Sudan University of Science and Technology

College of Graduate Studies

Study of Causes of First Trimester Complications using Ultrasonography

دراسة أسباب مضاعفات الحمل في الثلث الأول من الحمل باستخدام التصوير بالموجات فوق الصوتية

Thesis Submitted in Partial fulfillment of the Requirement of M.Sc Degree in Medical Diagnostic Ultrasound

By

Sapreen Mohammed Drar Hassan

Supervisor

Dr: Muna Ahmed Mohammed

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الآيـــة

(قُلْ إِنْ كَانَ آبَاؤُكُمْ وَأَبْنَاؤُكُمْ وَإِخْوَانُكُمْ وَأَزْوَاجُكُمْ وَعَشِيرَتُكُمْ وَأَمْوَالٌ اقْتَرَفْتُمُوهَا وَتِجَارَةٌ تَخْشَوْنَ كَسَادَهَا وَمَسَاكِنُ تَرْضَوْنَهَا أَحَبَّ إِلَيْكُمْ مِنَ اللَّهِ وَرَسُولِهِ وَجِهَادٍ فِي سَبِيلِهِ فَتَرَبَّصُوا حَتَّى يَأْتِيَ اللَّهُ بِأَمْرِهِ وَاللَّهُ لا يَهْدِي الْقَوْمَ الْفَاسِقِينَ)

صدق الله العظيم
سورة التوبة الآية (24)

Dedication

I dedicate my humble effort to the candles that burn
To light my way, my sweet lovely parents for whose
Affection, love, encouragement and prays of day and
Night make me able to get such success and honor,
I also dedicate this thesis to my brothers and sisters
Who have supported me?
Special thanks to my dear husband for being there
For me during those difficult and trying times.
To all people in my life who touch my heart.

Acknowledgements

I would like to express my deep and sincere gratitude to my supervisor Dr Muna Ahmed Mohamed, for her supervision and guidance that set me on the right track. Without her help this work could not have been accomplished. I am very thankful for her detailed, constructive comments and for his personal guidance for this work.

My thanks also go to staff at the hospital for their help and providing this data.

Finally, I would like to sincerely thank my family for their consistent mental support and their unselfish help in the past years.

Abstract

The demand for ultrasound in early pregnancy has been increasing steadily, and is now a routine investigation for most women within the first trimester of their pregnancy. It is a safe investigation which provides reassurance, charts normal development, and identifies women with abnormal or high risk pregnancies.

The main objectives of this study is to determine the causes of pregnancy failure in first trimester, to identify sonographer features of early pregnancy failure, and to study the role of ultrasound in differentiate the type of pregnancy failure in first trimester.

The study was conducted at Alturky Teaching Hospital. Patients whom referred to the ultrasound clinic for assessing their first trimester pregnancy, with symptoms of abdominal pain, vaginal bleeding or both. On this study among 50 pregnant women the highest numbers of patients were found within age group of 28-37 years (27 patients (54%) while the lowest were found for age group of 38-47 years (9 patients (18%). According to parity , (34%) of patients with only one pregnancy then p2 (26%), p0 (16%) while P5 and P7 (2%), In addition to that (42%) of patients with only one abortion, while patient with recurrent abortion (3&4) times were (2%).the majority of the patients were house wives (78%) while the little portion of the patients are workers (22%). The result of this study revealed that the major cause were unexplained (31 patient(62%), while trauma (14 patient (28%) and Fibroids (5 patient (10%). This study revealed higher complications were reported with patient's with low parity, older patients and inversely proportional with the number of pregnancies. Improvement of the awareness of ladies regarding pregnancy complications will enable early diagnosis and improve the outcome of the management.

المستخلص

ازداد الطلب على الموجات فوق الصوتية في الحمل المبكر بشكل مطرد ، وهو الآن إجراء تحقيق روتيني لمعظم النساء خلال الأشهر الثلاثة الأولى من الحمل. وهو عبارة عن تحقيق آمن يوفر طمأنة وتخطيطًا للتطور الطبيعي ويحدد النساء اللائي يعانين من حالات حمل غير طبيعية أو عالية الخطورة.

الأهداف الرئيسية لهذه الدراسة هي تحديد الخصائص التصويرية لفشل الحمل المبكر ، لتحديد أسباب فشل الحمل في الأشهر الثلاثة الأولى ، ودراسة دور الموجات فوق الصوتية في التفريق بين نوع فشل الحمل في الأشهر الثلاثة الأولى.

أجريت الدراسة في مستشفى التركي التعليمي ، بلغ عدد العين 50 مريضة تم تحويلهن إلى عيادات الموجات فوق الصوتية لتقييم الحمل في الأشهر الثلاثة الأولى، مع أعراض آلام في البطن ، نزيف مهبلي أو كلاهما. أظهرت هذه الدراسة أن أكبر عدد من المرضى في الفئة العمرية من 28-37 سنة (27 مريضا (54 ٪) في حين أن أقل نسبة للفئة العمرية 38-47 سنة (9 مرضى (18 ٪). أغلب المرضى ممن لديهن عدد مرات حمل أقل (مرة واحدة 42٪) في حين كانت أدنى نسبة لذوات الحمل المتكرر(3-4) مرات 2 ٪. أيضا وجد أن غالبية المرضى ربات منزل (78 ٪) في حين أن الجزء القليل من المرضى هم من العمال (22 ٪).

أظهرت نتائج هذه الدراسة أيضا أن السبب الرئيسي لم يتم تفسيره (31 مريضا (62 ٪) ، في حين أن الحوادث (14 مريضا (28 ٪) والأورام الليفية (5 مريض (10 ٪).وكشفت هذه الدراسة عن حدوث مضاعفات أعلى مع المرضى الذين لديهن عدد مرات حمل أقل والمرضى الأكبر سنا ويتناسب عكسيا مع عدد حالات الحمل. إن تحسين وعي السيدات بمضاعفات الحمل سيمكن من التشخيص المبكر وتحسين نتائج الإدارة

Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATION

TVS	Transvaginal sonography
GnRH	Gonadotropin-releasing hormone
FSH	Follicular stimulating hormone
LH	Luteinizing hormone
RPOC	Retain product of conception
GA	Gestational age
WHO	World health organization
GTD	Gestational trophoblastic disease
LPD	Luteal phase defect
PCOS	Polycystic ovarian syndrom
HSV	Herps simplex virus
RPL	Recurrent pregnancy loss
CRL	Crown – rump length
EP	Ectopic pregnancy
IUP	Intra uterine pregnancy

Chapter one

Introduction

Chapter one

Introduction

1.1 Introduction:

The demand for ultrasound in early pregnancy has been increasing steadily, and is now a routine investigation for most women within the first trimester of their pregnancy. It is a safe investigation which provides reassurance, charts normal development, and identifies women with abnormal or high risk pregnancies. Transvaginal ultrasound has revolutionized the diagnosis of early pregnancy as it can detect a pregnancy at an earlier stage, whether it is normal and therefore reassuring, or abnormal and require intervention. Ultrasound is also a useful tool to aid decisions regarding management of abnormal pregnancy, such as ectopic pregnancy or miscarriage.(Sawyer and Jurkovic, 2007)

The advent of high-resolution transvaginal ultrasound (TVS) has revolutionized our understanding of the pathophysiology and the management of early pregnancy failure. Knowledge of the ultrasound appearances of normal early pregnancy development and a good understanding of its pitfalls are essential for the diagnosis and management of early pregnancy failure. Ultrasound imaging has rapidly replaced all other techniques used to study normal human development in the first trimester, and ultrasound features of the early gestational sac have corroborated anatomical studies showing that the first structures to appear are the celomic cavity and the secondary yolk sac. No single ultrasound measurement of the different anatomical features in the first trimester has been shown to have a high predictive value for determining early pregnancy outcome. Similarly, Doppler studies have failed to demonstrate abnormal blood flow indices in

the first-trimester uteroplacental circulation of pregnancies that subsequently end in miscarriag.(Jauniaux et al., 2005) .

The sequence of events in early pregnancy, as seen on transvaginal ultrasonography, follows a fairly predictable pattern. The gestational sac is first seen at approximately 5 weeks of gestational age, appearing as a small cystic-fluid collection with rounded edges and no visible contents, located in the central echogenic portion of the uterus (i.e., within the decidua). Previously described ultrasonographic signs of early pregnancy — the "double sac sign" and "intradecidual sign" — were defined with the use of trans abdominal ultrasonography, but with current transvaginal ultrasonographic technology, these signs are absent in at least 35% of gestational sacs. Therefore, any round or oval fluid collection in a woman with a positive pregnancy test most likely represents an intrauterine gestational sac and should be reported as such; it is much less likely to be a pseudogestational sac or decidual cyst, findings that can be present in a woman with an ectopic pregnancy. (Doubilet et al., 2013)

The yolk sac, a circular structure about 3 to 5 mm in diameter, makes its appearance at about $5\frac{1}{2}$ weeks of gestation. The embryo is first seen adjacent to the yolk sac at about 6 weeks, at which time the heartbeat is present as a flickering motion.(Doubilet et al., 2013)

Variations from the expected pattern of development are worrisome or, if major, definitive for early pregnancy failure. The criteria most often used to diagnose pregnancy failure are the absence of cardiac activity by the time the embryo has reached a certain length (crown–rump length), the absence of a visible embryo by the time the gestational sac has grown to a certain size (mean sac diameter), and the absence of a visible embryo by a certain point in time.(Doubilet et al., 2013)

1.1.1 Crown–Rump Length as a Criterion for Failed Pregnancy:

Shortly after transvaginal ultrasonography became widely available in the mid-to-late 1980s, several studies sought to determine the cutoff value for crown–rump length above which cardiac activity is consistently visible on transvaginal ultrasonography in a viable pregnancy. The cutoff values identified in these studies were 4 mm and 5 mm. Despite the small number of patients in these studies, a crown–rump length of 5 mm was widely recommended as a positivity criterion for diagnosing failed pregnancy when no cardiac activity is seen.(Doubilet et al., 2013)

1.1.2 Mean Sac Diameter as a Criterion for Failed Pregnancy:

The size of the gestational sac, measured as the mean sac diameter (the average of the sagittal, transverse, and anteroposterior diameters of the sac), increases as pregnancy progresses. A number of studies have examined the cutoff value for the mean sac diameter above which an embryo is consistently visible on transvaginal ultrasonography in a normal pregnancy. Initial studies involving small numbers of patients put the cutoff value at 16 mm and 17 mm, leading to the widespread use of a mean sac diameter of 16 mm as a positivity criterion for diagnosing failed pregnancy when no embryo is seen. (Doubilet et al., 2013)

1.1.3 Time-Based Criteria for Failed Pregnancy:

Not all failed pregnancies ever develop a 7-mm embryo or a 25-mm gestational sac, so it is important to have other criteria for diagnosing pregnancy failure. The most useful of such criteria involve nonvisualization of an embryo by a certain point in time. An alternative approach to predicting pregnancy failure, based on subnormal growth of the gestational sac and embryo, has been shown to be unreliable.

Nonvisualization of an embryo with a heartbeat by 6 weeks after the last menstrual period is suspicious for failed pregnancy, but dating of the last menstrual period (in a pregnancy conceived without medical assistance) is

too unreliable for definitive diagnosis of pregnancy failure. (Doubilet et al., 2013) .

1.1.4 Other Suspicious Findings:

Several ultrasonographic findings early in the first trimester have been reported as abnormal. These include an “empty” amnion, an enlarged yolk sac, and a small gestational sac. Because none of these signs have been extensively studied, they are considered to be suspicious for, though not diagnostic of, failed pregnancy.(Doubilet et al., 2013)

1.2 The problem of the study:

Complications in early pregnancy could result in adverse outcome in the current or subsequent pregnancy.

Therefore, this study try to assess the causes of pregnancy complications during first trimester by using ultrasound.

1.3 Objectives:

1.3.1General objective:

To study the causes of early pregnancy failure

1.3.2 Specific objectives:

- To determine the causes of early pregnancy failure.
- To study the roles of ultrasound in differentiate the type of pregnancy failure in first trimester.
- To identify the sonographic features of early pregnancy failure.
- To correlate the causes with maternal age.
- To correlate the number of abortion with maternal age.

1.4Thesis outline

The thesis is outlined into five chapters as follows:

Chapter one: general introduction to medical ultrasound, problem and objectives of the study, Chapter two: is devoted to the literature review to the previous local and international studies and focused pregnancy

complications and assessment using ultrasound and the operation principle of ultrasound imaging machines and review ultrasound techniques, Chapter three: Materials and techniques are presented in this chapter. Features of the machines used in the study and patient sample and characteristics and statistical analysis used this thesis, Chapter four: presents the results, and data collected from the investigation, Chapter five: discusses the findings of the study and gives some conclusions about the topic under study. Brief recommendations for future research are also given

Chapter Two

Literature review

Chapter Two

Literature review

2.1Theoretical background:

2.1.1Anatomy of the female reproductive system:

2.1.1.1 The uterus:

The uterus is a hollow, thick-walled muscular organ. Its 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. The uterus is located between the two layers of the broad ligament laterally, the bladder anteriorly, and the recto sigmoid colon posteriorly. The uterus is divided into two major portions, the body and the cervix, by a slight narrowing at the level of the internal os. (Carol M. RumacK et al., 2011)

The fundus is the superior area of the body above the entrance of the fallopian tubes. The area of the body where the tubes enter the uterus is called the cornua. The anterior surface of the uterine fundus and body is covered by peritoneum.The peritoneal space anterior to the uterus is the vesicouterine pouch, or anterior cul-de-sac. This space is usually empty, but it may contain small bowel loops. Posteriorly, the peritoneal reflection extends to the posterior fornix of the vagina, forming the rectouterine recess, or posterior cul-de-sac. Laterally, the peritoneal reflection forms the broad ligaments, which extend from the lateral aspect of the uterus to the lateral pelvic side walls . The round ligaments arise from the uterine cornua anterior to the fallopian tubes in the broad ligaments, extend anterolaterally, and course through the inguinal canals to insert into the fascia of the labia majora.(Carol M. RumacK et al., 2011)

The cervix is located posterior to the angle of the bladder and is anchored to the bladder angle by the parametrium. The cervix opens into the upper vagina through the external os.(Carol M. RumacK et al., 2011)

The vagina is a fibromuscular canal that lies in the midline and runs from the cervix to the vestibule of the external genitalia. The cervix projects into the proximal vagina, creating a space between the vaginal walls and the surface of the cervix called the vaginal fornix. Although the space is continuous, it is divided into anterior, posterior, and two lateral fornices.(Carol M. RumacK et al., 2011)

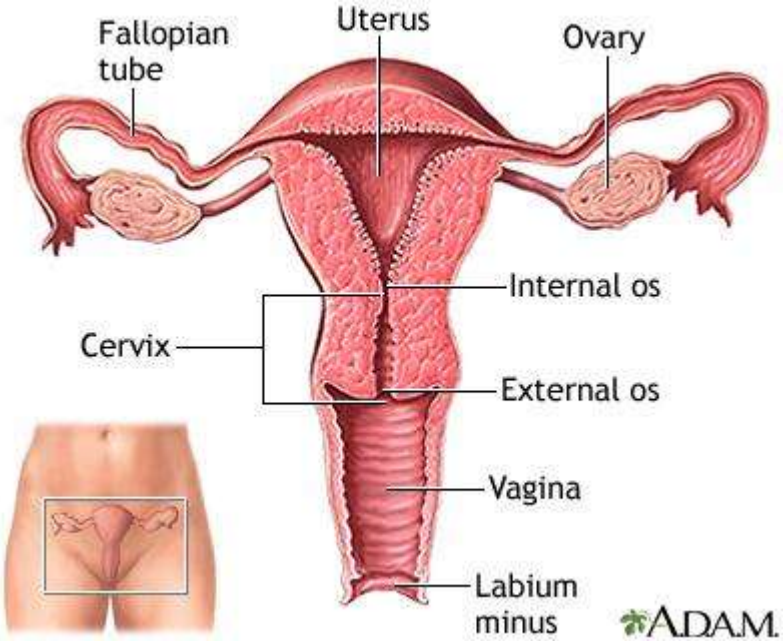

Figure 2.1: anatomy of the uterus

(https://www.researchgate.net/figure/Anatomy-of-uterus-http-adamaboutnet_fig3_301549192)

2.1.1.2 fallopian tubes:

The two fallopian tubes run laterally from the uterus in the upper free margin of the broad ligament. Each tube varies from 7 to 12 cm in length and is divided into intramural, isthmic, ampullary, and infundibular portions. The intramural, or interstitial, portion is approximately 1 cm long, is contained within the muscular wall of the uterus, and is the narrowest part of the tube. The isthmus, constituting the medial third, is slightly wider, round, cordlike, and continuous with the ampulla, which is tortuous and forms approximately one-half the length of the tube. The ampulla terminates in the most distal portion, the infundibulum, or fimbriated end, which is funnel shaped and opens into the peritoneal cavity.(Carol M. RumacK et al., 2011)

2.1.1.3 The ovaries:

The ovaries are elliptical in shape, with the long axis usually oriented vertically. The surface of the ovary is not covered by peritoneum but by a single layer of cuboidalor columnar cells called the germinal epithelium that becomes continuous with the peritoneum at the hilum of the ovary. The internal structure of the ovary is divided into an outer cortex and inner medulla. The cortex consists of an interstitial framework, or stroma, which is composed of reticular fibers and spindle-shaped cells and which contains the ovarian follicles and corpus lutea. Beneath the germinal epithelium, the connective tissue of the cortex is condensed to form a fibrous capsule, the tunica albuginea. The medulla, which is smaller in volume than the cortex, is composed of fibrous tissue and blood vessels, especially veins.(Carol M. RumacK et al., 2011)

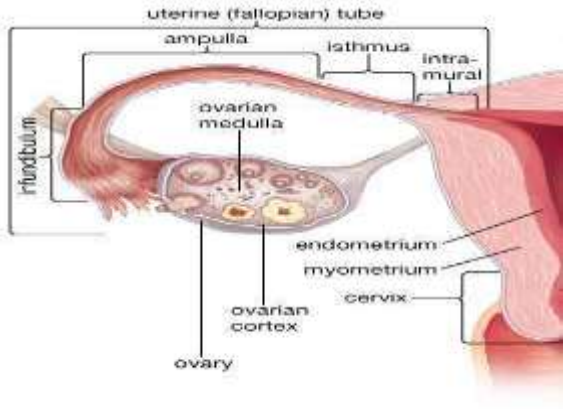

Figure 2.2:anatomy of the ovaries and fallopian tubes

http://www.examnnotes.com/Fallopian%20or%20Uterine%20Tube.html

2.1.1.4 Blood supply:

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 artery ascends along the lateral margin of the uterus in the broad ligament and, at the level of the uterine cornua, runs laterally to anastomose with the ovarian artery. The uterine arteries anastomose extensively across the midline through the anterior and posterior arcuate arteries, which run within the broad ligament and then enter the myometrium. The uterine plexus of veins accompanies the arteries.(Carol M. RumacK et al., 2011)

The ovarian arteries arise from the aorta laterally, slightly inferior to the renal arteries. They cross the external iliac vessels at the pelvic brim and run medially within the suspensory ligament of the ovary. After giving off branches to the ovary, the ovarian arteries continue incommedially in the broad ligament to anastomose with the branches of the uterine artery. The ovarian veins leave the ovarian hilum and form a plexus of veins in the broad ligament that communicate with the uterine plexus of veins. The right ovarian vein drains into the inferior vena cava inferior to the right renal vein, whereas the left ovarian vein drains directly into the left renal vein.(Carol M. RumacK et al., 2011)

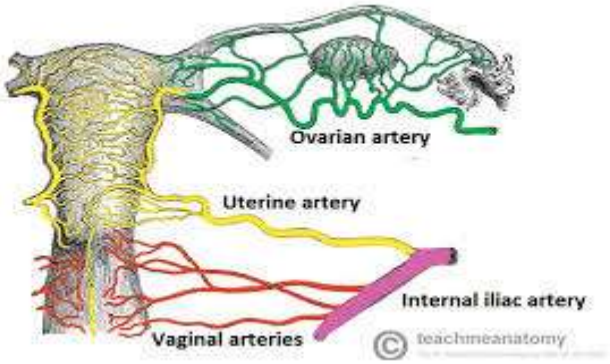

Figure 2.3 : Blood supply of the uterus

(https://teachmeanatomy.info/pelvis/female-reproductive-tract/uterus/)

2.1.2 physiology of the female reproductive system:

2.1.2.1 menstral cycle:

The last menstrual period relates to the onset of menses; therefore, the first day of the menstrual cycle is said to occur on the first day of bleeding. The average menstrual cycle lasts 28 days, with ovulation typically occurring around day 14. However, some menstrual cycles may last only 25 days while others may last up to 45 days. Days 1 through 5 of the menstrual cycle correlate with menses, at which time the endometrium is shed. The first menstrual cycle is termed menarche. Menarche occurs at different ages and may be influenced by environment and diet. However, if an individual does not experience menarche before age 16, she is said to have primary amenorrhea. Primary amenorrhea may be caused by congenital abnormalities or congenital obstructions, such as an imperforate hymen. Secondary amenorrhea may be associated with endocrinologic abnormalities or pregnancy. Secondary amenorrhea that is not associated with pregnancy is characteristically diagnosed in the postmenarchal woman who has had at least 12 months without a menstrual cycle.(Penny, 2011)

2.1.2.2 The Role of the Hypothalamus:

The hypothalamus is an area within the brain that is located just beneath the thalamus. The primary responsibility of the hypothalamus, as it relates to the menstrual cycle, is to regulate the release of hormones by the anterior pituitary gland. The hypothalamus achieves this function by releasing its own hormone, gonadotropin-releasing hormone (GnRH), which in turn stimulates the release of hormones by the anterior pituitary gland. Hormones The pituitary gland, often referred to as the "master gland," is an endocrine gland located within the brain that consists of an anterior and posterior lobe. The anterior lobe of the pituitary gland is responsible for the release of two chief hormones that influence the menstrual cycle: follicle-stimulating hormone (FSH) and luteinizing hormone (LH). FSH causes the development of multiple follicles on the ovaries. LH surges around day 14 of the menstrual cycle, which results in ovulation. (Penny, 2011)

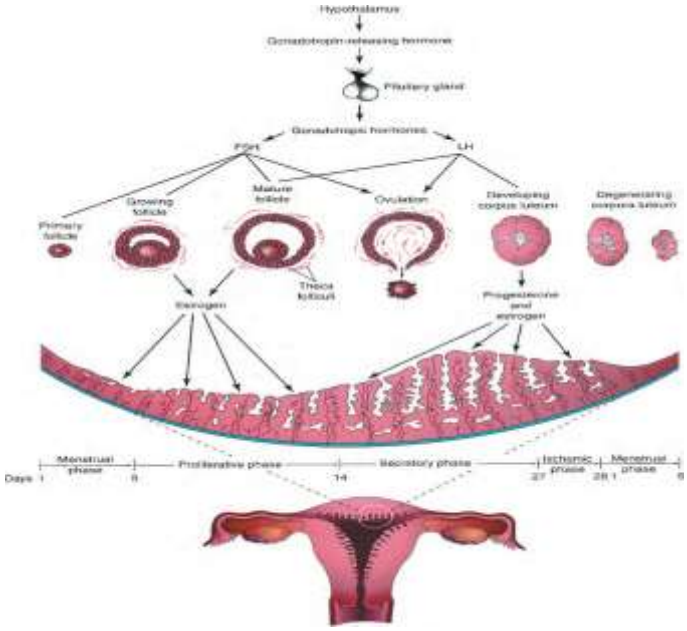

Figure 2.4:Schematic drawing of interrelationships among the hypothalamus, pituitary gland, ovaries and endometrial lining.(Carol M. RumacK et al., 2011)

2.1.2.3 The physiology of the ovarian cycle:

The ovarian cycle consists of two phases: the follicular phase and the luteal phase. The follicular phase of the ovarian cycle is considered to begin on day 1 and lasts until day 14, thus, in effect, ending with ovulation.. During the follicular phase, the anterior pituitary gland secretes FSH, which initiates the follicular development of the ovary. Many follicles are produced by the ovary. While numerous follicles manifest, only one follicle will be maintained and become the graafian follicle or dominant follicle prior to ovulation. This graafian follicle, which can grow as large as 2.7 cm, contains the developing oocyte (egg) within a region called the cumulus oophorus.

Around day 14, LH, produced by the anterior pituitary gland, stimulates ovulation, at which time the graafian follicle, which has grown to a size of 15 to 27 mm, ruptures and expels a small amount of fluid and the ovum into the peritoneum. The ovum is picked up by the fimbria of the fallopian tube and is propelled through the tube, either to be fertilized, resorbed by the body, or passed with menstruation.

The second phase of the ovarian cycle, days 15 to 28, is termed the luteal phase. After the graafian follicle ruptures, it is temporarily turned into an endocrine gland in the form of the corpus luteum. The corpus luteum, while producing estrogen in small amounts, primarily produces progesterone to maintain the thickness of the endometrium and prepare the endometrium for the (conceivably) fertilized ovum. All the other follicles undergo atresia.(Penny, 2011)

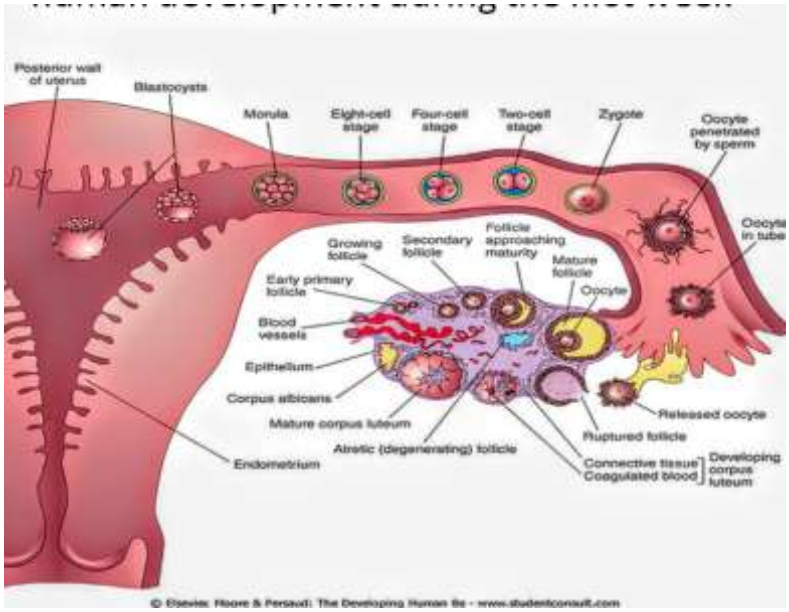

Figure 2.5:Diagram of ovarian cycle, fertilization, and human development to the blastocyst stage.(Carol M. RumacK et al., 2011)

2.1.2.4 The physiology of the endometrial cycle:

The endometrial cycle consists of two phases: the proliferative phase and the secretory phase. The proliferative phase occurs after menstruation and lasts until ovulation. The endometrium is influenced by estrogen and progesterone, which are produced by the ovary.During the first half of the menstrual cycle, the endometrium undergoes thickening as a result of estrogen stimulation. Thus, proliferation of the endometrium, which is described as the multiplication of similar forms, occurs during the proliferative phase of the endometrial cycle, as the functional layer increases in thickness.The secretory phase of the endometrial cycle occurs after ovulation and is stimulated by progesterone. Progesterone maintains the thickness of the endometrium in preparation for implantation. Shouldfertilization not take place, menses begin on day 1 of the cycle, resulting from a lack of estrogen and progesterone. Conversely, if fertilization does occur, the endometrial thickness is maintained by the continual production of progesterone by the corpus luteum of pregnancy.(Penny, 2011)

2.1.2.5 Normal conception and the first six weeks:

A mature ovum is released through ovulation at around day 14 of the menstrual cycle, as the Graafian follicle ruptures and liberates the ovum into the peritoneal cavity.

The fimbria of the fallopian tube transports the ovum into the distal portion of the tube, the infundibulum. Conception, also referred to as fertilization, is the union of an ovum with a sperm. A sperm, which can live up to 72 hours, unites with the egg in the distal one third of the fallopian tube, most likely in the ampulla. Conception usually occurs within 24 hours after ovulation.

The combination of the sperm and ovum produces a structure referred to as the zygote. The zygote undergoes rapid cellular division and eventually forms into a cluster of cells called the morula. The morula continues to differentiate and form a structure referred to as the blastocyst. The outer tissue layer of the blastocyst is comprised of syncytiotrophoblastic tissue, also referred to as trophoblastic cells. The inner part of the blastocyst will develop into the embryo, amnion, umbilical cord, and the primary and secondary yolk sacs.

The outer part, the trophoblastic tissue, will develop into the placenta and chorion.

On days 20 or 21 of the menstrual cycle, the blastocyst begins to implant into the decidualized endometrium at the level of the uterine fundus. By 28 days, complete implantation has occurred and all early connections have been established between the gestation and the mother.

The blastocyst makes these links with the maternal endometrium via small projections of tissue called chorionic villi. The implantation of the blastocyst within the endometrium may cause some women to experience a small amount of vaginal bleeding. This is referred to as implantation bleeding.

The fourth week of gestation is an extremely dynamic stage in the pregnancy. The primary yolk sac regresses during week 4 and two separate membranes are formed.

The outer membrane is the chorionic sac or gestational sac. Within the gestational sac is the amnion or amniotic sac. By the end of week 4, the secondary yolk sac becomes wedged between these two membranes in an area called the chorionic cavity or extraembryonic coelom.

The developing embryo is located between the yolk sac and amnion at 4 weeks. At this time, the alimentary canal is formed. It will become the foregut, midgut, and hindgut. The neural tube also begins to develop at this time. The neural tube will become the fetal head and spine. By 5 weeks, suspicion of pregnancy abounds, as the woman misses the scheduled onset of menses for the month. Within the developing gestation, the embryonic heart begins to beat for the first time. (Penny, 2011)

2.1.3 Normal ultrasound feature of early pregnancy:

2.1.3.1 Decidual Reaction (Weeks 3 to 4):

The decidual reaction of the endometrium is essentially the first sonographically identifiable sign of a pregnancy.(Penny, 2011)

2.1.3.2 Gestational Sac (Weeks 4 to 5):

The first definitive sonographic sign of an intrauterine pregnancy is identification of the gestational sac within the decidualized endometrium.(Penny, 2011)

Figure 2.6: Gestational sac at 5.0 weeks' gestation.The gestational sac (*) is seen as a round fluid collection within the endometrium, with no structures yet seen within it. The gestational sac is surrounded by two echogenic rings, an inner ring (*short arrows*), and an outer ring (*long arrows*), corresponding

to the two layers of the decidua. This is referred to as the double-sac sign or double decidual sign.(Penny, 2011)

2.1.3.3 Secondary Yolk Sac (5.5 weeks):

The first structure seen with sonography within the gestational sac is the secondary yolk sac It appears within the gestational sac as a round, anechoic structure surrounded by a thin, echogenic rim.(Penny, 2011)

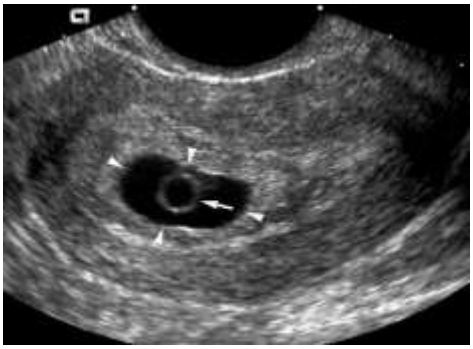

Figure 2.7:Gestational sac and secondary yolk sac at 5.5 gestational weeks. The gestational sac (*arrowheads*) contains the secondary yolk sac (*arrow*) No embryo is seen at this time.(Penny, 2011)

2.1.3.4 Chorionic and Amniotic Cavities (5.5 weeks):

The gestational sac consists of two cavities: the chorionic cavity and amniotic cavity. The chorionic cavity lies between the amnion and chorion. It contains the yolk sac and fluid. The amniotic cavity contains simpleappearing amniotic fluid and the developing embryo. The amniotic membrane, or amnion, can be seen within the gestational sac as a thin, echogenic line loosely surrounding the embryo.(Penny, 2011)

Figure 2.8:Chorionic cavity and amnion.(Penny, 2011)

2.1.3.5 Embryo (5 to 6 weeks):

By 6 weeks, the embryo can be seen located within the amniotic cavity adjacent to the yolk sac. Heart motion can be detected in a 4-mm embryo, with motion certainly evident within the 5-mm embryo.(Penny, 2011)

Figure 2.9:Normal embryo at 6.5 weeks' gestation. Note embryonic pole *(calipers)* adjacent to yolk sac.(Carol M. RumacK et al., 2011)

2.1.3.6 Embryo (7 to 8 weeks):

Fetal limb buds are readily identified by 7 weeks. The fetal head at this time is proportionally larger than the body. Within the fetal head, a cystic structure may be noted. This most often represents the rhombencephalon, or hindbrain.(Penny, 2011)

Figure 2.10: The rhombencephalon (*arrow*) is seen within the head of this 8-week embryo,appearing as a cyst.(Penny, 2011)

2.1.4 Pathology of the female reproductive system:

2.1.4.1 early pregnancy failure:

2.1.4.1.1 Miscarriage and Abortion:

The termination of a pregnancy before viability is termed a miscarriage or an abortion. There are several categories of abortions, including threatened, complete, incomplete, missed, inevitable and septic. Clinical findings consistent with a miscarriage include vaginal bleeding, pelvic cramping, and the passage of the products of conception. Types of miscarriage include:

2.1.4.1.1.1 Spontaneous abortion/miscarriage:

A pregnancy that ends spontaneously before the fetus has reached a viable gestational age. The World Health Organization defines it as expulsion or extraction of an embryo or fetus weighing less than 500g (typically corresponds to a gestational age of 22 weeks).(Weintraub and Sheiner, 2011)

2.1.4.1.1.2 Threatened abortion:

Bleeding through a closed cervical os during the first half of pregnancy. The bleeding is often painless, although it may be accompanied by mild suprapubic pain. On examination, the uterine size is appropriate for gestational age, and the cervix is long and closed. Fetal cardiac activity can be detect able if the gestation is sufficiently advanced.(Weintraub and Sheiner, 2011)

Figure 2.11: Threatened abortion

(http://www.fetalultrasound.com/online/text/4-003.HTM)

2.1.4.1.1.3 Inevitable abortion:

When abortion is pending, there may be increased bleeding, intensely painful uterine cramps, and a dilated cervix. The gestational tissue can often be felt or visualized through the internal cervical os.(Weintraub and Sheiner, 2011)

Figure 2.12: Inevitable abortion

(http://www.fetalultrasound.com/online/text/4-004.HTM)

2.1.4.1.1.4 Incomplete abortion:

When the fetus is passed, but significant amounts of placental tissue may be retained, also called an abortion with retained products of conception (RPOC) (commonly occurs after 12 weeks' gestation). On examination, the cervical os is open, gestational tissue may be observed in the vagina/cervix, and the uterus is smaller than expected for gestational age but not well contracted. The amount of bleeding varies but can be severe enough to cause hypovolemic shock. Painful cramps are often present.(Weintraub and Sheiner, 2011)

Figure 2.13: incomplete abortion

(http://www.fetalultrasound.com/online/text/4-006.HTM)

2.1.4.1.1.5 Complete abortion:

When an abortion occurs (usually before 12weeks of gestation) and the entire contents of the uterus are expelled. More than one-third of all cases are complete abortions. If a complete abortion has occurred, the uterus is small and well contracted with a closed cervix; slight vaginal bleeding and mild cramping can be present.(Weintraub and Sheiner, 2011)

Figure 2.14: complete abortion

(http://www.fetalultrasound.com/online/text/4-007.HTM)

2.1.4.1.1.5 Missed abortion:

Refers to in utero death of the embryo or fetus prior to the 20th week of gestation, with prolonged retention of the pregnancy (4–8weeks). Vaginal bleeding may occur, and the cervix is usually closed. (Weintraub and Sheiner, 2011)

Figure 2.15: missed abortion (no cardiac activity)

(https://radiopaedia.org/articles/missed-miscarriage-2)

2.1.4.1.1.6 Septic abortion:

An abortion accompanied by fever, chills, malaise, abdominal pain, vaginal bleeding, and frequently purulent discharge. Physical examination may reveal tachycardia, tachypnea, lower abdominal tenderness, and a tender uterus with dilated cervix. (Weintraub and Sheiner, 2011)

2.1.4.1.2 Ectopic pregnancy:

An ectopic pregnancy is defined as a pregnancy located anywhere other than the endometrial or uterine cavity. Women with a history of assisted reproductive therapy (technology), fallopian tube scarring, and/or pelvic inflammatory disease are among the list of patients who are at high risk for ectopic pregnancies .The most common location of an ectopic pregnancy is within the fallopian tube, specifically the ampullary portion of the tube. Other locations for ectopic implantation include the isthmus of the tube, the fimbria, abdomen, cornu of the uterus (interstitial of tube), ovary, and cervix, with the least common locations being the latter two.(Penny, 2011)

Figure 2.16:Transvaginal view of the right adnexa demonstrates an extrauterine gestational sac (*arrows*) containing an embryo (*calipers*).(Penny, 2011)

2.1.4.1.3 Blighted Ovum or Anembryonic Gestation:

A blighted ovum or anembryonic gestation is diagnosed when there is no evidence of a fetal pole or yolk sac within the gestational sac. Along with being empty, the gestational sac often has an irregular border with a poor decidual reaction. Patients present with vaginal bleeding, a low hCG, and reduction in pregnancy symptoms.(Penny, 2011)

Figure 2.17: blighted ovum

(https://radiopaedia.org/articles/anembryonic-pregnancy)

2.1.4.1.4 Subchorionic Hemorrhage:

Small, benign subchorionic hemorrhages can be seen during a routine first-trimester ultrasound examination. A subchorionic hemorrhage is essentially a bleed between the endometrium and the gestational sac, and therefore may be referred to as a perigestational hemorrhage. Sonographically, a subchorionic hemorrhage appears as an anechoic, crescent-shaped area adjacent to the gestational sac at the margin of the placenta.(Penny, 2011)

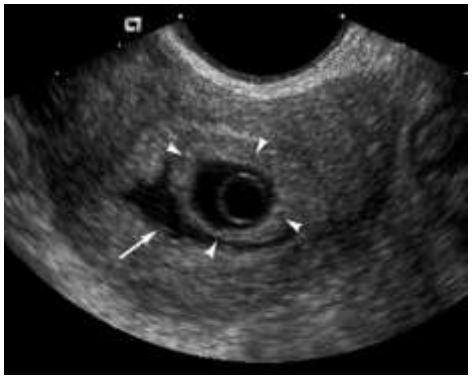

Figure 2.18: Subchorionic hemorrhage. Transverse view of the uterus demonstrates a crescent-shaped fluid collection (*arrow*) adjacent to the gestational sac (*arrowheads*). (Penny, 2011)

2.1.4.1.5 Gestational Trophoblastic Disease:

Gestational trophoblastic disease (GTD), often referred to as a molar pregnancy, is a group of disorders that are the result of an abnormal combination of male and female gametes . The term *trophoblast* in the title of this disease relates to the cells that surround the developing gestation. As stated earlier, trophoblastic cells are those cells that produce hCG. GTD results in the excessive growth of the trophoblastic cells. Therefore, there are excessive amounts of hCG in the maternal circulation.(Penny, 2011)

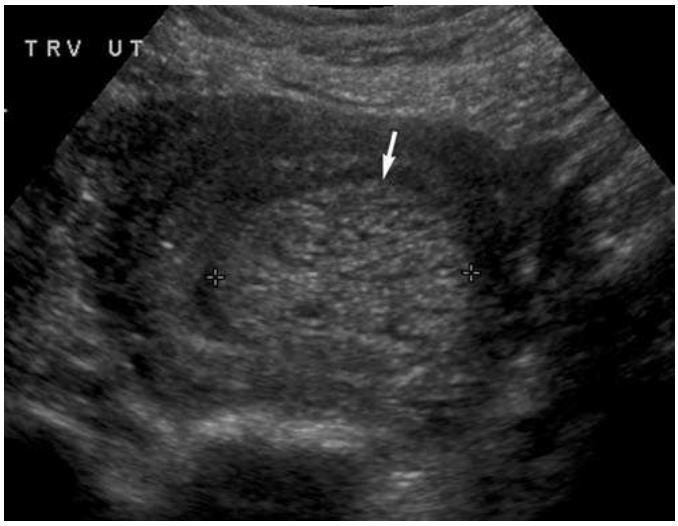

Figure 2.19:Complete hydatidiform mole. Transverse image of the uterus demonstrates the uterine cavity filled with an echogenic mass (*arrow*, *calipers*) that contains small cystic spaces representing hydropic chorionic villi.(Penny, 2011)

2.1.4.2 Causes of early pregnancy faliure:

2.1.4.2.1 Genetic Etiologies:

Approximately 2% to 4% of RPL is associated with a parental balanced structural chromosome rearrangement, most commonly balanced reciprocal or Robertsonian translocations. Additional structural abnormalities associated with RPL include chromosomal inversions, insertions, and mosaicism. Single gene defects, such as those associated with cystic fibrosis

or sickle cell anemia, are seldom associated with RPL.(Ford and Schust, 2009)

2.1.4.2.2 Anatomic Etiologies:

Anatomic abnormalities account for 10% to 15% of cases of RPL and are generally thought to cause miscarriage by interrupting the vasculature of the endometrium, prompting abnormal and inadequate placentation. Thus, those abnormalities that might interrupt the vascular supply of the endometrium are thought to be potential causes of RPL. These include congenital uterine anomalies, intrauterine adhesions, and uterine fibroids or polyps.(Ford and Schust, 2009)

2.1.4.2.3 Endocrine Etiologies:

Luteal phase defect (LPD), polycystic ovarian syndrome (PCOS), diabetes mellitus, thyroid disease, and hyperprolactinemia are among the endocrinologic disorders implicated in approximately 17% to 20% of RPL.Traditionally, LPD has been proposed to result from inadequate production of progesterone by the corpus luteum and endometrial maturation insufficient for proper placentation. It is diagnosed when there is a persistent lag of longer than 2 days in the histologic development of the endometrium compared with the day of the menstrual cycle.(Ford and Schust, 2009)

2.1.4.2.4 Infectious Etiologies:

Certain infections, including *Listeria monocytogenes*, *Toxoplasma gondii*, rubella, herpes simplex virus (HSV), measles, cytomegalovirus, and coxsackieviruses, are known or suspected to play a role in sporadic spontaneous pregnancy loss.(Ford and Schust, 2009)

2.1.4.2.5 Immunologic Etiologies:

Because a fetus is not genetically identical to its mother, it is reasonable to infer that there are immunologic events that must occur to allow the mother to carry the fetus throughout gestation without rejection. In

fact, there have been at least 10 such mechanisms proposed. It therefore follows that there may be abnormalities within these immunologic mechanisms that could lead to both sporadic and recurrent pregnancy loss.(Ford and Schust, 2009)

2.1.4.2.6 Thrombotic Etiologies:

Both inherited and combined inherited/acquired thrombophilias are common, with more than 15% of the white population carrying an inherited thrombophilic mutation.

The potential association between RPL and heritable thrombophilias is based on the theory that impaired placental development and function secondary to venous and/or arterial thrombosis could lead to miscarriage.(Ford and Schust, 2009)

2.1.4.2.7 Environmental Etiologies:

Because of its propensity to result in feelings of responsibility and guilt, patients are often particularly concerned about the possibility that environmental exposures may have caused their pregnancy losses. Links between sporadic and/or RPL and occupational and environmental exposures to organic solvents, medications, ionizing radiation, and toxins have been suggested, although the studies performed are difficult to draw strong conclusions from because they tend to be retrospective and confounded by alternative or additional environmental exposures.(Ford and Schust, 2009)

2.1.4.2.8 Unexplained Etiologies:

when all known and potential causes for RPL are accounted for, almost half of patients will remain without a definitive diagnosis. The optimal management of these patients is often as unclear as the etiology of their RPL.(Ford and Schust, 2009)

2.1.5 Basic physics

Ultrasound is the term used to describe sound of frequencies above 20 000 Hertz (Hz),beyond the range of human hearing. Frequencies of 1–30 megahertz (MHz) are typical for diagnostic ultrasound.

Diagnostic ultrasound imaging depends on the computerized analysis of reflected ultrasound waves, which non-invasively build up fine images of internal body structures.(Harald Lutz, 2011)

2.1.5.1Generation of ultrasound:

Piezoelectric crystals or materials are able to convert mechanical pressure (which causes alterations in their thickness) into electrical voltage on their surface (the piezoelectric effect). Conversely, voltage applied to the opposite sides of a piezoelectric material causes an alteration in its thickness (the indirect or reciprocal piezoelectric effect). If the applied electric voltage is alternating, it induces oscillations which are transmitted as ultrasound waves into the surrounding medium. The piezoelectric crystal, therefore, serves as a transducer, which converts electrical energy into mechanical energy and vice versa.(Harald Lutz, 2011)

Ultrasound transducers are usually made of thin discs of an artificial ceramic material such as lead zirconate titanate. The thickness (usually 0.1–1 mm) determines the ultrasound frequency.

In most diagnostic applications, ultrasound is emitted in extremely short pulses as a narrow beam comparable to that of a flashlight. When not emitting a pulse (as much as 99% of the time), the same piezoelectric crystal can act as a receiver.(Harald Lutz, 2011)

2.1.5.2 Properties of ultrasound:

Sound is a vibration transmitted through a solid, liquid or gas as mechanical pressure waves that carry kinetic energy. A medium must therefore be present for the propagation of these waves. The type of waves

depends on the medium. Ultrasound propagates in a fluid or gas as longitudinal waves, in which the particles of the medium vibrate to and fro along the direction of propagation, alternately compressing and rarefying the material. In solids such as bone, ultrasound can be transmitted as both longitudinal and transverse waves; in the latter case, the particles move perpendicularly to the direction of propagation. The velocity of sound depends on the density and compressibility of the medium.(Harald Lutz, 2011)

2.1.5.3 Doppler basics:

Motion of the reflector towards the transducer produces an increase in the reflected ultrasonic frequency, whereas motion away gives a reduction. The system electronics note whether the detected ultrasound has a higher or lower frequency than that transmitted and hence extract information on the direction of motion relative to the transducer.(Allan, 2014)

2.2 Previous studies:

The risk of a spontaneous abortion was 8.9% in women aged 20–24 years and 74.7% in those aged 45 years or more. High maternal age was a significant risk factor for spontaneous abortion irrespective of the number of previous miscarriages, parity, or calendar period. The risk of an ectopic pregnancy and stillbirth also increased with increasing maternal age.(Andersen et al., 2000)

Nulliparous women 35 years and older had higher rates of antepartum, intrapartum, and newborn complications (Prysak et al., 1995).

It has been reported that nulliparous women had an increased risk of pregnancy complications. High parity women with no previous complicated pregnancy were at low risk of complications (Majoko et al., 2004).

Spontaneous pregnancy loss is common, with approximately 15% of all clinically recognized pregnancies resulting in miscarriage. When recurrent pregnancy loss (RPL) is defined as 3 consecutive pregnancy losses prior to

20 weeks from the last menstrual period, 1% to 2% of women will be affected.(Ford and Schust, 2009)

Eighty percent of miscarriages occur before 12 weeks of gestation, and the majority are due to chromosomal abnormalities.(Lashen et al., 2004)

Excessive occupational physical activity has a definite detrimental effect on the outcome of pregnancy.(El Metwalli et al., 2001)

In women with pain or bleeding and serum β-hCG levels less than 1,500 mIU/mL, the risk of ectopic pregnancy is substantially increased, while the likelihood of normal intrauterine pregnancy is low.(Kohn et al., 2003)

Clear and statistically significant associations were found between cigarette and alcohol consumption and spontaneous abortion. There was a weaker but statistically significant association with coffee consumption: If the associations were casual, 11% of the spontaneous abortions could be attributed to smoking, 5% to alcohol, and 2% to coffee.(Armstrong et al., 1992)

The incidence of fetal loss increased significantly with maternal age and decreased with gestation. In the pregnancies resulting in fetal loss, compared to those with live births, the incidence of vaginal bleeding and cigarette smoking was higher, the fetal heart rate was significantly lower and the gestation sac diameter was smaller but the yolk sac diameter was not significantly different.(Makrydimas et al., 2003)

Study of 50 pregnant cases presented with vaginal bleeding using patient personal data plus ultrasound finding. The ultrasound finding revealed that the highest causes of early Pregnancy failure is miscarriage (76%), comparing with renal diseases (6%), uterine mass ,thyroid diseases, pelvic inflammatory(4%), and ectopic pregnancy (2%). The study showed that the failure of first trimester is more common in age more than 33years old.(Khalid, 2015)

Submucosal fibroids had the strongest association with lower ongoing pregnancy rates, primarily through decreased implantation. pregnancy rates appeared slightly lower in patients with intramural fibroids 36.9% vs 41.1% . however, patients with intramural fibroids also experienced more miscarriages, 20.4% vs 12.9%. Adverse obstetric outcomes are rare and may reflect age or other differences in fibroid populations.(Klatsky et al., 2008)

The future pregnancy outcome of 201 consecutive women, median age 34 years (range 22-43), with a history of unexplained recurrent first trimester miscarriage (median 3; range 3-13), Women aged < or = 30 years had a subsequent miscarriage rate of 25% (14/57) which rose to 52% (13/25) in women aged > or = 40 years (P = 0.02). After three consecutive miscarriages, the risk of miscarriage of the next pregnancy was 29% (34/119) but increased to 53% (9/17) after six or more previous losses (P = 0.04).(Clifford et al., 1997)

Chapter Three

Material and Methods

Chapter Three

Material and Methods

3.1 Materials:

3.1.1 Study design:

Prospective experimental study was done to study the causes of early pregnancy failure.

3.1.2 Study area and duration:

The study was conducted in Khartoum state in Alturky Teaching Hospital. The study was carried over duration of 5 months from July 2018 To December 2018.

3.1.3 Sample/sample size:

Sample size in this study was 50 patients which presented for ultrasound clinics for assessing their first trimester pregnancy, with symptoms of abdominal pain, vaginal bleeding or both.

3.1.3.1 Inclusion criteria:

Pregnant women with positive clinical manifestations like vaginal bleeding, abdominal pain and Pelvic mass. Women who have a family history of birth defects, women who used possible harmful medications or drugs during pregnancy.

3.1.4.2 Exclusion criteria:

Pregnant women in second and third trimester, and pregnant women with twins.

3.1.4 Machine used:

Samsung Sonoace X6 ultrasound machine with 3.5 MHz curvilinear probe.

3.2 Methods:

3.2.1 Methods of data collections:

A data had been collected with data sheet that designed to meet the purpose of the study, and ultrasound images.

3.2.2 Methods of data analysis:

Data were analyzed by using SPSS, frequencies, percentages, and cross tabulation.

3.2.3 Ethical considerations:

All results taken from patients images after the verbal agreement of them, the Head of the department , and Medical Records Clerks in Hospital . All cases evaluated in so privacy way and no patients information more than needed used.

3.2.4 Technique used:

First trimester scanning performed using an abdominal approach. Abdominal scanning was performed with a full maternal bladder, provides a wider field of view, and provides the greatest depth of view.

For most ultrasound exams, the patient was positioned lying face-up on an examination table. A clear gel is applied to the area of the body being studied to help the transducer make secure contact with the body and eliminate air pockets between the transducer and the skin. The transducer pressed firmly against the skin and sweeps it back and forth over the area of interest. There are a variety of transabdomenal transducers and a 3.5 MHz frequency transducer used.

3.2.5 Interpreation: by dr. Doaa Alamin

Figure 3.1 Trans-abdominal probe. (aaenp-natl.starchapter.com)

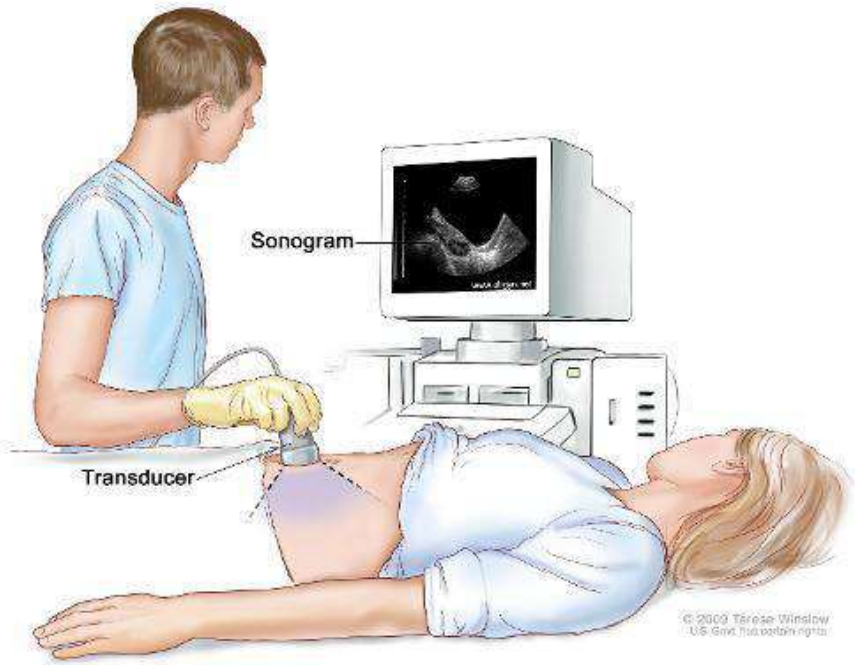

Figure 3.2 Transabdomenal ultrasound technique (http://ww.cancer.gov)

Chapter Four

Results

Chapter Four

Results

4.1 Results

Table 4.1 frequency distribution of patient age

Age	Frequency	Percent
18-27	14	28
28-37	27	54
38-47	9	18
Total	50	100%

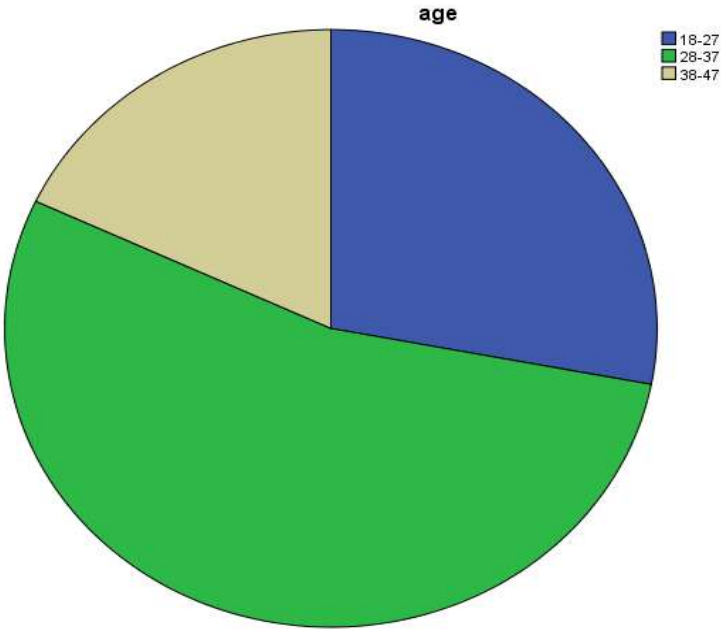

Figure 4.1: Patients age distribution

Table 4.2 distribution of Patient parity

parity	Frequency	Percent
P0	8	16
P1	17	34
P2	13	26
P3	5	10
P4	5	10
P5	1	2
P7	1	2
Total	50	100%

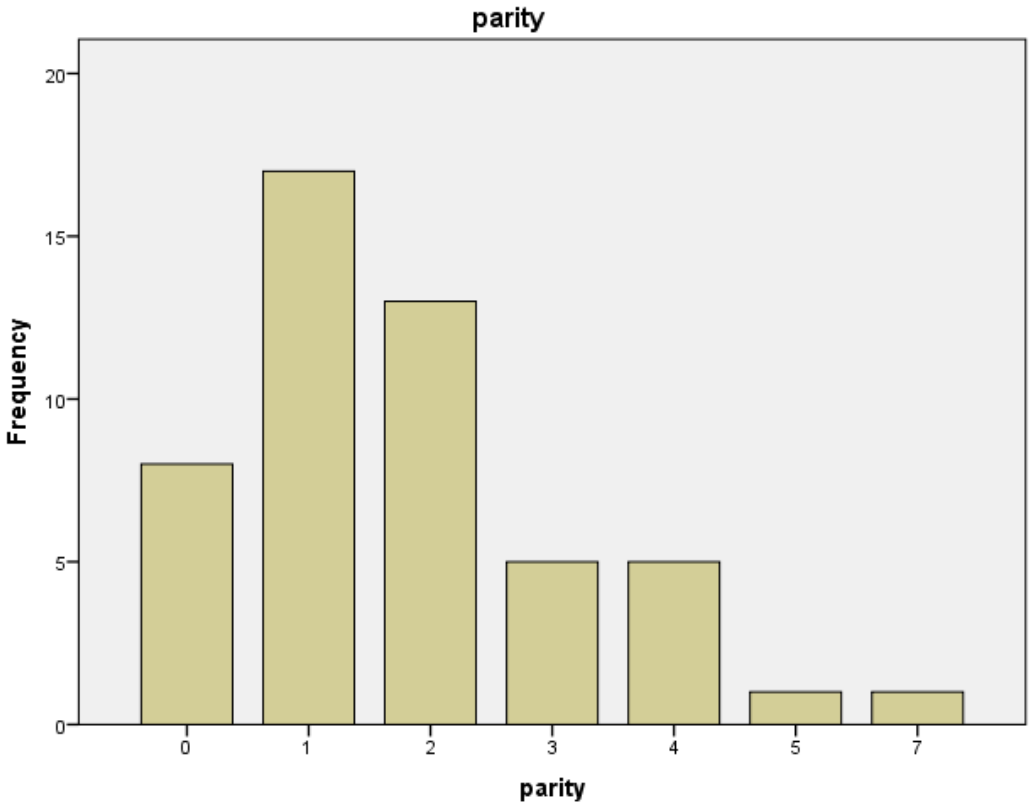

Figure 4.2: the frequency distribution of the number of parity.

Table 4.3 frequency distribution of number of abortion

No of abortion	Frequency	Percent
0	17	34
1	21	42
2	10	20
3	1	2
4	1	2
Total	50	100%

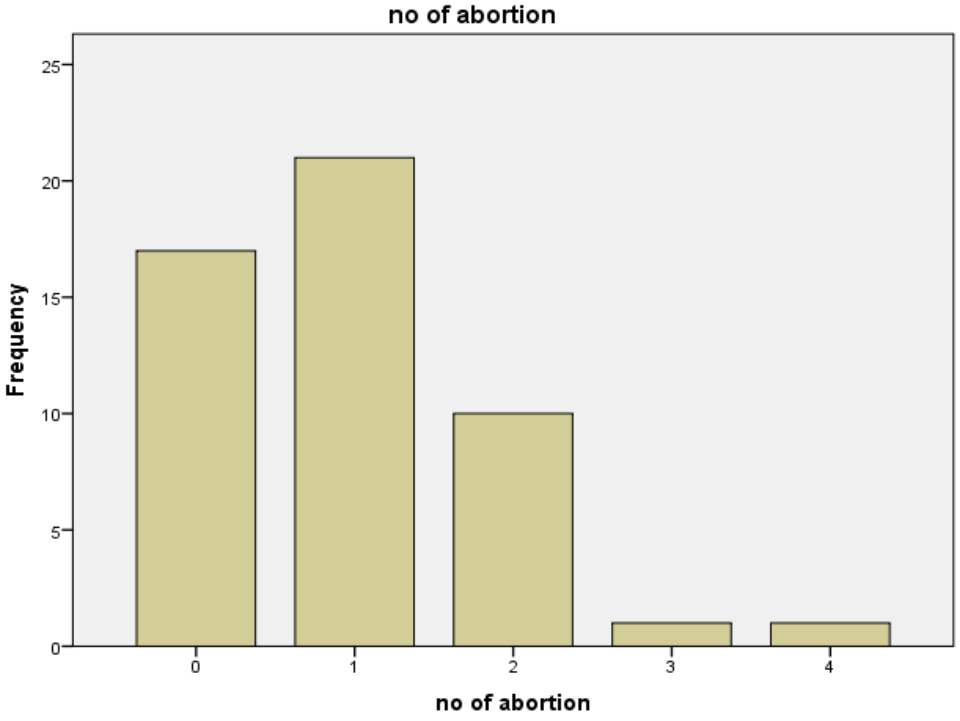

Figure 4.3: distribution of number of abortion

Table 4.4 distribution of Gestational age (GA)

GA	Frequency	Percent
12-16.9	11	22
4-7.9	20	40
8-11.9	19	38
Total	50	100%

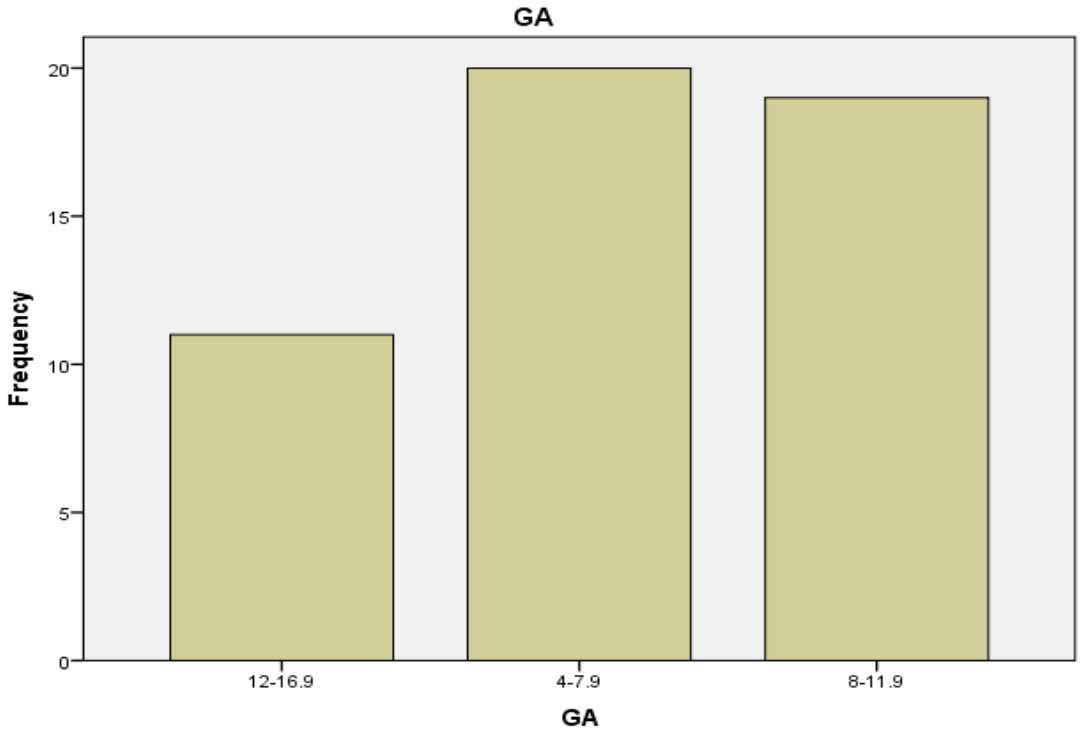

Figure 4.4 Gestational age distribution

Table 4.5 distribution of Patient occupation

Occupation	Frequency	Percent
House wife	39	78
Worker	11	22
Total	50	100%

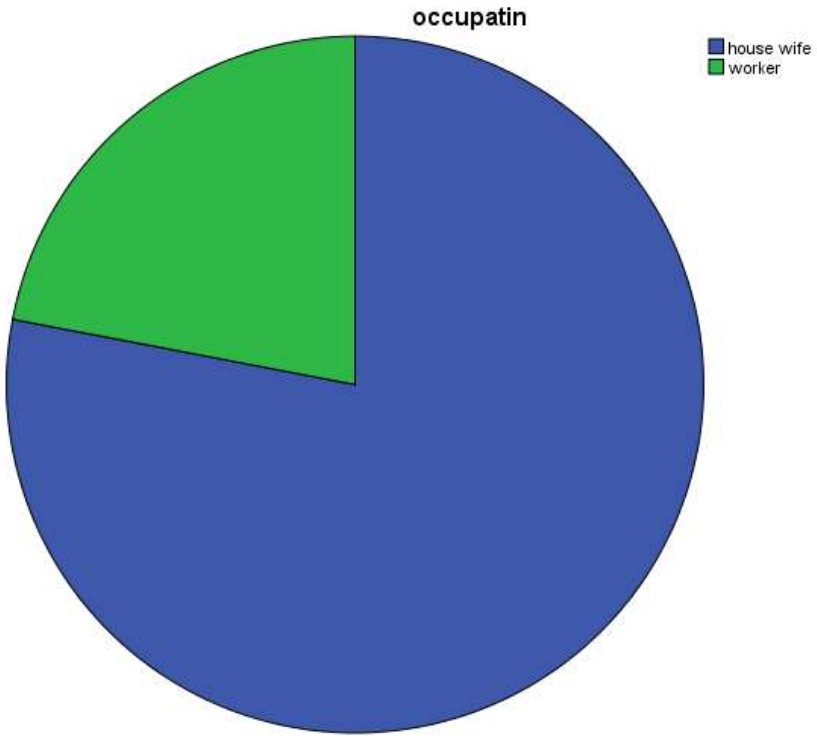

Figure 4.5: distribution of Patient occupation

Table 4.6 distribution of Patient complain

presenting complain	Frequency	Percent
abdominal pain	5	10
No complain	7	14
vaginal bleeding	15	30
vaginal bleeding and abdominal pain	23	46
Total	50	100%

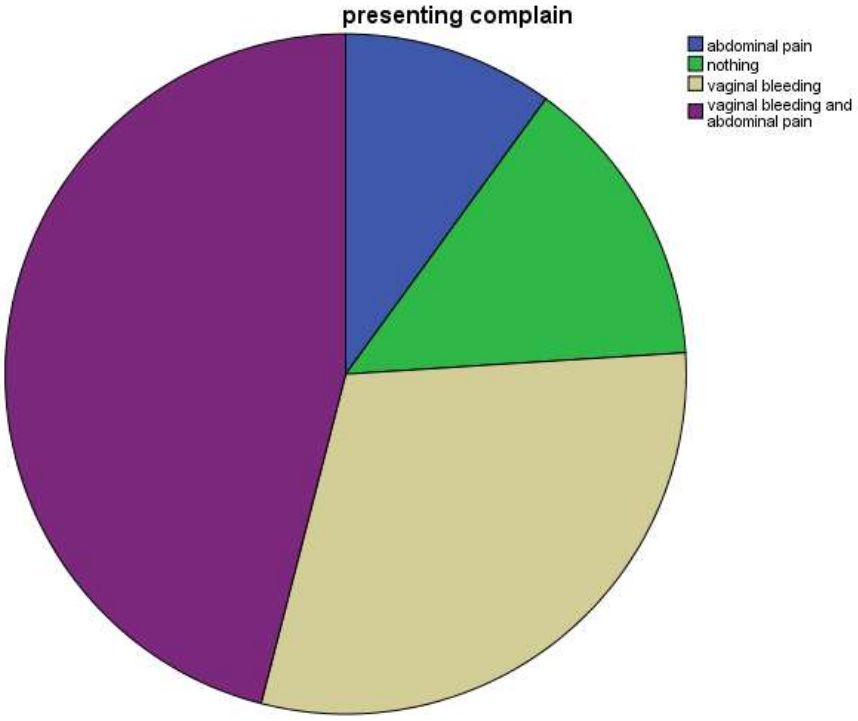

Figure 4.6: frequency distribution of presenting complain.

Table 4.7 distribution of causes of complication

cause	Frequency	Percent
Fibroid	5	10
Trauma	14	28
Unexplained	31	62
Total	50	100%

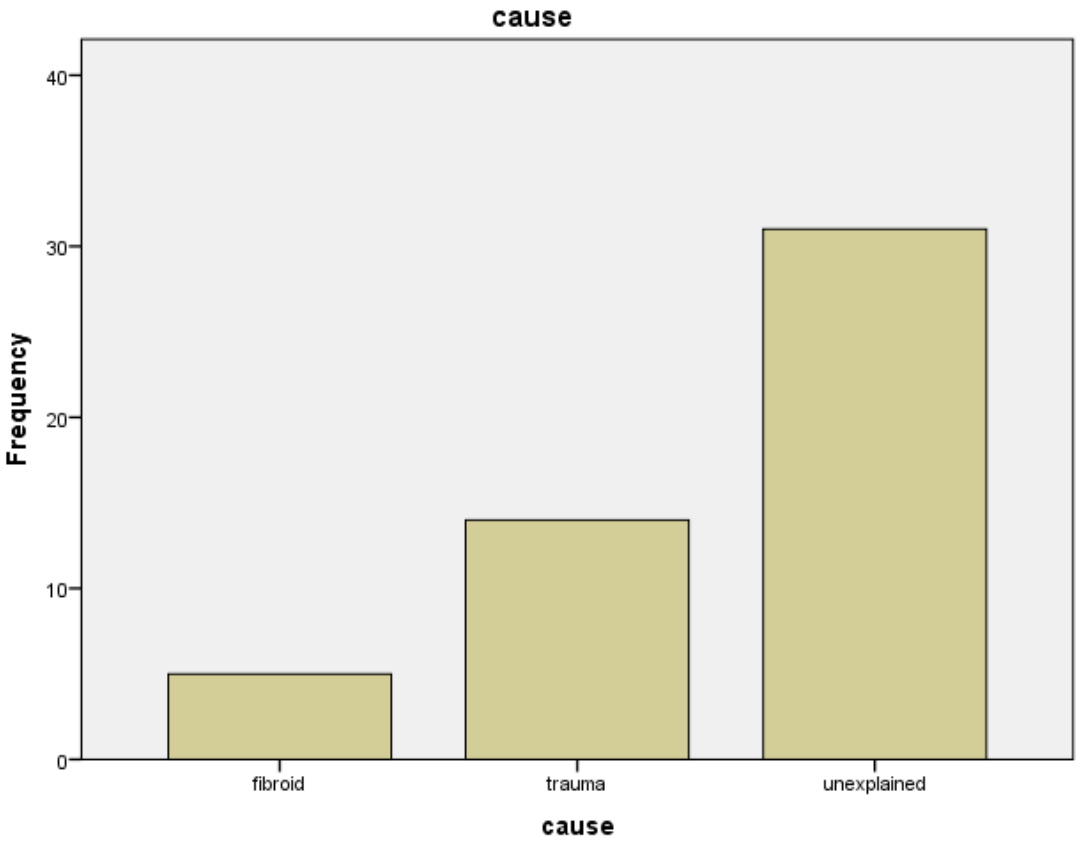

Figure 4.7 distribution of Causes of complications

Table 4.8 distribution of ultrasound finding

Ultrasound finding	Frequency	Percent
blighted ovum	1	2
complete abortion	4	8
ectopic pregnancy	1	2
incomplete abortion	27	54
inventible abortion	1	2
missed abortion	15	30
threatened abortion	1	2
Total	50	100%

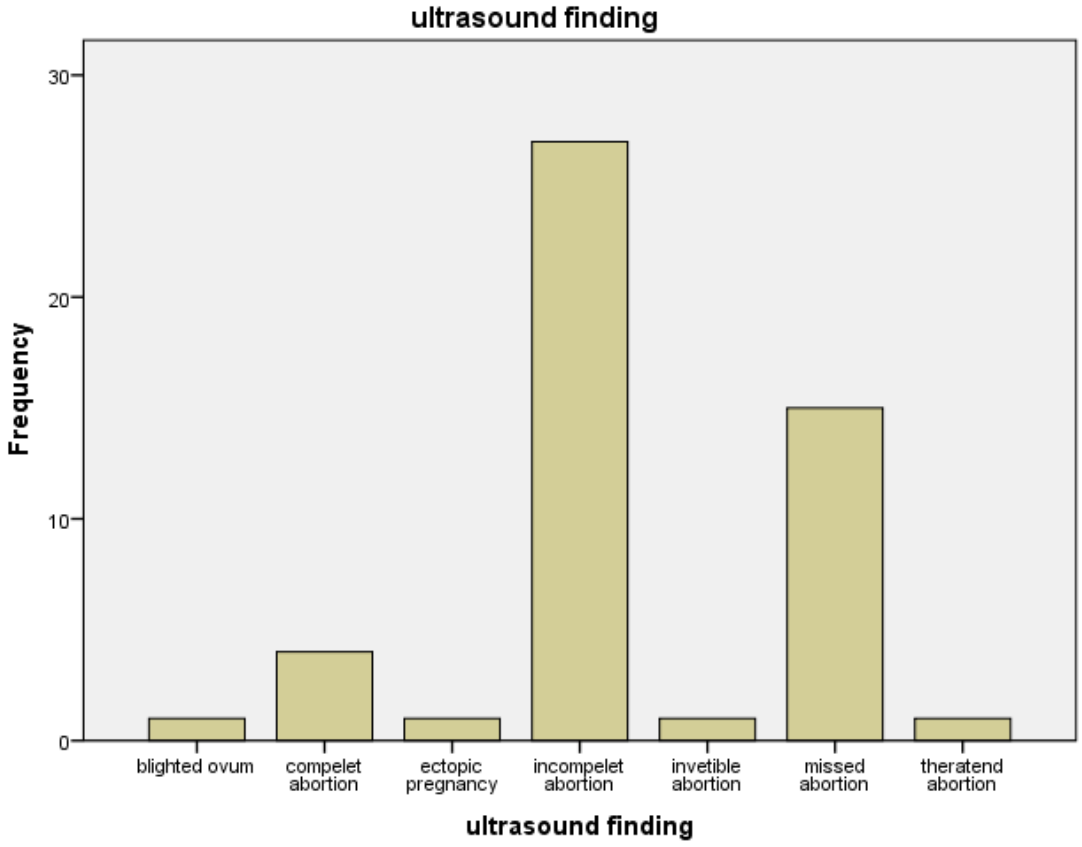

Figure 4.8: frequency distribution of ultrasound finding

Table 4.9 distribution of sonographic feature of complication

Sonographic feature	Frequency	Percent
Clear	3	6
dead embryo	16	32
empty GS	1	2
retain product	28	56
viable fetus	2	4
Total	50	100%

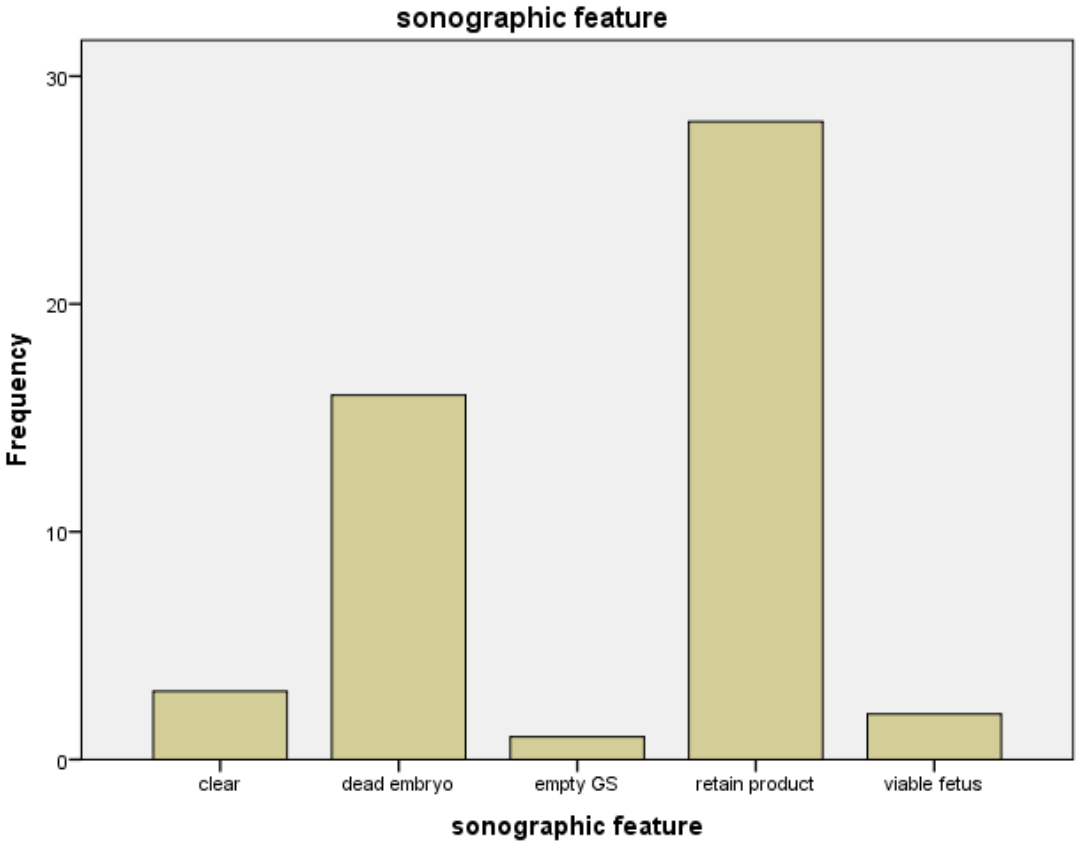

Figure 4.9: distribution of the sonographic feature

Table 4.10: age in years and ultrasound finding cross tabulation

Ultrasound finding	Age			Total
	18-27	28-37	38-47	
blighted ovum	1	0	0	1
compelet abortion	0	3	1	4
ectopic pregnancy	0	1	0	1
incompelet abortion	8	16	3	27
invetible abortion	0	1	0	1
missed abortion	4	6	5	15
theratend abortion	1	0	0	1
Total	14	27	9	50

Table 4.11: age in years and cause of complication cross tabulation

Cause	age			Total
	18-27	28-37	38-47	
Fibroid	1	3	1	5
Trauma	3	8	3	14
Unexplained	10	16	5	31
Total	14	27	9	50

Table 4.12: age in years and number of abortion cross tabulation

No of abortion	age			Total
	18-27	28-37	38-47	
0	5	10	2	17
1	5	11	5	21
2	4	5	1	10
3	0	1	0	1
4	0	0	1	1
Total	14	27	9	50

Chapter Five

Discussion, conclusion, and recommendations

Chapter Five

Discussion, conclusion, and recommendations

5.1 Discussion

This study intended to evaluate the cause of early pregnancy complications.

On this study among 50 pregnant women the highest number of patients were found within age group of 28-37 years (27 patients (54%) while the lowest were found for age group of 38-47 years (9 patients (18%).this was the same as the result of (Andersen et al., 2000) Table(4.1).

According to parity , (34%) of patients with only one pregnancy then p2 (26%), p0 (16%) while P5 and P7 (2%), this convenient with previous studies (Prysak et al., 1995) and (Majoko et al., 2004) Table (4.2) , higher complications were reported with patient's with low parity.

In addition to that (42%) of patients with only one abortion, while patient with recurrent abortion (3&4) times were (2%).this was same with previous study (Ford and Schust, 2009) Table (4.3).

The duration of pregnancy, which is reported as the number of completed weeks of gestation. was found that the highest frequency gestational age from 4-7.9 (20 patient , 40%) whie the lowest frequency gestational age from 12-16.9 weeks(11 patient, 22%).which was in agreement with result of (Lashen et al., 2004) Table (4.4).

The majority of the patients were house wives (78%) while the little portion of the patients are workers (22%).this is resemble to result of (El Metwalli et al., 2001) Table (4.5).

In addition to that the majority (46% of the patients) are present with both indications (vaginal bleeding and abdominal pain) .while less number

of patients (5 patient,10%) are present with abdominal pain. this result correspond with (Kohn et al., 2003) Table (4.6).

The result of this study revealed that the major cause were unexplained (31 patient(62%), while trauma (14 patient (28%) and Fibroids (5 patient (10%), this in convenient with (Armstrong et al., 1992) Table (4.7).

5.2 Conclusion:

The research studied different cases of early pregnancy failure from week (4) to (16) pregnant women ages varied between 18 and 43 and was conducted in Alturky Teaching Hospital. All procedures done by using ultrasonography instrument with curvilinear transducer (3.5 Hz), transabdominal scan. This study revealed higher complications were reported with patient's with low parity, older patients and inversely proportional with the number of pregnancies.

Ultrasound is necessary throughout pregnancy period especially in first trimester because it can help in identifying early pregnancy complication.

5.3 Recommendations:

- Doubling the efforts in medical domain in general and obstetrics and gynecology in particular for avoiding and reduction of infants and children mortality.
- Frequent ultrasound check throughout the pregnancy period and in first trimester specifically is recommended.
- Ultrasound, if available, is the preferred modality to verify the early pregnancy failure.

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Appendix 1

Image 1: complete abortion for a 25years old female patient c/o bleeding and pain.

Image 2: incomplete abortion for a33 years old female patient present with vaginal bleeding

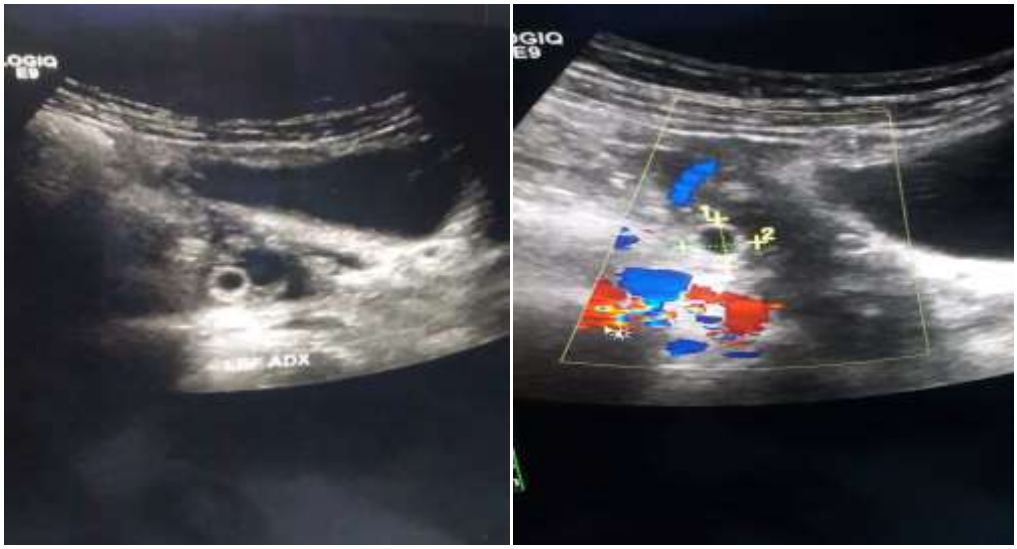

Image 3: left adnexal ectopic pregnancy for 35 years old patient suffering from pain.

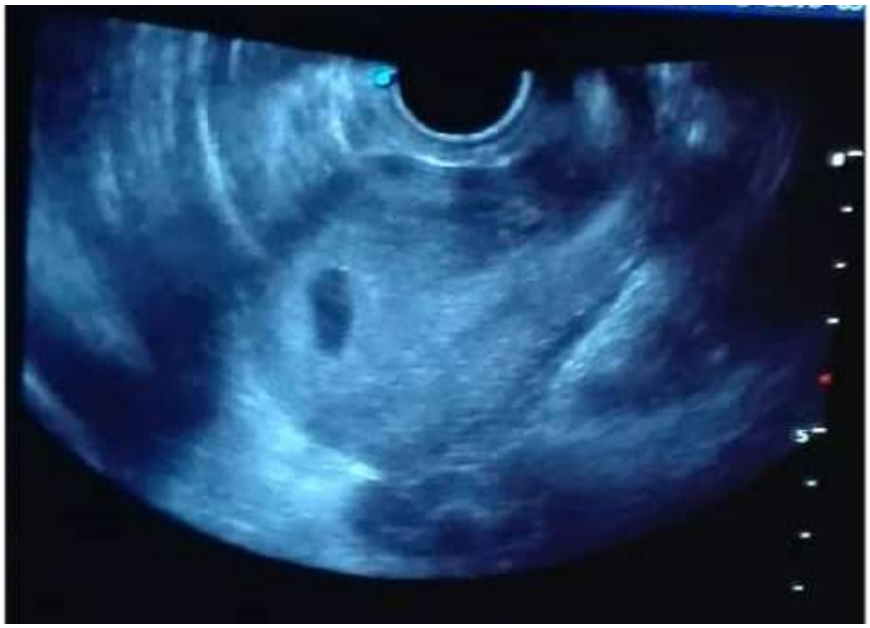

Image 4: Blighted ovum for 20 years old patient.

Image 5: Blighted ovum for 25 years old patient with vaginal bleeding

Image3: Sonoace x6 ultrasound machine

Appendix 2

Data collecting sheet

Age	parity	No of abortion	occupation	cause	GA	Presenting complain	Ultrasound finding	Sonographic feature