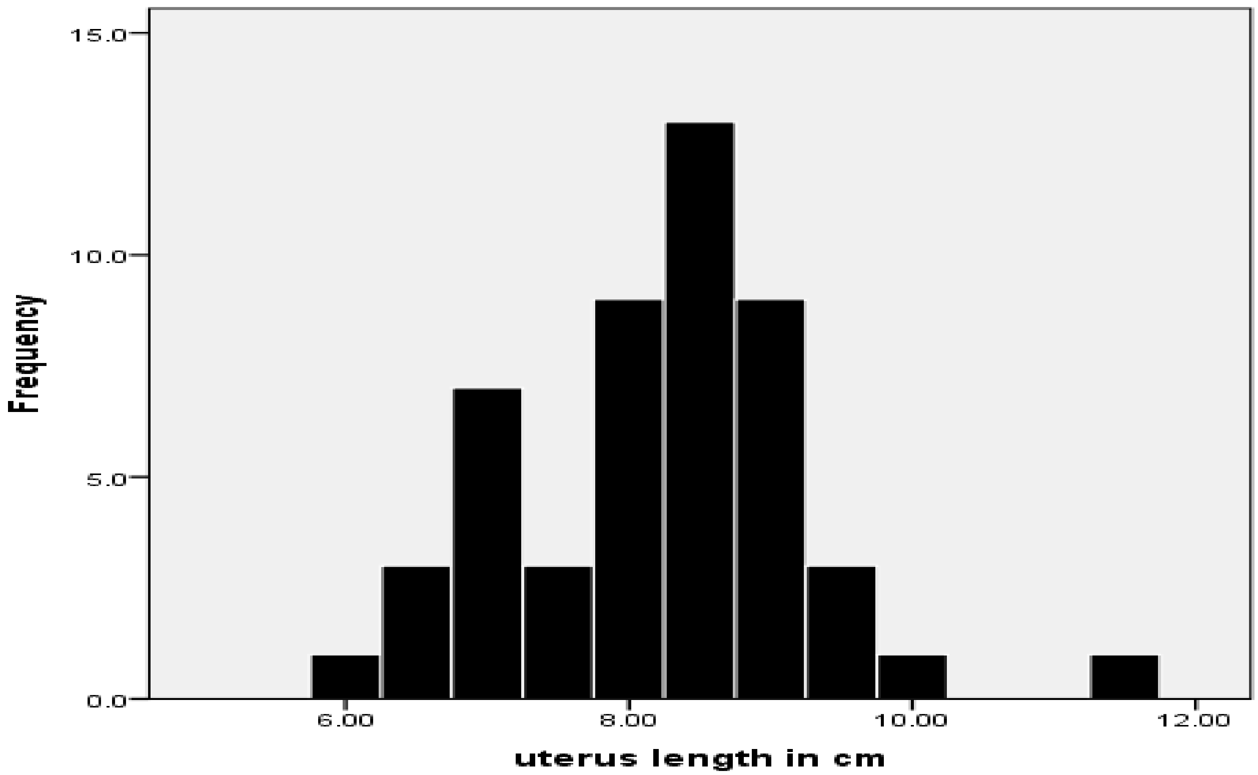

Fig (4. 1) shows bar graph displaying frequency distribution of uterus length.

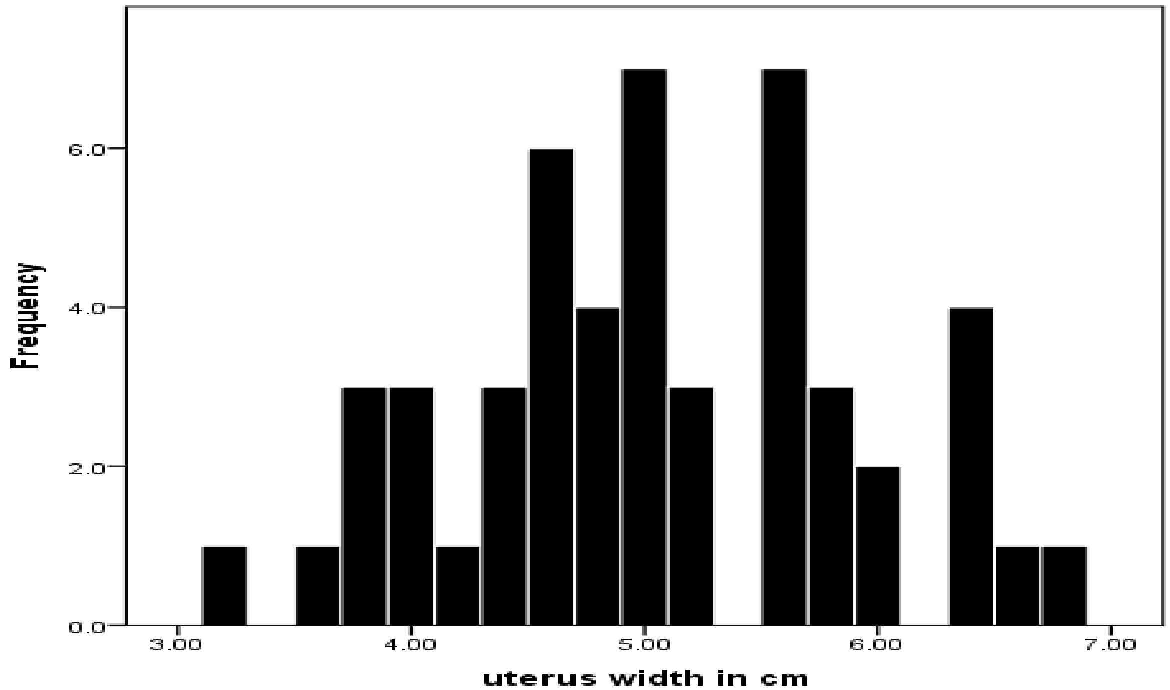

Fig (4. 2)shows bar graph displaying frequency distribution of uterus width.

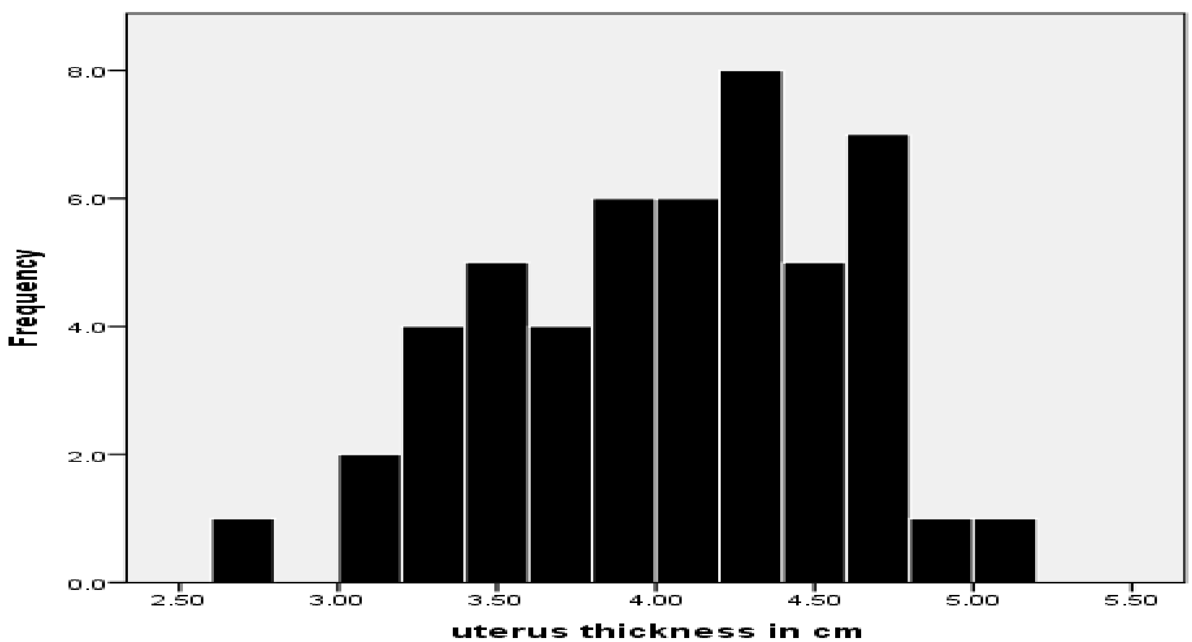

Fig (4. 3) shows bar graph displaying frequency distribution of uterus thickness.

Table (4. 1) Model expressing descriptive statistics of uterus length, width and thickness

	N	Range	Minimum	Maximum	Mean	Std. Deviation
uterus length in cm	50	5.30	6.00	11.30	8.2220	1.00332
uterus width in cm	50	3.50	3.20	6.70	5.0020	.84382
uterus thickness in cm	50	2.40	2.70	5.10	3.9900	.54182

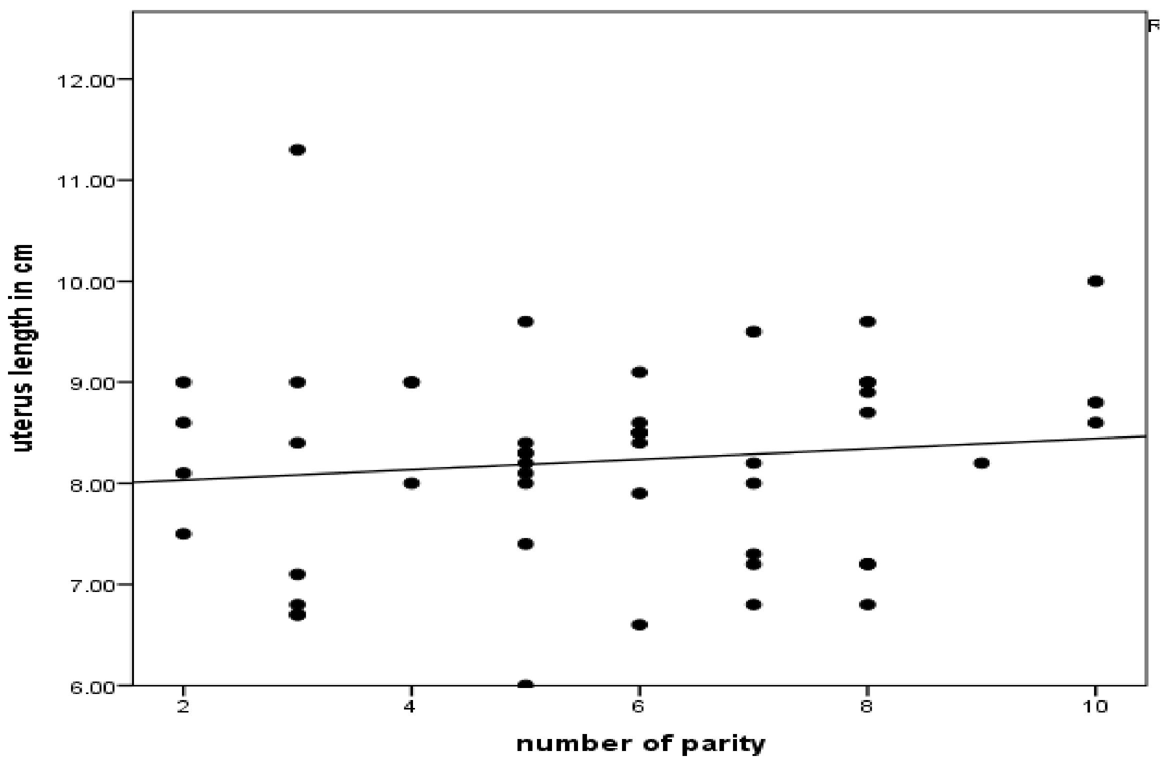

Fig (4. 4) scatter plot shows the relationship between number of parity and uterus lengths.

Table (4. 2) Model correlation testexpressingthe relationship between the number of parity and uterus length:

		Number of parity	Uterus length in cm
Number of parity	Pearson Correlation	1	.113
	Sig. (2-tailed)		.436
	N	50	50

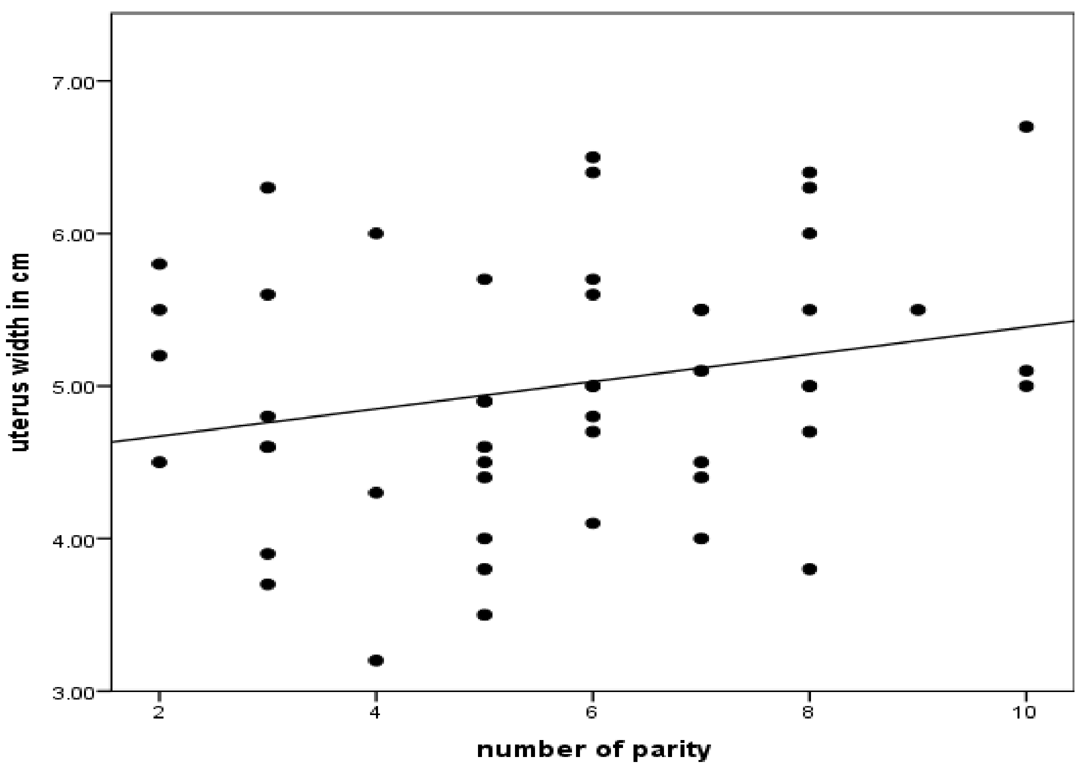

Fig (4. 5) scatter plot shows the relationship between number of parity and uterus width.

Table (4. 3) Model correlation testexpressingthe relationship between the number of parity and uterus width:

		Number of parity	Uterus width in cm
Number of parity	Pearson Correlation	1	.234
	Sig. (2-tailed)		.102
	N	50	50

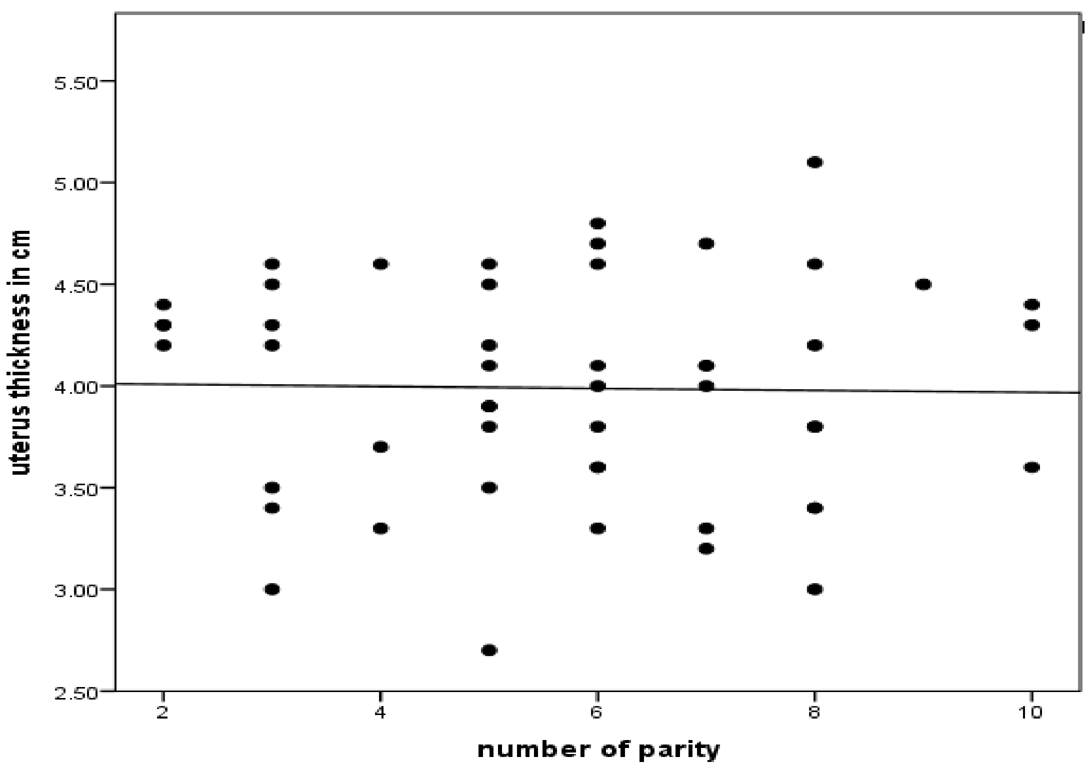

Fig (4. 6) scatter plot shows the relationship between number of parity and uterus thickness.

Table (4. 4) Model correlation testexpressingthe relationship between the number of parity and uterus thickness:

		Number of parity	Uterus thickness in cm
Number of parity	Pearson Correlation	1	-.020
	Sig. (2-tailed)		.892
	N	50	50

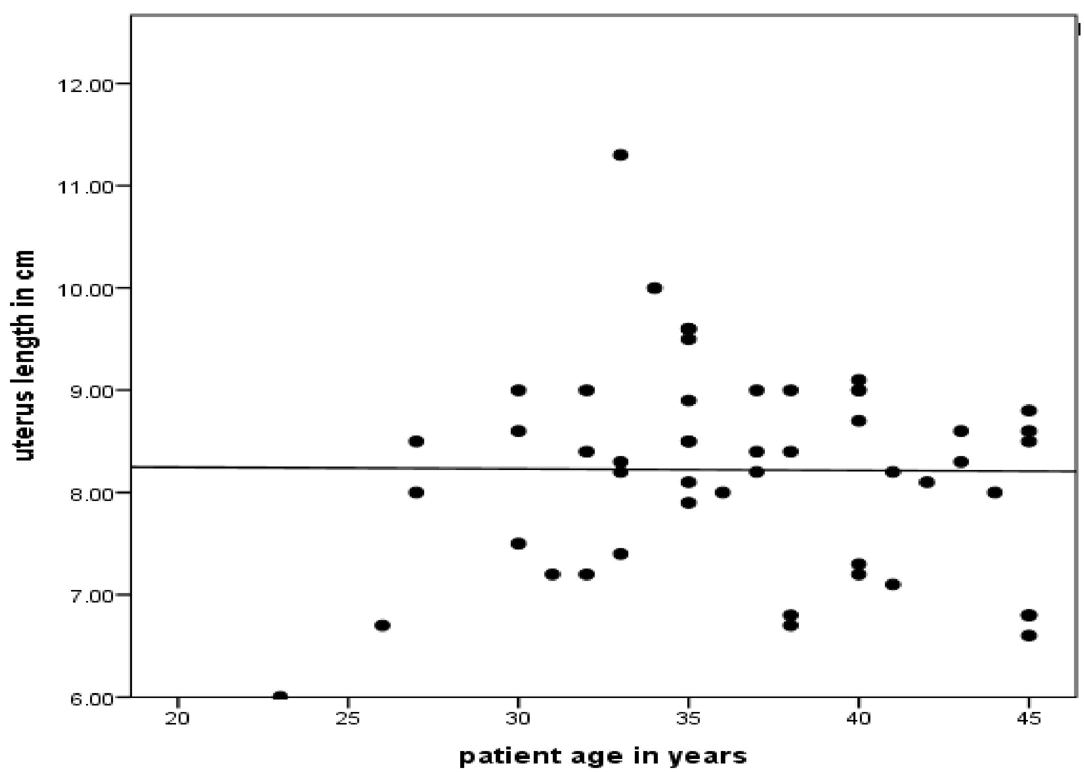

Fig (4. 7) scatter plot shows the relationship between patient age and uterus length.

Table (4. 5) Model correlation testexpressingthe relationship between the patient age and uterus length:

		Patient age in years	Uterus length in cm
Patient age in years	Pearson Correlation	1	-.008
	Sig. (2-tailed)		.955
	N	50	50

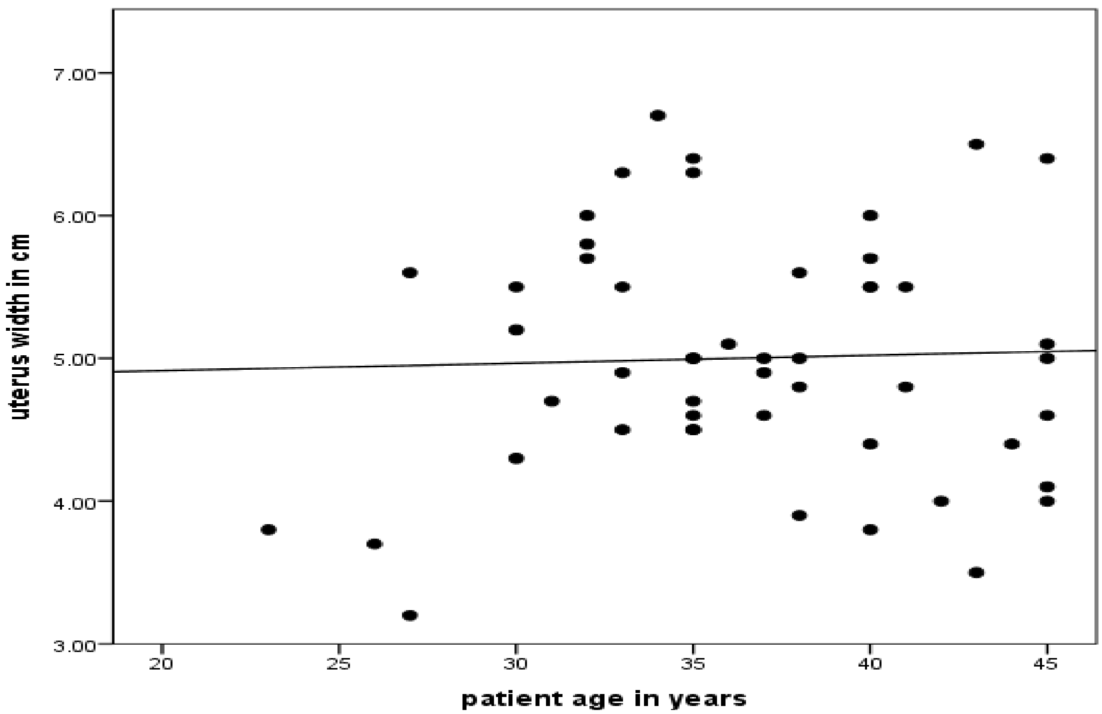

Fig (4. 8) scatter plot shows the relationship between patient age and uterus width.

Table (4. 6) Model correlation testexpressingthe relationship between the patient age and uterus width:

		Patient age in years	Uterus width in cm
Patient age in years	Pearson Correlation	1	.035
	Sig. (2-tailed)		.808
	N	50	50

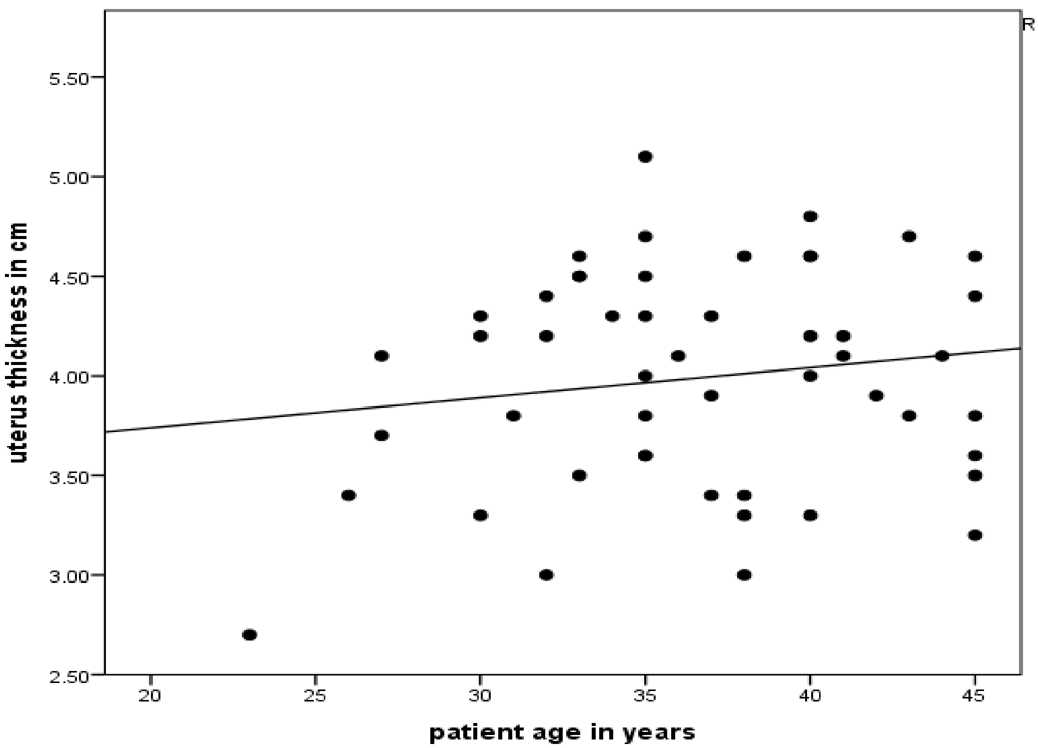

Fig (4. 9) scatter plot shows the relationship between patient age and uterus thickness.

Table (4. 7) Model correlation testexpressingthe relationship between the patient age and uterus thickness:

		Patient age in years	Uterus thickness in cm
Patient age in years	Pearson Correlation	1	.154
	Sig. (2-tailed)		.285
	N	50	50

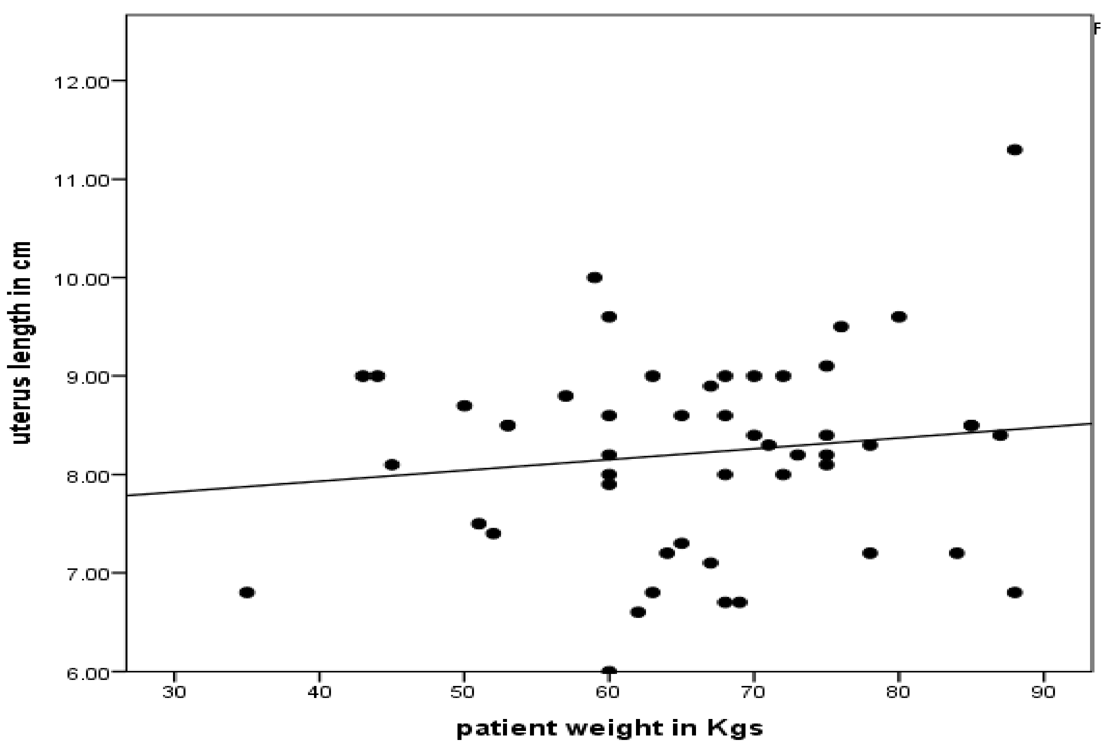

Fig (4. 10) scatter plot shows the relationship between patient weight and uterus length.

Table (4. 8) Model correlation testexpressingthe relationship between the patient weight and uterus length:

		Patient weight in Kgs	Uterus length in cm
Patient weight in Kgs	Pearson Correlation	1	.135
	Sig. (2-tailed)		.352
	N	50	50

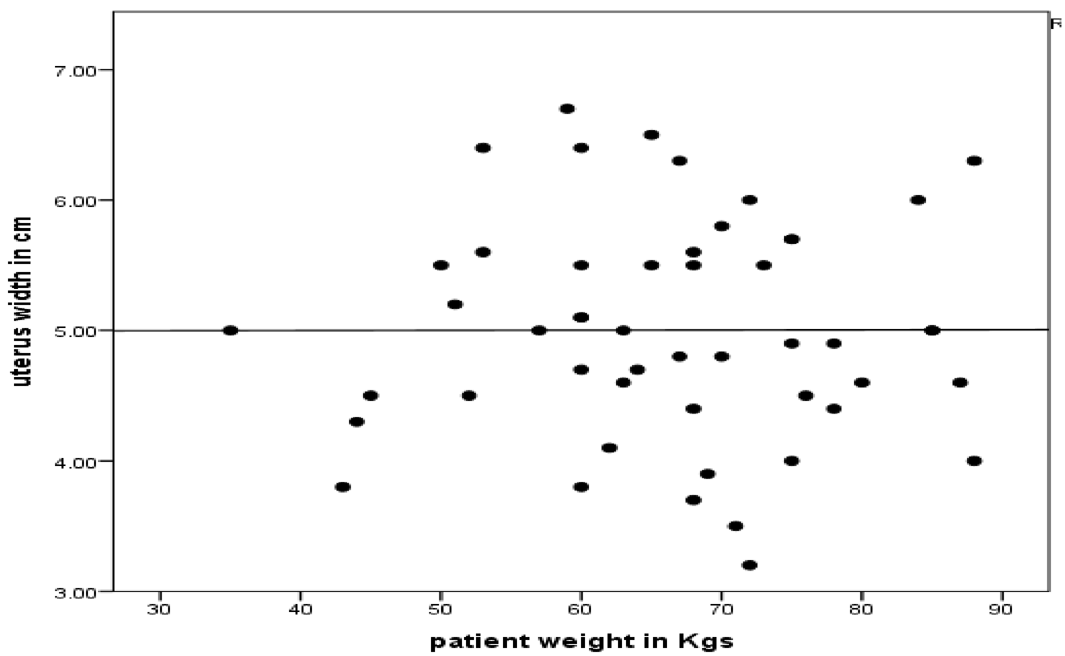

Fig (4. 11) scatter plot shows the relationship between patient weight and uterus width.

Table (4. 9) Model correlation testexpressingthe relationship between the patient weight and uterus width:

		Patient weight in Kegs	Uterus width in cm
Patient weight in Kgs	Pearson Correlation	1	.002
	Sig. (2-tailed)		.988
	N	50	50

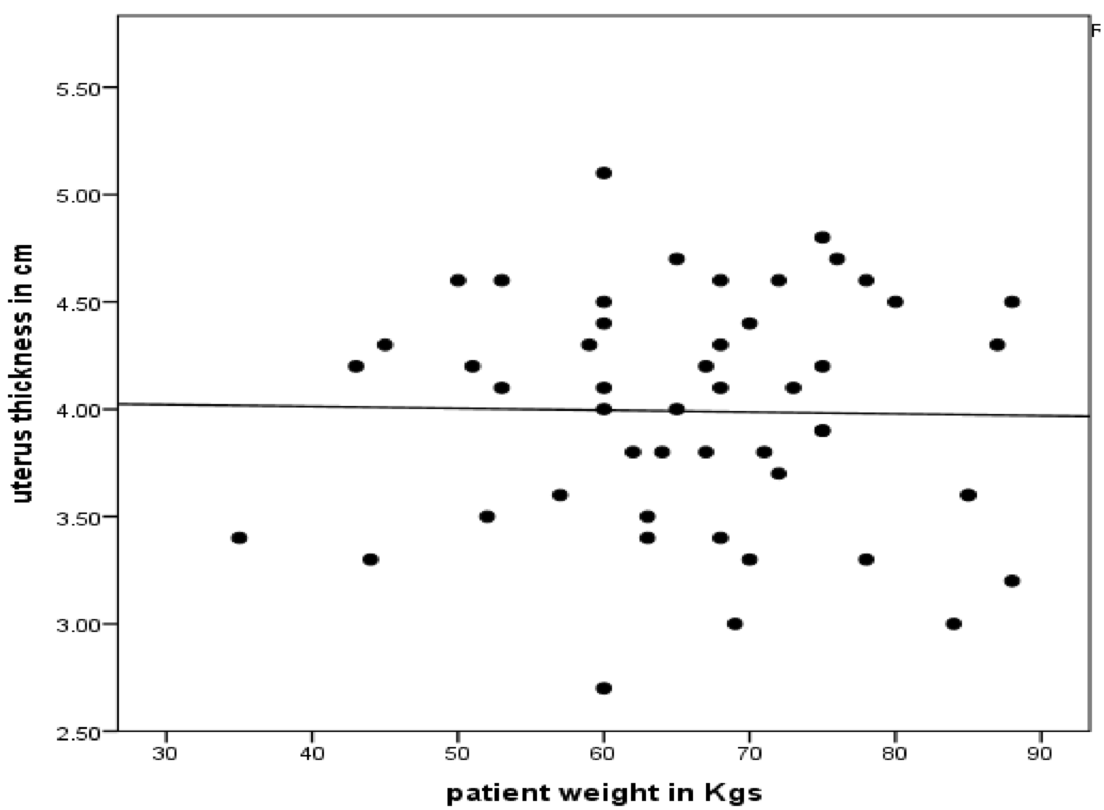

Fig (4. 12) scatter plot shows the relationship between patient weight and uterus thickness.

Table (4. 10) Model correlation testexpressingthe relationship between the patient weight and uterus thickness:

		Patient weight in Kgs	Uterus thickness in cm
Patient weight in Kgs	Pearson Correlation	1	-.019
	Sig. (2-tailed)		.893
	N	50	50

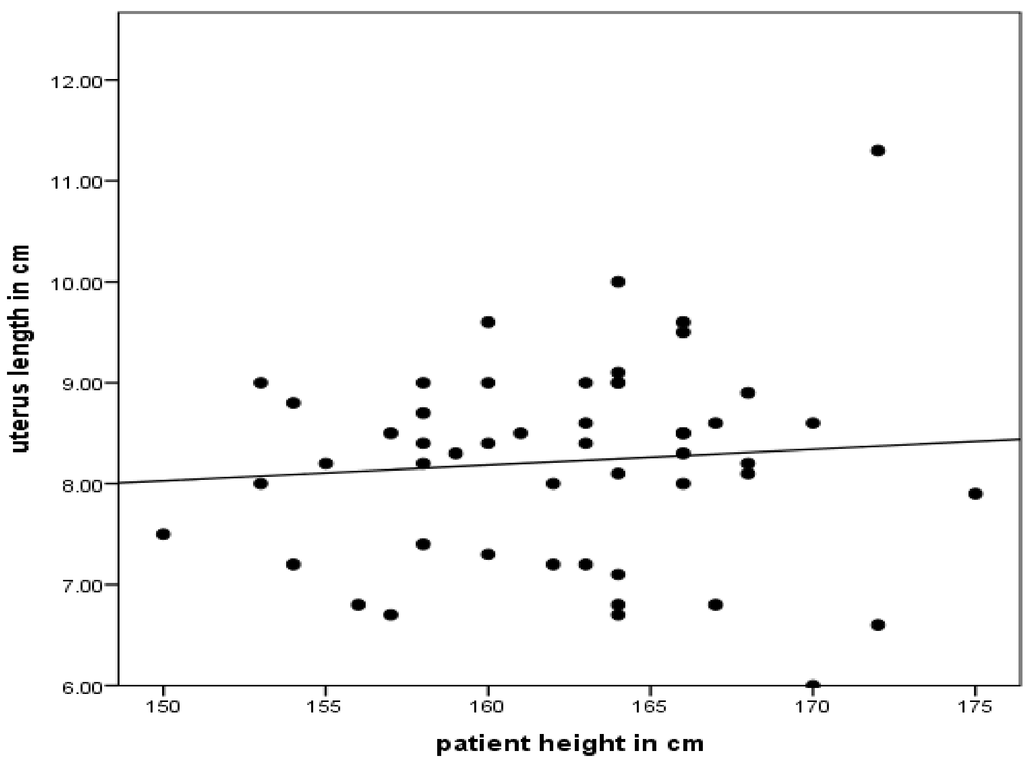

Fig (4. 13) scatter plot shows the relationship between patient height and uterus length.

Table (4. 11) Model correlation testexpressingthe relationship between the patient height and uterus length:

		Patient height in cm	Uterus length in cm
Patient height in cm	Pearson Correlation	1	.085
	Sig. (2-tailed)		.559
	N	50	50

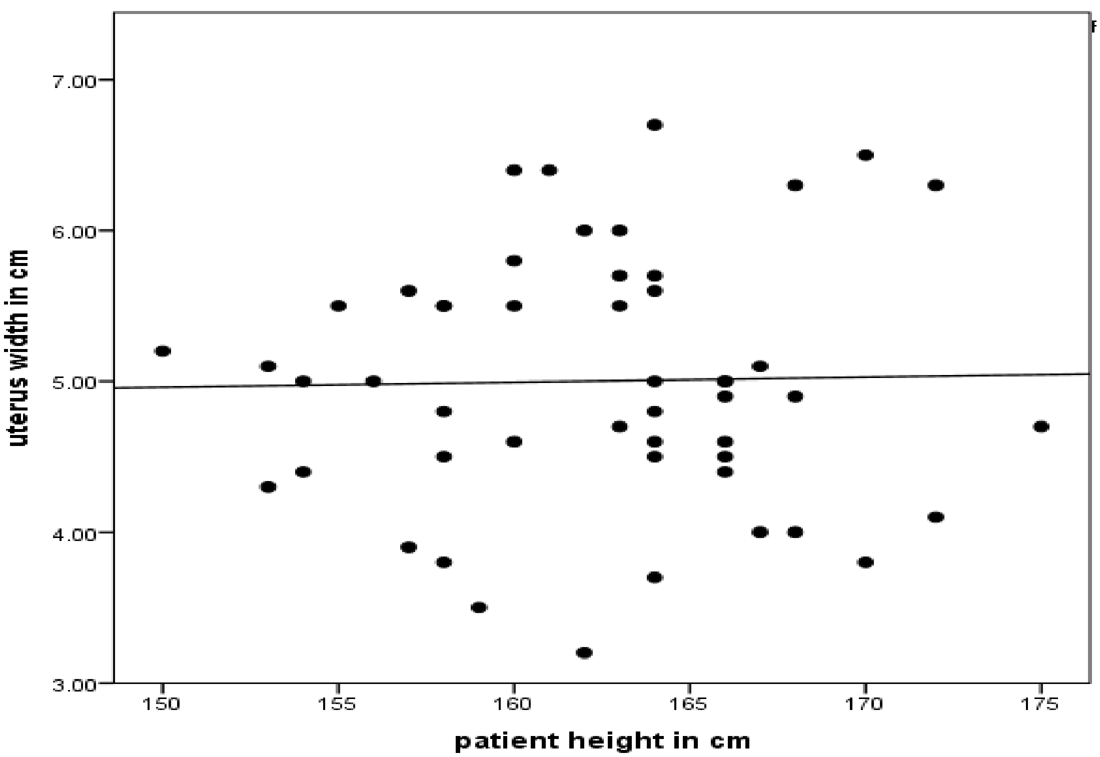

Fig (4. 14) scatter plot shows the relationship between patient height and uterus width.

Table (4. 12) Model correlation testexpressingthe relationship between the patient height and uterus width:

		Patient height in cm	Uterus width in cm
Patient height in cm	Pearson Correlation	1	.021
	Sig. (2-tailed)		.884
	N	50	50

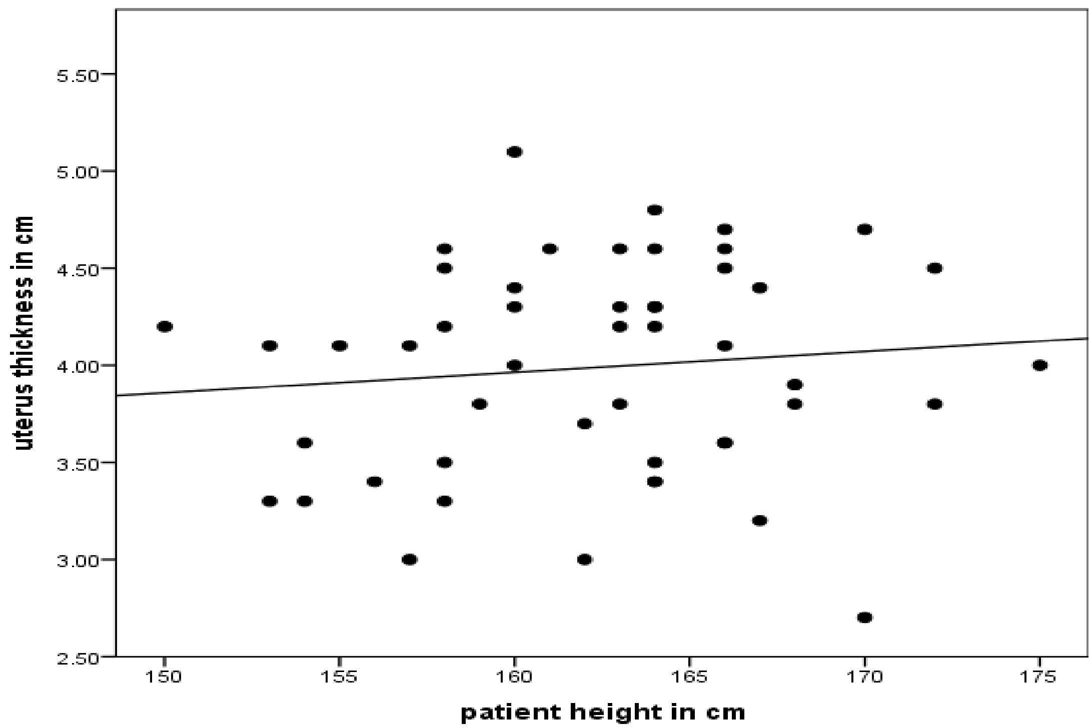

Fig (4. 15) scatter plot shows the relationship between patient height and uterus thickness.

Table (4. 13) Model correlation testexpressingthe relationship between the patient height and uterus thickness:

		Patient height in cm	Uterus thickness in cm
Patient height in cm	Pearson Correlation	1	.107
	Sig. (2-tailed)		.459
	N	50	50

Chapter Five

Discussion, Conclusion, and Recommendations

Chapter Five

Discussion, Conclusion, and Recommendations

5-1 Discussion:

The results of this study showed that the uterus length, width and thickness diameters were measured and displayed in Fig. (4-1, 4-2and4-3), and their mean values were (8.22±1) cm, (5±0.84) cm, and (3.99±0.54) cm respectively see table (4-1) this study agree with (Hum Reprod. 2013).

Also the results confirmed that there is no significant relationship between the number of parity and uterus length, width and thickness figures (4-4 , 4-5 and 4-6) respectively, because the value in the "Sig. (2-tailed)" Raw see tables (4-2 , 4-3 and 4-4) is 0.436 , 0.102 and 0.892 respectively which is more than 0.05 , this study disagree with (J. Verguts, Timmerman 2013)

Moreover also there is no significant relationship between the patient age and uterus length , width and thickness Figures (4-7 , 4-8 and 4-9) respectively , because the value in the "Sig. (2-tailed)" Raw see tables (4-5 , 4-6 and 4-7) is 0.955 , 0.808 and 0.285 respectively which is more than 0.05 , this study disagree with (J. Verguts, Timmerman 2013)

The study also showed that there is no significant relationship between the patient weight and uterus length , width and thickness Figures (4-10 , 4-11 and 4-12) respectively , because the value in the "Sig. (2-tailed)" Raw see tables (4-8 , 4-9 and 4-10) is 0.352 , 0.988 and 0.893 respectively which is more than 0.05 .

Lastly the study showed that there is no significant relationship between the patient height and uterus length , width and thickness Figures (4-13 , 4-14 and 4-15) respectively , because the value in the "Sig. (2-tailed)" Raw see tables (4-11 , 4-12 and 4-13) is 0.559 , 0.884 and 0.459 respectively which is more than 0.05 .

5-2 Conclusion:

The results of this Thesis states that the uterus length, width and thickness diameters mean values were (8.22±1) cm, (5±0.84) cm, and (3.99±0.54) cm respectively. The study also concludes that, there was no significant relationship between number of parity and uterus length, width and thickness diameters. Also, the study found out that there was no significant relationship between patient age, weight and height with uterus length, width and thickness diameters.

5-3 Recommendations:

Trans-abdominal ultrasound is a respectful approach, and should be used confidently in the measurements and evaluation of the uterus size and pathologies among Sudanese.

In order to improve the image quality, the patients should be well prepared, and the ultrasound machines should be well adjusted to have better resolution.

There is another factors that might affect the uterus size were not included here such as the ethnic group, hormones levels, personal habits and environmental factors. There for other researches were recommended to cover these factors.

It's better to follow standard protocols to improve our techniques.

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Appendices

بسم الله الرحمن الرحيم

Sudan University of Science and Technology

Collage of Graduate Studies

Data Collection Sheet

Measurement of Uterine Size of Multiparous Women using ultrasound

No	Age	Weight	Height	Number of Parity	Uterus length	Uterus Width	Uterus Thickness

Image with full description

U/S image (1) uterus measurement (7.4 × 4.7 × 4.5 cm) in multipaurs 32 years

U/S image (2) uterus measurement (7.4 × 4.5 cm) in multipaurs 29 years

U/S image (3) uterus measurement (8× 9.22 × 4.9 cm) in multiparus 43 years

U/S image (4) uterus measurement (7.9 × 3.5 × 3 cm) in multiparus 30 years