Sudan University of Science and Technology

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Study the causes of first trimester complications using Ultrasonography in Nyala city

دراسة أسباب مضاعفات الثلث الاول من الحمل باستخدام التصوير بالموجات فوق الصوتية في مدينة نيالا

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

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الآيـــــــــــــــة

بسم الله الرحمن الرحيم

إِنَّ فِي خَلْقِ السَّمَوَاتِ وَالأَرْضِ وَاخْتِلافِ اللَّيْلِ وَالنَّهَارِ لآيَاتٍ لأُولِي الأَلْبَابِ . الَّذِينَ يَذْكُرُونَ اللَّهَ قِيَامًا وَقُعُودًا وَعَلَى جُنُوبِهِمْ وَيَتَفَكَّرُونَ فِي خَلْقِ السَّمَوَاتِ وَالأَرْضِ رَبَّنَا مَا خَلَقْتَ هَذَا بَاطِلاً سُبْحَانَكَ فَقِنَا عَذَابَ النَّارِ رَبَّنَا إِنَّكَ مَن تُدْخِلِ النَّارَ فَقَدْ أَخْزَيْتَهُ وَمَا لِلظَّالِمِينَ مِنْ أَنصَارٍ . رَبَّنَا إِنَّنَا سَمِعْنَا مُنَادِيًا يُنَادِي لِلإِيمَانِ أَنْ آمِنُوا بِرَبِّكُمْ فَآمَنَّا رَبَّنَا فَاغْفِرْ لَنَا ذُنُوبَنَا وَكَفِّرْ عَنَّا سَيِّئَاتِنَا وَتَوَفَّنَا مَعَ الأَبْرَارِ . رَبَّنَا وَآتِنَا مَا وَعَدتَّنَا عَلَى رُسُلِكَ وَلا تُخْزِنَا يَوْمَ القِيَامَةِ إِنَّكَ لا تُخْلِفُ المِيعَاد)

صدق الله العظيم

سورة آل عمران الايات 190-194

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 especially my brother abdelmoneim for being my guardian during my educational career.

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.

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Abstract

Diagnostic ultrasound is powerful and frequently used tool in the assessment of first-trimester pregnancy. Routine ultrasound examination is frequently performed to obtain information that will enable delivery of optimal antenatal care and thus the best possible outcome for mother and fetus. The main objectives of this study is to identify sonographic features of early pregnancy failure, To determine the causes of pregnancy failure in fist trimester, and To study the role of ultrasound in differentiate the type of pregnancy failure in first trimester.

The study was conducted at three ultrasound clinics in Nyala City, western Sudan. A total of 40 patients whom referred to the ultrasound clinics for assessing their first trimester pregnancy, with symptoms of abdominal pain, vaginal bleeding or both. The main results of study were the highest number of patients were found within age group of 25-34 years (20 patients (50%) while the lowest were found for age group of 45-54 years (1 patients (2.5%).The highest number of patients were found within G5 & G7 (12.5%) while the lowest were found for G11. the majority of the patients were house wives (67%) while the little portion of the patients are workers (33%).The main cause of complications during pregnancy of the entire patients group. Fibroids (7(17.5%) and trauma (4 (10%) are the main causes while the vast majority remain unexplained (24 cases 60%). 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.

الملخص

التشخيص بالموجات فوق الصوتية هي وسيلة فعالة في تقييم الحمل في الأشهر الثلاثة الأولى. وغالبا ما يتم إجراء الفحص بالموجات فوق الصوتية الروتينية للحصول على المعلومات التي تمكن الطبيب من تقديم الرعاية المثلى قبل الولادة وبالتالي أفضل نتيجة ممكنة للأم والجنين. هدفت هذه الدراسة لتحديد مميزات ظهور فشل الحمل بالموجات الصوتية. ودراسة اسباب فشل الحمل في الثلاث شهور الاولى باستخدام الموجات فوق الصوتية، وتحديد دقة الموجات فوق الصوتية في التفريق بين انواع فشل الحمل في الأشهر الثلاثة الأولى.

أجريت الدراسة في ثلاث عيادات للموجات فوق الصوتية في مدينة نيالا، غرب السودان. بلغ عدد العينة 40 مريضة تم تحويلهن الى عيادات الموجات فوق الصوتية لتقييم الحمل في الأشهر الثلاثة الأولى من الحمل. دواعي الفحص هي آلام في البطن، والنزيف المهبلي أو كليهما. تم إجراء الفحص للبطن مع المثانة والمسح المهبلي للحصول على أكبر قدر من التفاصيل الدقيقة. اظهرت هذه الدراسة ان الفئة العمرية من 25-34سنة (20 مريضا (50٪) هي الاكثر ترددا لفحوصات الموجات الصوتية لتقييم مضاعفات فشل الحمل في حين بينت الدراسة ان أدنى ترددا للفئة العمرية من 45-54 سنة (1 مريض (2.5٪). أشارت الدراسة أيضا اغلب المرضى ممن لديهن عدد مرات حمل أقل(5 و7 مرات) في حين كانت أدنى نسبة لذوات الحمل المتكرر(11 مرة). وفقا للتصنيف المهني، كانت غالبية المرضى من ربات المنازل(67٪)، بينما تشكل النساء العاملات 33٪ من عينة الدراسة. أظهرت الدراسة أن السبب الرئيسي للمضاعفات خلال فترة الحمل هى الأورام الليفية (17.5٪) والحوادث (4 (10٪) بينما ظلت الغالبية الغالبية العظمى بدون أسباب راجحة (24 حالة 60٪). كشفت هذه الدراسة عن ارتفاع مضاعفات الحمل مع نفقان عدد مرات الحمل وقلت المضاعفات مع تعدد مرات الولادة. تحسين وعي السيدات الحوامل بشأن مضاعفات الحمل ستساعد في التشخيص المبكر وتجنب المضاعفات.

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List of abbreviation

GA	Gestational age
ACOG	the American college of obstetricians and gynecologists
AIUM	the American institute for ultrasound in medicine
ACR	the American college of radiology
IUCD	Intra-uterine contraceptive device
DES	Diethylstilbestrol(synthetic form of estrogen)
APS	antiphospholipid antibody syndrome
RPL	Recurrent pregnancy loss
LPD	Luteal phase defect
PCOS	polycystic ovarian syndrome
HSV)	, herpes simplex virus
IgG	Immunoglobulin G
IgM	Immunoglobulin M
MTHFR	methylene tetrahydrofolate reductase
LDA	Low-dose aspirin
CN X	Cranial nerve number X (vagus nerve)
FSH	follicle stimulating hormone
LH	luteinizing hormone
PMS	premenstrual syndrome
FDIU	Fetal death in utero
bpm	Beat pear minute
WHO	World health organization

Chapter One

Introduction

Chapter one:

Introduction

1.1 Introduction

Diagnostic ultrasound is powerful and frequently used tool in the assessment of first-trimester pregnancy. Today's obstetrician gynecologist is frequently called upon to interpret and in many cases perform ultrasound scans in the first trimester. In fact, certification of residency programs requires documentation of adequate exposure to and training in the evaluation of first trimester ultrasound. Failure to understand the limitations of diagnostic ultrasound or inadequate training of physicians in this technique can result in grave complications for the patient and liability for health-care providers (Martin, et al, 2003;Parry et al 2017).

Prenatal ultrasonography is a common procedure in the United States, the center for disease control and prevention reported that a prenatal ultrasound examination was performed in 67 percent of live birth in 2002. (Martin et al,2003). Whether all obstetrical patients should undergo ultrasound screening improves pregnancy outcome is controversial. Currently, the American college of obstetricians and gynecologists (ACOG), the American institute for ultrasound in medicine (AIUM) , and the American college of radiology (ACR) support the use of ultrasound when there is specific medical indications and advise against casual use of ultrasonography during pregnancy. {(ACOG,2004; Abuhamad, 2008)}. ACOG also stated that the benefits and limitations of ultasonography should be discussed with all patients, and performance of the procedure is reasonable in patients who request it. (Martin, et al, 2003;Parry et al 2017)

1.2 Advantages of prenatal screening ultrasound:

The primary objective of routine fetal ultrasound examination is to obtain information that will enable delivery of optimal antenatal care and thus the best possible outcome for mother and fetus, the following information is obtained: Fetal

viability, Gestational age and expected date of delivery, Number of fetuses, chorionicity should be determined in multiple gestations, Fetal biometry, Fetal survey to detect congenital anomalies, including signs suggestive of aneuploidy, Assessment of amniotic fluid volume and Placental location. (Salomon et al, 2011)

Criteria for a good screening test are in general, screening tests should have high sensitivity, although this may come at the expense of lowered specificity. They should identify individuals with an important disease or condition and be cost effective, allowing for control of health care costs by identifying disease early and treating before the consequences of the disease are overwhelming. Ultrasonography has advanced obstetric practice by enable relatively detailed assessment of the fetus in utero, including an accurate estimate of gestational age when performed in the first half of pregnancy (Mongelli M, 1996).

Ultrasound is the only method that provides non invasive diagnosis of early pregnancy complications. Despite this, the implementation of ultrasound in routine clinical practice has been slow, because of the poor diagnostic accuracy of transabdominal ultrasound in early pregnancy, the limited availability of ultrasound equipment and the lack of sonographers trained in early pregnancy diagnosis. (Mongelli M, 1996).

However, since the introduction of transvaginal sonography in the late 1980s, decreased costs and wider availability of equipment, ultrasound examination has become the mainstay of early pregnancy diagnosis. As a result, the demand for ultrasound examination has been increasing steadily. To accommodate this, the first dedicated early pregnancy units were opened in the United Kingdom in the early 1990s. (Anderson et al., 2007)

The most common causes of early pregnancy failure include chromosome aberrations, uterine abnormalities, exposure to teratogens, hormonal dysfunction, and pregnancy with an IUCD. The incidence of chromosome aberrations in spontaneous abortions is as high as 60%. The most common uterine abnormalities

associated with early pregnancy failure include Mullerian anomalies (e.g. DES-affected uterus), myomatous disease of the uterus, and incompetence of the cervix. (The Institute of Diagnostic Medical Ultrasound, 2017)

1.3 The problem of the study:

Complications and events in early pregnancy could result in adverse outcome in the current or subsequent pregnancy. Worldwide, about 287,000 women die from pregnancy and childbirth related complications in 2010.

In most rural areas in Sudan, there is limited access to medical care and, therefore, the need to identify women whose pregnancy is at increased risk of complications is an important part of antenatal screening. There are few studies from western Sudan that address risks of nulliparity independent of extremes of maternal age. Therefore, this study try to assess the causes of pregnancy complications during first trimester in Nyala city by using ultrasound.

1.4 Objective of the study:

1.4.1 General objective

To study the causes of early pregnancy complications using ultrasonography.

1.4.2 Specific objective:

1- To identify sonographic features of early pregnancy failure.
2- To determine the causes of pregnancy complications in fist trimester.
3- To study the role of ultrasound in differentiate the type of pregnancy failure in first trimester.

1.5 Thesis 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

Theoretical Background

Chapter two:

theoretical background

2.1. Anatomy of the Female Reproductive System

The primary sex organs of the female are the ovaries. The accessory sex organs include the uterine tubes, uterus, vagina, clitoris, and mammary glands.

2.1.1. Ovaries

The ovaries are paired, oval organs located within the pelvic cavity lateral to the uterus. In an adult, the ovaries are slightly larger than an almond about 2 to 3 cm (centimeters) long, 2 cm wide, and 1 to 1.5 cm thick. Their size usually varies during each menstrual cycle as well as during pregnancy. (Anwar , 2006; Mahadevan 2013)

The ovaries are anchored within the pelvic cavity by specific cords and sheets of connective tissue. A double fold of peritoneum, called the mesovarium, attaches to each ovary at its hilum, which is the anterior surface of the ovary where its blood vessels and nerves enter. Each ovary is anchored to the lateral aspect of the uterus by an ovarian ligament, which is the superior portion of the round ligament of the uterus. Finally, a suspensory ligament attaches to the lateral edge of each ovary and projects superolaterally to the pelvic wall. The ovarian blood vessels and nerves are housed within each suspensory ligament, and they join the ovary at its hilum. Smooth muscle fibers within both the mesovarium and the suspensory ligament contract at the time of ovulation to bring the ovaries into close proximity with the uterine tube openings. (Anwar, 2006; Mahadevan 2013)

Each ovary is supplied by an ovarian artery and an ovarian vein. The ovarian arteries are direct branches off the aorta, immediately inferior to the renal vessels. The ovarian veins exit the ovary and drain into either the inferior vena cava or one of the renal veins. Traveling with the ovarian artery and vein are autonomic nerves. Sympathetic axons come from the T10 segments of the spinal cord, whereas

parasympathetic axons come from CN X (vagus nerve). (Anwar, 2006; Mahadevan 2013)

When an ovary is sectioned and viewed microscopically, many features are visible. Surrounding the ovary is a thin, simple cuboidal epithelial layer called the germinal epithelium, so named because early anatomists erroneously thought it was the origin of the female germ (sex) cells. Deep to the germinal epithelium is a connective tissue capsule called the tunica albuginea, which is homologous to the tunica albuginea of the testis. Deep to the tunica albuginea, the ovary can be partitioned into an outer cortex and an inner medulla. The cortex contains ovarian follicles (described next), while the medulla is composed of areolar connective tissue and contains branches of the ovarian blood vessels, lymph vessels, and nerves. (Anwar, 2006; Mahadevan 2013)

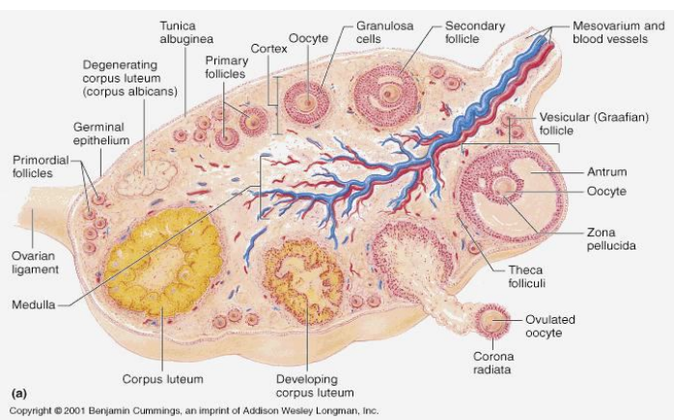

Figure 2.1: Anatomy of the ovary (Anwar, 2006; Mahadevan 2013)

2.1.2 Uterine Tubes

The uterine tubes**,** also called the fallopian tubes or oviducts, extend laterally from both sides of the uterus toward the ovaries. In the lateral part of these tubes, the secondary oocyte is fertilized, and the pre-embryo begins to develop as it travels toward the uterus. Usually it takes the pre-embryo about 3 to 4 days to reach the lumen of the uterus. The uterine tubes are small in diameter, and reach their maximum length of between 10 and 12 centimeters after puberty. These tubes are

covered and suspended by the mesosalpinx, a specific superior part of the broad ligament of the uterus. (Anwar, 2006; Mahadevan 2013)

Each uterine tube is composed of contiguous segments that are distinguishable in both gross examination and histologic sections:

The infundibulum is the free, funnel-shaped, lateral margin of the uterine tube. Its numerous individual fingerlike folds are called fimbriae. The fimbriae of the infundibulum enclose the ovary only at the time of ovulation.

The ampulla is the expanded region medial to the infundibulum. Fertilization of an oocyte typically occurs there. (Anwar, 2006; Mahadevan 2013)

The isthmus extends medially from the ampulla toward the lateral wall of the uterus. It forms about one-third of the length of the uterine tube.

■ The uterine part (intramural part or interstitial segment) extends medially from the isthmus and is continuous with the wall of the uterus. (Anwar, 2006; Mahadevan 2013)

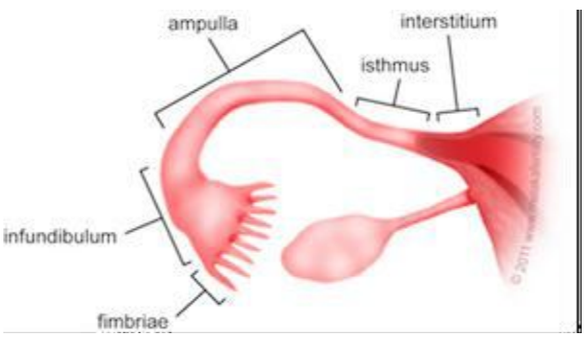

Figure 2.2 : Anatomy of fallopian tube (Anwar , 2006; Mahadevan 2013)

2.1.3 Uterus

The uterus is a pear-shaped, thick-walled muscular organ within the pelvic cavity. It has a lumen (internal space) that connects to the uterine tubes superolaterally and to the vagina inferiorly. (Anwar, 2006)

Normally, the uterus is angled antero superiorly across the superior surface of the urinary bladder, a position referred to as anteverted. If the uterus is positioned posterosuperiorly (so that it is projecting toward the rectum), this position is called

retroverted. In older women, the uterus may shift from anteverted to retroverted. (Anwar, 2006; Mahadevan 2013)

The uterus is partitioned into the following regions:

The fundus is the broad, curved superior region extending between the lateral attachments of the uterine tubes, The major part of the uterus is its middle region, called the body**,** which is composed of a thick wall of smooth muscle, A narrow, constricted inferior region of the body that is superior to the cervix is called the isthmus, The cervix is the narrow inferior portion of the uterus that projects into the vagina. Within the cervix is a narrow channel called the cervical canal**,** which connects to the vagina inferiorly. The superior opening of this canal is the internal os. The inferior opening of the cervix into the lumen of the vagina is the external os. The cervix contains mucin-secreting glands that help forma thick mucus plug at the external os. This mucus plug is suspected to be a physical barrier that prevents pathogens from invading the uterus from the vagina. The mucus plug thins considerably around the time of ovulation, so sperm may more easily enter the uterus. (Anwar, 2006; Mahadevan 2013)

2.1.3.1 Support of the Uterus

pelvic diaphragm and urogenital diaphragm: The muscles of the pelvic floor hold the uterus and vagina in place and help resist intra-abdominal pressure exerted inferiorly on the pelvis. The round ligaments of the uterus extend from the lateral sides of the uterus, through the inguinal canal and attach to the labia majora. These ligaments help keep the uterus in an anteverted position. The transverse cervical ligaments (or cardinal ligaments) run from the sides of the cervix and superior vagina laterally to the pelvic wall. They help restrict inferior movements of the uterus. The uterosacral ligaments(or sacrocervical ligaments) connect the inferior portion of the uterus posteriorly to the sacrum. (Anwar, 2006)

Many of these ligaments travel between the folds of the broad ligament. Weakness in either the pelvic floor muscles or these ligaments can lead to prolapse of the

uterus, in which the uterus starts to protrude through the vagina. (Anwar, 2006; Mahadevan 2013)

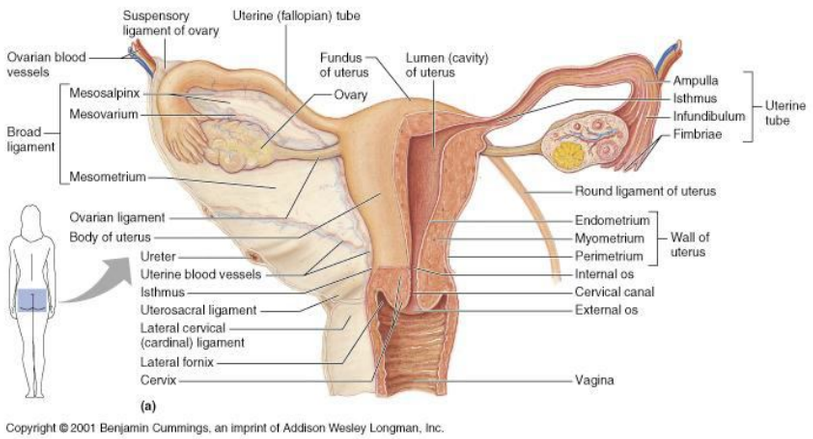

Figure 2.3: Anatomy of the uterus (www. Anatomy of uterus images.com)

2.1.3.2 Blood Supply of the uterus

Each internal iliac artery extends a branch called a uterine artery through the broad ligament to the lateral wall of the uterus. Numerous smaller branches from the uterine artery then penetrate the muscular wall of the uterus and further diverge into arcuat arteries. Thereafter, each arcuate artery gives rise to smaller vessels, called radial arteries, which extend into the innermost layer (endometrium)of the uterus. Here they branch into spiral arteries, which swirl throughout the endometrium, extending between and throughout the uterine glands (described below) toward the mucosal surface (Anwar, 2006; Mahadevan 2013)

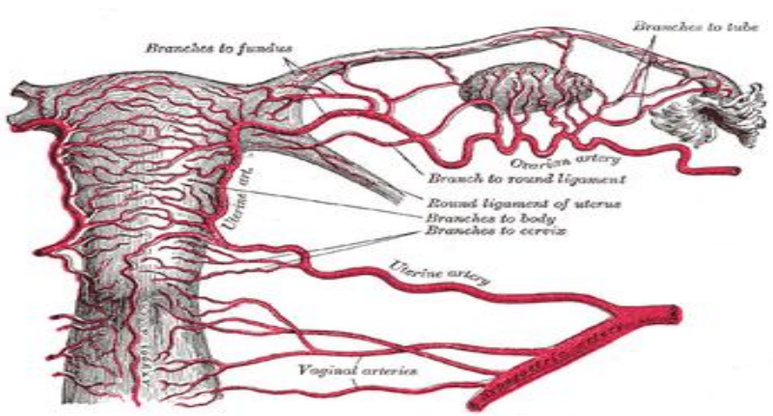

Figure 2.4: blood supply of the uterus (Anwar , 2006; Mahadevan 2013)

2.1.3.3 Wall of the Uterus

The perimetrium The outer tunic of most of the uterus is a serosa, is continuous with the broad ligament. The myometrium is the thick, middle tunic of the uterine wall formed from three intertwining layers of smooth muscle. In the non pregnant uterus, the muscle cells are less than 0.25 millimeters in length. During the course of a pregnancy, smooth muscle cells increase both in size (hypertrophy) and in number (hyperplasia). Some cells may exceed 5 millimeters in length by the end of gestation. Endometrium The inner most tunic of the uterus, is an intricate mucosa composed of a simple columnar epithelium and an underlying lamina propria. Two distinct layers form the endometrium:

basal layer The deeper layer**,** also called the stratum basalis. The basal layer is immediately adjacent to the myometrium, and is a permanent layer that undergoes few changes during each uterine cycle. functional layer The more superficial of the two endometrial layers**,** or stratum functionalis. If fertilization and implantation do not occur, this lining is shed as menses. (Anwar, 2006; Mahadevan 2013)

2.1.4 Vagina

The vagina is a thick-walled, fibromuscular tube that forms the inferior most region of the female reproductive tract and measures about 10 centimeters in length in an adult female. The vagina connects the uterus with the outside of the body antero-ventrally, and thus functions as the birth canal. The vagina is also the copulatory organ of the female, as it receives the penis during intercourse, and it serves as the passageway form menstruation. (Anwar, 2006; Mahadevan 2013)

The vaginal wall is heavily invested with both blood vessel sand lymphatic vessels. Arterial supply comes from the vaginal arteries and venous drainage is via vaginal veins. The lumen of the vagina is flattened anteroposteriorly. The vagina's relatively thin, distensible wall consists of three tunics: an inner mucosa, a middle muscularis, and an outer adventitia. (McKinley et al. 2015)

2.2 Physiology of Female reproductive system :

2.2.1 Menstrual Cycle:

The menstrual cycle can be described by the ovarian or uterine cycle. The ovarian cycle describes changes that occur in the follicles of the ovary whereas the uterine cycle describes changes in the endometrial lining of the uterus. Both cycles can be divided into three phases. The ovarian cycle consists of the follicular phase, ovulation, and the luteal phase where-as the uterine cycle consists of menstruation, proliferative phase, and secretary phase. (Konig and Liebich 1999).

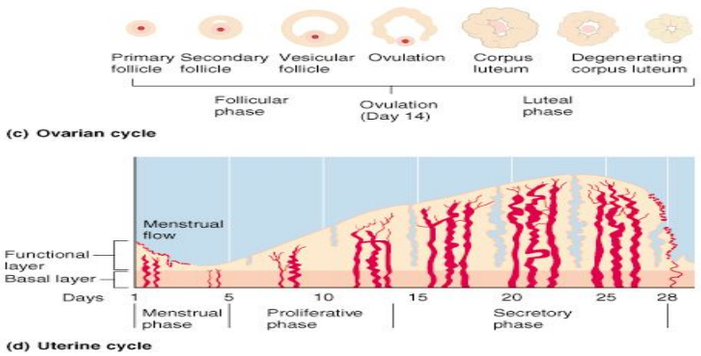

Figure 2.5: Menstrual cycle image (Konig and Liebich 1999)

The ovarian cycle is split into two phases: The follicular phase is the first part of the ovarian cycle. During this phase, the ovarian follicles mature and get ready to release an egg. The latter part of this phase overlaps with the proliferative phase of the uterine cycle. (Ben Pansky, 2017)

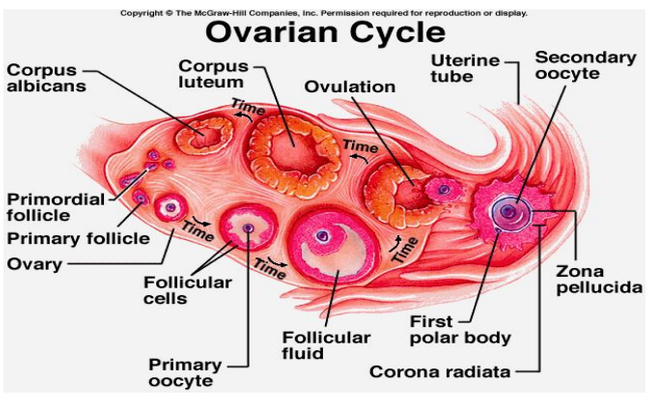

Figure 2.6: Ovarian cycle(Ben Pansky,2017)

Through the influence of a rise in follicle stimulating hormone (FSH) during the first days of the cycle, a few ovarian follicles are stimulated. These follicles, which were present at birth and have been developing for the better part of a year in a process known as folliculognesis, compete with each other for dominance. Under the influence of several hormones, all but one of these follicles will stop growing, while one dominant follicle in the ovary will continue to maturity. The follicle that reaches maturity is called a tertiary, or Graafian, follicle, and it contains the ovum. (Cappello 2006).

Ovulation is the second phase of the ovarian cycle in which a mature egg is released from the ovarian follicles into the oviduct. During the follicular phase, estradiol suppresses production of luteinizing hormone (LH) from the anterior pituitary gland. When the egg has nearly matured, levels of estradiol reach a threshold above which this effect is reversed and estrogen stimulates the production of a large amount of LH. This process, known as the LH surge, starts around day 12 of the average cycle and may last 48 hours. After being released from the ovary, the egg is swept into the fallopian tube by the fimbria, After about a day, an unfertilized egg will disintegrate or dissolve in the fallopian tube. (Capella 2006)

The luteal phase is the final phase of the ovarian cycle and it corresponds to the secretory phase of the uterine cycle. During the luteal phase, the pituitary hormones FSH and LH cause the remaining parts of the dominant follicle to transform into the corpus luteum, which produces progesterone. The increased progesterone in the adrenals starts to induce the production of estrogen. The hormones produced by the corpus luteum also suppress production of the FSH and LH that the corpus luteum needs to maintain itself. Consequently, the level of FSH and LH fall quickly over time, and the corpus luteum subsequently atrophies. Falling levels of progesterone trigger menstruation and the beginning of the next cycle. The uterine cycle (menstrual cycle) is the monthly series of changes that the female's uterus, or uterine tissue, undergoes in preparation for the implantation of a fertilized egg. (Dyce et al 1990)

The proliferative phase is the second phase of the uterine cycle when estrogen causes the lining of the uterus to grow, or proliferate, during this time. As they mature, the ovarian follicles secrete increasing amounts of estradiol, and estrogen. The estrogens initiate the formation of a new layer of endometrium in the uterus, histologically identified as the proliferative endometrium. The estrogen also stimulates crypts in the cervix to produce fertile cervical mucus, which may be noticed by women practicing fertility awareness . The secretary phase is the final phase of the uterine cycle and it corresponds to the luteal phase of the ovarian cycle. During the secretory phase, the corpus luteum produces progesterone, which plays a vital role in making the endometrium receptive to implantation of the blastocyst and supportive of the early pregnancy, by increasing blood flow and uterine secretions and reducing the contractility of the smooth muscle in the uterus; it also has the side effect of raising the woman's basal body temperature. (Bairbre 2000)

2.2.2 Embryo and development

Fertilization occurs on or about day 14 as the mature ovum and sperm unite to form the zygote in the outer third of the fallopian tube. Cellular division of the zygote occurs during transit through the fallopian tube. By the time the conceptus enters the uterus, about day 17, it is at the 12- to 15-cell stage (morula). By day 20, the conceptus has matured to the blastocyst stage. The blastocyst is a fluid-filled cyst lined with trophoblastic cells that contain a cluster of cells at one side called the inner cell mass. On day 20, the blastocyst at the site of the inner cell mass burrows through the endometrial membrane into the hyperplastic endometrium, and implantation. Implantation is completed by day 23 as the endometrial membrane reforms over the blastocyst. During implantation, the amniotic cavity forms in the inner cell mass. A bilaminar embryonic disk separates the amniotic cavity from the exocoelomic cavity. The primary (primitive) yolk sac forms at about 23 days of gestational age as the blastocyst cavity becomes lined by the exocoelomic membrane and hypoblast. As the extraembryonic coelom forms, the primary yolk sac is pinched off and extruded, resulting in the formation of the secondary yolk

sac. Standard embryology texts indicate that the secondary yolk sac actually forms at approximately 27 to 28 days of menstrual age, when the mean diameter of the gestational sac is approximately 3 mm. It is the secondary yolk sac, rather than the primary yolk sac, that is visible with ultrasound, the term yolk sac is used to refer to the secondary yolk sac. The extraembryonic coelom becomes the chorionic cavity. (Rumack et all,2011)

2.3 Normal ultrasound features of early pregnancy(Gaillard 2017)

From 0 to 4.3 weeks: no ultrasound findings

From 4.3 to 5 weeks: possible small gestational sac, possible double decidual sac sign (DDSS), or possible intra decidual sac sign (IDSS)

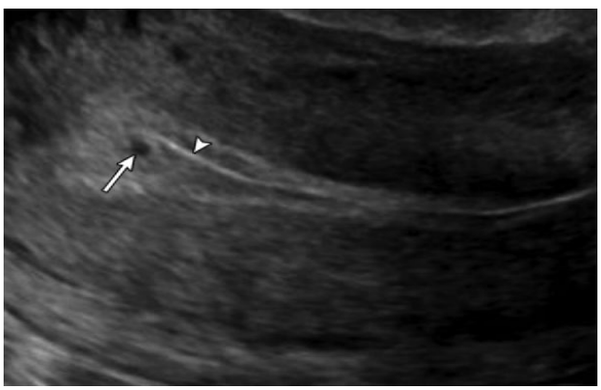

Figure 2.7: gestaional sac and intradecidual sign (Shuchi K, et all 2015)

From 5.1 to 5.5 weeks: larger gestational sac should be visible by this time.

From 5.5 to 6.0 weeks : yolk sac should be visible by this time, gestational sac should be ~6 mm in diameter, and double decidual sign.

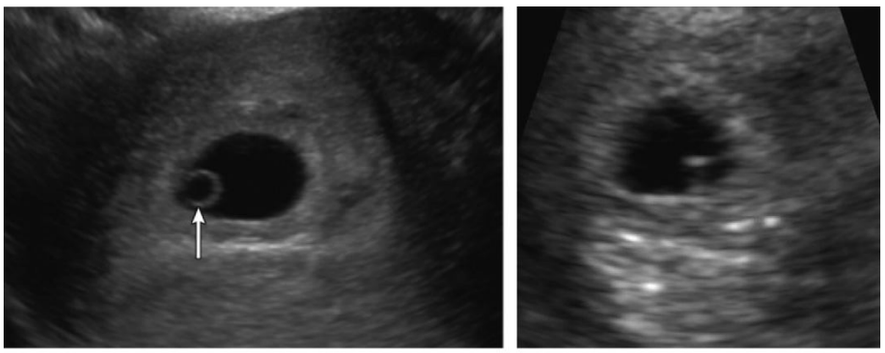

Figure 2.8: normal yolk sac (Shuchi K, et all 2015)

More than 6.0 weeks**:** fetal pole may be identifiable on endovaginal ultrasound (1-2 mm), fetal heart rate (FHR) should be ~100-115 bpm and gestational sac should be ~10 mm in diameter

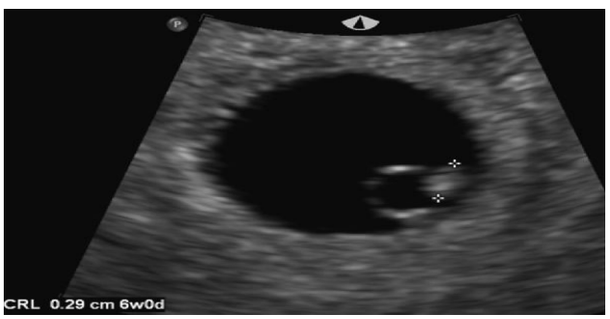

Figure 2.9: appearance of 6 week fetal pole (Shuchi K, et all 2015)

In 6.5 Weeks: crown rump length (CRL) should be ~5 mm

From 7 to 8 Weeks**:** CRL is between 11-16 mm, and cephalad and caudal poles can be identified.

From 8 to 9 Weeks: CRL is between 17-23 mm, limb buds appear, head can be seen as separate from the body.

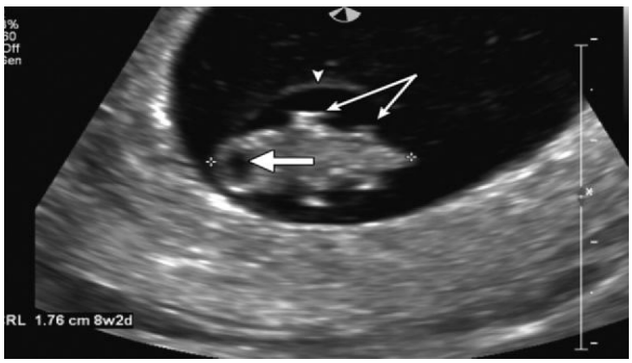

Figure 2.10: appearance of fetal pole at 8 weeks (Shuchi K, et all 2015)

From 9 to 10 weeks: CRL is between 23-32 mm, fetal heart rate 170-180 bpm, fetal movement can be seen, a round hypoechoic structure in the fetal

brain represents a developing embryonic/fetal rhombencephalon, and nuchal translucency may begin to be seen.

2.4 Pathology of the Female reproductive System:

2.4.1 Failure of pregnancy in first trimester:

2.4.1.1 miscarriage:

A pregnant woman can undergo different miscarriages that are categorized by different names. It is used as an umbrella term to explain different types of loss of pregnancies. These different types of spontaneous loss of pregnancies are discussed below:

2.4.1.1.1 Threatened Miscarriage:

This is a type that sends shivers down an expecting mother's spine. In this condition, a woman suffer from vaginal bleeding along with some light spotting. It is, 1 in 4 pregnant women suffer from this type of bleeding during their first trimester. In this type, the cervix remains tightly closed. The mother and the fetus need to be closely monitored and in majority of the cases, the pregnancy continues without any major issues. (Rowling and Coleman 1997)

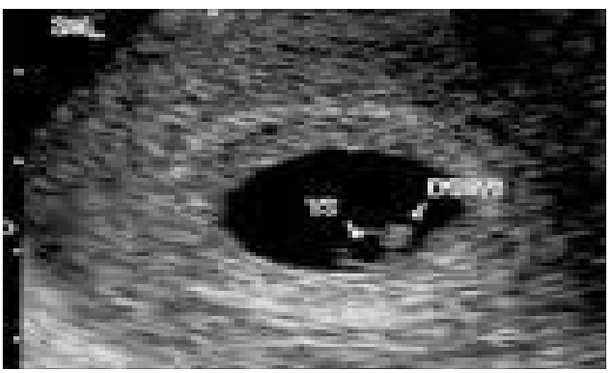

Figure 2.11: Threatened Miscarriage

www.threatened abortion ultrasound images.com

2.4.1.1.2 Missed Miscarriage:

Many pregnant women experience this type without any symptoms. They are unaware of the fact that they have just undergone an abortion and suffered from embryonic death. The embryo is not expelled from the womb for unknown reasons

and thus the mother does not experience any symptoms. Fetal death is only determined when fetal heart tones checked during an ultrasound examination.(Bagratee and Khullar 2004).

Figure 2.12: A missed abortion (www. Ultrasound images.com)

2.4.1.1.3 Incomplete or Inevitable Miscarriage:

This occurs when the body starts the process of spontaneous abortion, but fails to expel all the tissues of failed pregnancy from the womb. The cervix dilates indicating it is a sure sign of expelling the fetus from the uterus. The mother experiences abdominal or back pain along with bleeding and cramps. This type of failed pregnancy is inevitable as there is no way from stopping the loss from occurring. An inevitable miscarriage refers to the presence of an open internal os in the presence of bleeding in the first-trimester of pregnancy. (Bagratee and Khullar 2004).

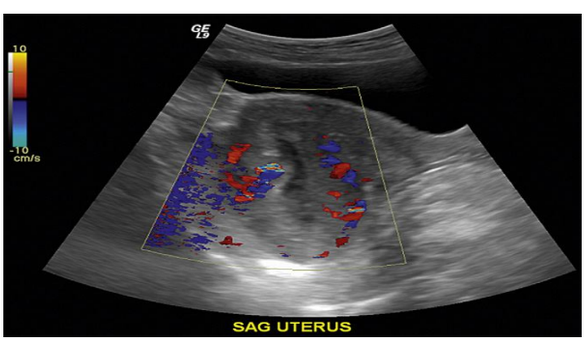

Figure 2.13: incomplete miscarriage (Reuter 2013)

2.4.1.1.4 Complete Miscarriage:

When all the products of conception, that is, the embryo have been expelled from the womb, it is termed as a complete failure. The bleeding will stop quickly and one can confirm it with the help of an ultrasound. (Winikoff et al 2008).

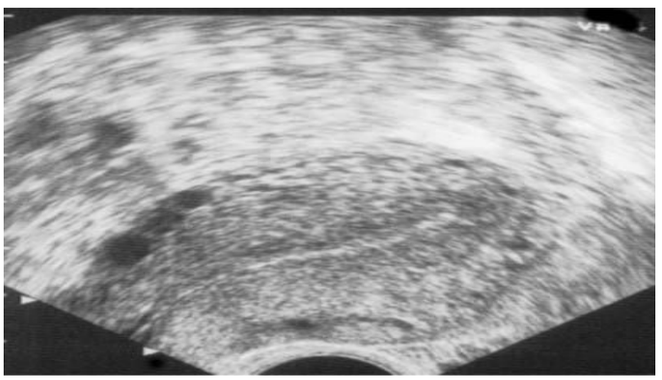

Figure 2.14: Complete Miscarriage. (Trish Chudleigh, et all 2004)

2.4.1.2 Blighted Ovum:

When a fertilized egg is implanted in the uterine wall, it will undergo fetal development. However, in case of a blighted ovum, also called an embryonic pregnancy, this never occurs. The presence of a gestational sac with or without the presence of a yolk sac. However, there is total absence of any kind of fetal growth. (Hong and Moon 2009).

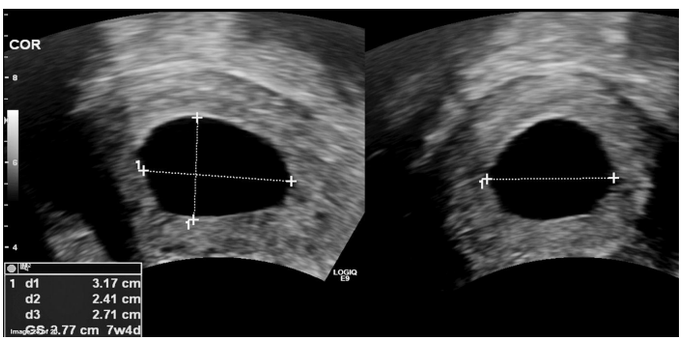

Figure 2.15: blighted ovum(leslie M. scout et all)

2.4.1.3 Ectopic Pregnancy:

When a fertilized egg implants itself inside the fallopian tube instead of the uterus, it is termed as an ectopic or tubal pregnancy. These pregnancies require immediate termination as the developing egg will lead to rupture of the fallopian tube. If left untreated, it could lead to serious complications including maternal death. (Scott 1987)

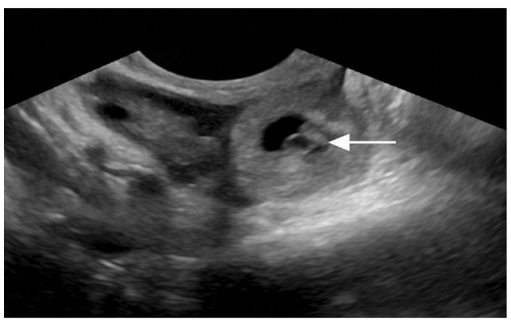

Figure 2.16: Tubal ectopic pregnancy (Scott et al 1987)

2.4.1.4 Molar Pregnancy:

During fertilization, an error in the genetic coding can lead to growth of an abnormal tissue. These pregnancies rarely involve the embryo, but cause in development of cells that make up the placenta. However, there is no fetus just presence of an incomplete mole. It is actually a form of tumor that will not survive. This is a very rare kind of pregnancy, thus, not seen in majority of the cases.(Mangili 2014)

Figure 2.17: complete molar pregnancy (steven M penny, et all 2011)

2.4.1.5 Peri-gestational Hemhorrage: Perigestational hemorrhage, from the chorionic frondosum (early placenta) is the most common source of vaginal bleeding during normal intrauterine pregnancy, and up to 20% of women with a threatened abortion have a subchorionic hematoma. Large perigestational hemorrhages have been associated with pregnancy loss while smaller perigestational hemorrhages usually resolve without sequelae. (Roya Sohaey 1997)

Figure 2.18 Subchorionic hematoma (Trish Chudleigh, et all 2004)

2.4.2 Etiologies of early Pregnancy loss

2.4.2.1 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 Danny, 2009)

2.4.2.2 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.

Other Müllerian anomalies, including unicornuate, didelphic, and bicornuate uteri have been associated with smaller increases in the risk for RPL. The role of the arcuate uterus in causing RPL is unclear. The presence of intrauterine adhesions, sometimes associated with Asherman syndrome, may significantly impact placentation and result in early pregnancy loss. Although congenital anomalies caused by prenatal exposure to diethylstilbestrol are clearly linked to RPL, this is becoming less clinically relevant as most affected patients move beyond their reproductive years. (Ford and Danny, 2009)

2.4.2.3 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 Traditionally, Some studies have noted abnormal elevations in luteinizing hormone or in androgens (both features associated with PCOS) among patients experiencing RPL, suggesting that these abnormalities may result in premature aging of the oocyte and/or dyssynchronous maturation of the endometrium. Studies have found evidence of PCOS in at least 40% of women with RPL. (ACOG, 2016)

2.4.2.4 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 Danny, 2009)

However, the role of infectious agents in recurrent loss is less clear, with a proposed incidence of 0.5%2 to 5%.8 The proposed mechanisms for infectious causes of pregnancy loss include: (1) direct infection of the uterus, fetus, or placenta, (2)

placental insufficiency, (3) chronic endometritis or endocervicitis, (4) amnionitis, or (5) infected intrauterine device. Those particular infections speculated to play a role in RPL include mycoplasma, ureaplasma, Chlamydia trachomatis, L monocytogenes, and HSV. (Ford and Danny, 2009)

2.4.2.5 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. One specific autoimmune disorder, APS, requires particular attention as it has been clearly linked with many poor obstetric outcomes, including RPL. (Ford and Danny, 2009)

2.4.2.6 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 most common of these are the factor V Leiden mutation, mutation in the promoter region of the prothrombin gene, and mutations in the gene encoding methylene tetrahydrofolate reductase (MTHFR). 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, the link between thrombophilias and pregnancy losses at greater than 10 weeks of gestation is more widely accepted than a link to those that occur prior to 10 weeks of gestation. (Ford and Danny, 2009)

2.4.2.7 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.

Three particular exposures-smoking, alcohol, and caffeine-have gained particular attention, and merit special consideration given their widespread use and modifiable nature. (Allison and Schust , 2009).

2.4.2.8 **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. Progesterone has been shown to be beneficial in decreasing the miscarriage rate among women who have experienced at least 3 losses. LDA has also been investigated as a potential therapy for unexplained RPL. Its use prior to and during pregnancy has only been proven to increase live birth rates among those women with previous miscarriages beyond 13 weeks of gestation. (Ford and Danny, 2009)

2.5 The ultrasound physics:

Ultrasound relies on high frequency sounds to image the body and diagnose patients. Ultrasounds are therefore longitudinal waves which cause particles to oscillate back and forth and produce a series of compressions and rarefactions. The amplitude is the distance a particle moves back or forth. Compressions are areas of the wave where particles are close together and there is high pressure. (Trish Chudleigh, et all 2004)

2.5.1 Production of sound waves

Ultrasound waves are produced when an electrical signal is applied to a piezoelectric crystal, it is produced by a piezoelectric crystal that has a dipole

regions of positive and negative charges, when the piezoelectric crystal is stimulated electrically ,the crystal expands a long its short axis.

If the polarity of the electric signal changed is reversed, the crystal will contract. When the crystal regains its original size and shape, it emits ultrasound wavesConversely if the ultrasound waves hits the piezoelectric crystal, it will produce the same shape deformity and after stability it will produce an electrical signal. (Trish Chudleigh, et all 2004)

2.5.2 Frequencies used in ultrasound diagnosis

Ultrasound uses high frequency sounds that are higher than the human ear can hear. ie. 20 000 Hz. Ultrasound can't detect objects that are smaller than its wavelength and therefore higher frequencies of ultrasound produce better resolution. On the other hand, higher frequencies of ultrasound have short wavelengths and are absorbed easily and therefore are not as penetrating. For this reason high frequencies are used for scanning areas of the body close to the surface and low frequencies are used for areas that are deeper down in the body. (Trish Chudleigh, et all 2004)

2.5.3 Ultrasound transducers

Transducers convert electrical energy into mechanical energy to produce

ultrasound and vice versa.

The part of the transducer which does this work is a piezo electric crystal. It can be synthetic or natural. They have an inherent property of vibrating when an electric current is applied and thus produce ultrasonic waves and conversely produce electric impulse when vibrated thus helping the acquisition of data for the formation of image. This effect is called "Piezoelectric effect". (Trish Chudleigh, et all 2004)

2.5.4 **Doppler Basics**

Doppler imaging can determine the presence and the direction of blood flow.

The movement of the blood cells toward the transducer compresses the soundwaves and creates shorter wavelengths and higher frequencies than those emitted by the transducer and called a positive shift or red shift.

The movement of the blood cells away from the transducer expands the sound waves and creates a longer wavelengths and lower frequencies than those emitted by the transducer which is called a negative shift or Blue shift. (Trish Chudleigh, et all 2004

2.6 Previous studies:

study done by Leridon and Regan et al, 1989, reported that the risk factors for spontaneous abortion have concluded that the predominant negative effects are those of advanced maternal age (with a clear increase in risk after 35 years) and previous spontaneous abortion. The causes of miscarriage are often unknown.

Study done by Schwartz and Mayaux et al, 1991, reported that spontaneous abortion, pregnancy complications, congenital abnormalities, maternal mortality and prenatal mortality, than do younger women.

Study done by Sheuly Begum, and ArifaAkterJahan et al, 2012, that followed women's hormone levels every day to detect very early pregnancy found a total miscarriage rate of 31%.

Study done by Sid Kirchheimern, 2003, reported that Stress has long been suspected as a possible cause of miscarriage, with several studies indicating an increased risk among women reporting high levels of emotional or physical turmoil in their early months of pregnancy or just before conception.

Risch and Coste et al, 1991,Were conflicting results have been obtained for other spontaneous abortion risk factors such as maternal consumption of tobacco, maternal psychological problems, interval between pregnancies, or previous use of the contraceptive pill Thus most of these studies analysed the effect of female factors on spontaneous abortion. Specifically, 15% of early miscarriages and 66% of late miscarriages have been attributed to infections (Baud et al., 2008).

Study done by Peter and Klatsky et al, 2007, 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. Increased risk of malpresentation (odds ratio, 2.9; 2.6-3.2), cesarean (odds ratio, 3.7; 3.5-3.9), and preterm delivery (odds ratio, 1.5; 1.3-1.7) are reported; however, the incidence of labor dystocia was low (7.5%).

Other study done by Woelfer and Salim et al, 2001, found that 983 women had a normally shaped uterine cavity, 72 an arcuate, 29 a subseptate, and five a bicornuate

uterus. Women with a subseptate uterus had a significantly higher proportion of first-trimester loss ($Z = 4.68$, $P < .01$) compared with women with a normal uterus. Women with an arcuate uterus had a significantly greater proportion of second-trimester loss ($Z = 5.76$, $P < .01$) and preterm labor ($Z = 4.1$, $P < .01$). There were no other significant differences in pregnancy outcomes between women with normal and abnormal uterine morphology.

Study done by Kaplan and Dart et al, 1996, Pregnant women with abdominal pain or vaginal bleeding received β-hCG values; positive radioimmunoassays prompted ultrasonography; indeterminate ultrasonography findings resulted in admission. 13% of patients had confirmed ectopic pregnancy; 99.5% of patients discharged from the ED(ectopic pregnancy) had documented IUPs. Transvaginal sonography in the ED established EP or IUP in 75%. For EP detection, sonography is 69% sensitive and 99% specific. History and physical examination do not reliably diagnose or rule out EP; of EP patients, 9% reported no pain and 36% lacked adnexal tenderness.

Chapter Three

Materials and Methods

Chapter Three

Material and Methods

3.1 Materials:

3.1.1 Sample size:

Sample size in this study was 40 patients which presented for ultrasound clinics for assessing their first trimester pregnancy, with symptoms of abdominal pain, vaginal bleeding or both.

3.1.2 study area and Machine used

The study was conducted at Nyala City:

- In Dr: Yasin Farah Clinic using GE (SonoScape A5) ultrasound machine with transabdominal convex probes ranges from 3.5 to 7.5 MHz and with transvaginal probe 10 MHz.
- In Fadaiel Medical Centre: using (Mindray DCN6 2016) ultrasound machine with convex probe with central frequency 6.5 MHz.
- In Yatafoon Clinic: using (Mindray DP 1100plus) ultrasound machine with convex transabdominal prob with central frequency 6.5MHz.

3.1.3 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 Exclusion criteria:

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

3.1.5 Study type:

Prospective excremental study

3.1.6 Study duration:

The study carried over duration of 8 months from november 2016 to July 2017.

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 then a vaginal approach. Abdominal scanning is performed with a full maternal bladder, provides a wider field of view, and provides the greatest depth of view. Vaginal scanning is performed with the bladder empty, gives a much greater resolution with greater crispness of fine detail.

3.2.4.1 Tran abdominal ultrasound

For most ultrasound exams, the patient is 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 trans-abdominal transducers and a 3.5 MHz frequency transducer used.

Figure 3.1 Trans-abdominal probe.

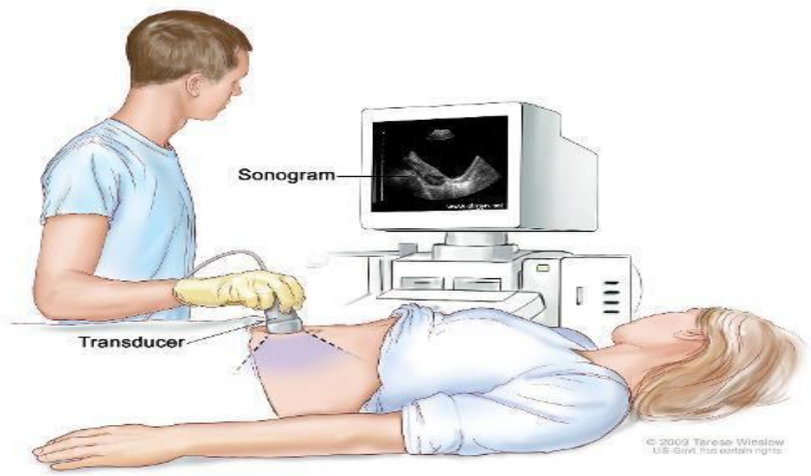

Figure 3.2 Transabdomen ultrasound technique

3.2.4.2 Transvaginal ultrasound

The patient is scanned in the normal examination position (dorsal lithotomy) with her feet secure in stirrups and her perineum even with the end of the examination table. place a small amount of ultrasonic coupling gel on the tip of the transvaginal transducer. Then cover the transducer with a condom. After lubricating the vaginal opening, gently the transducer inserted into the vagina.

Visualize the longitudinal plane of the uterus (sagital section) and evaluate its' size. Identify (if present), the gestational sac, yolk sac, fetus (or fetuses), presence or absence of fetal movement and fetal heart beat. Transvaginal transducer probe frequency was (7.5MHz).

Figure 3.3: Transvaginal probe.

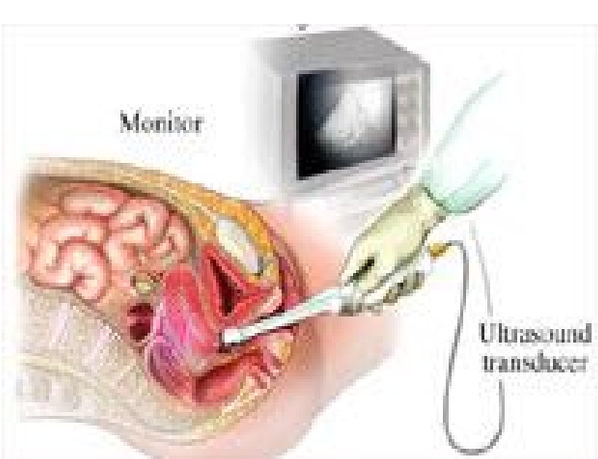

Figure 3.4: Transvaginal ultrasound procedure

Chapter Four

Results

Chapter Four

Results

4.1 Results

Table 4.1 frequency distribution of patient age

Age	Frequency	%
15-24	5	12.5
25-34	20	50
35-44	14	35
45-54	1	2.5
total	40	100%
Minimum=19, maximum=46, means=31.2, std. Deviation=6.400		

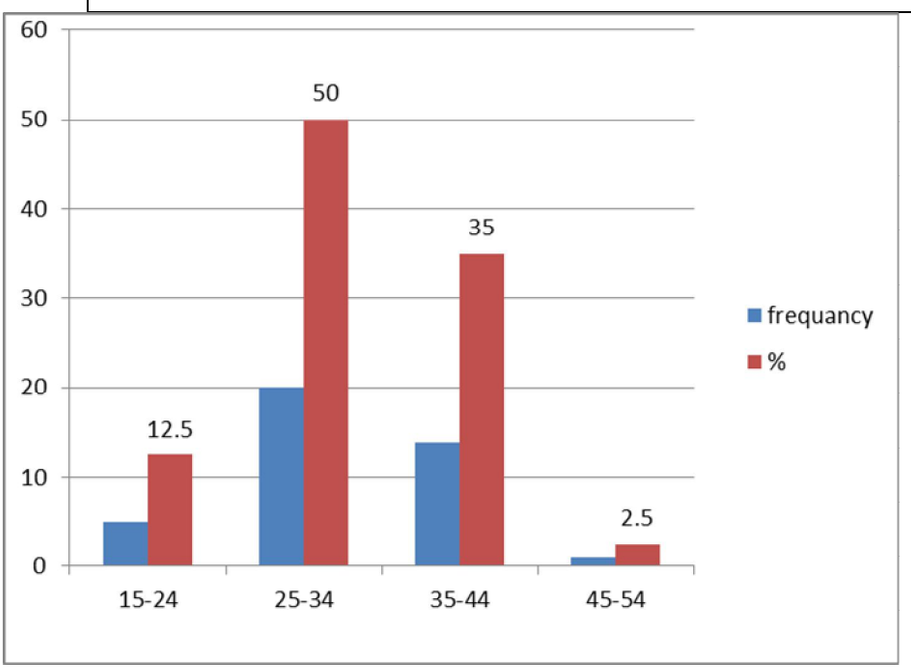

Figure 4.1: Patients age distribution

Table 4.2 distribution of Patient parity

Parity	No	%
P0	5	12.5
P1	4	10
P2	7	17.5
P3	5	12.5
P4	7	17.5
P5	6	15
P6	3	7.5
P8	1	2.5
P9	1	2.5
P11	1	2.5
total	40	100%

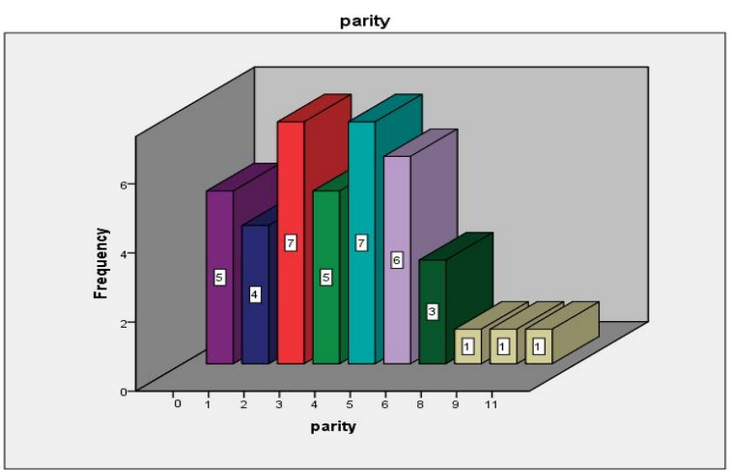

Figure 4.2: the frequency distribution of the number of parity.

Table 4.3 frequency distribution of Patient gravity

Parity	Frequency	%
G1	4	10
G2	4	10
G3	6	15
G4	4	10
G5	5	12.5
G6	8	20
G7	5	12.5
G8	1	2.5
G9	1	2.5
G10	1	2.5
G12	1	2.5
total	40	100%

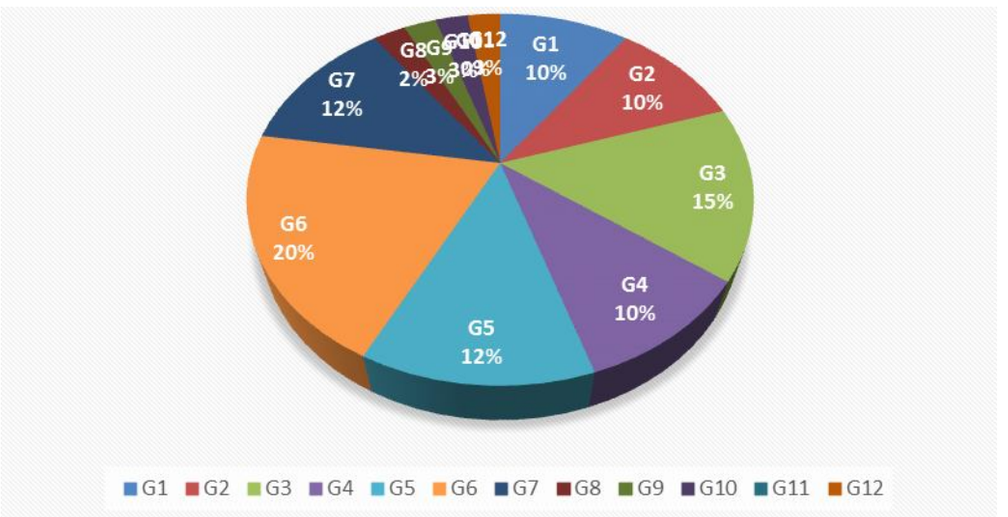

Figure 4.3: distribution of patient gravity

Table 4.4 distribution of GA

GA	Frequency	%
5-6.9	11	27.5
7-9.9	23	57.5
10-12.9	6	15
total	40	100%

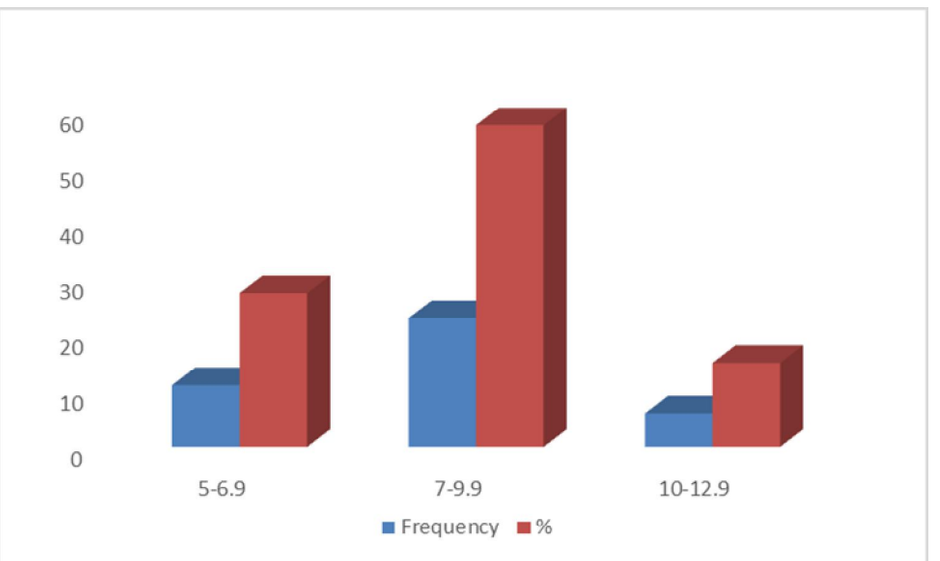

Figure 4.4 GA distribution

Table 4.5 distribution of Patient occupation

occupation	No	%
House wife	27	67.5
worker	13	32.5
total	40	100%

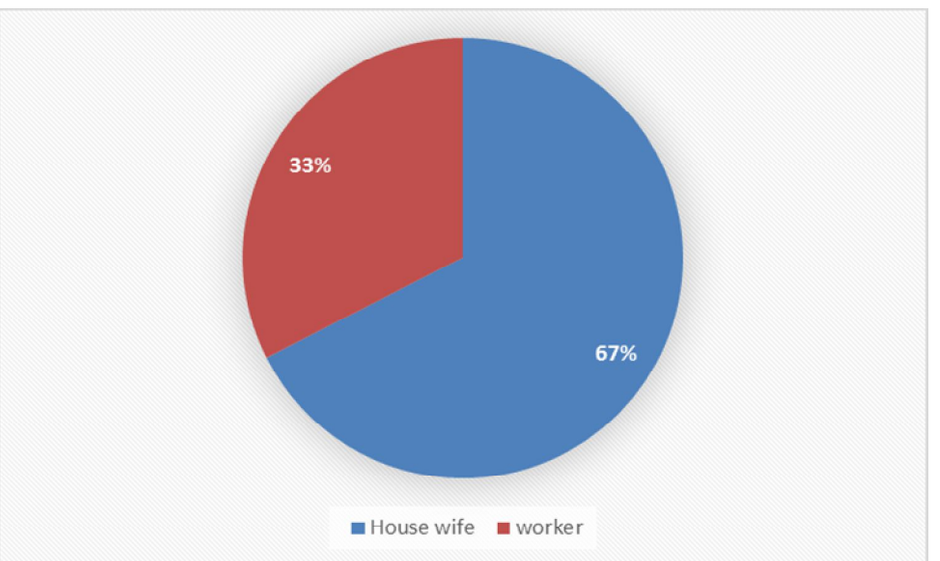

Figure 4.5: distribution of Patient occupation

Table 4.6 distribution of Patient complain

Complain	No	%
Abdominal pain	15	37.5
Vaginal bleeding	15	37.5
Vaginal bleeding and abdominal pain	10	25
total	40	100%

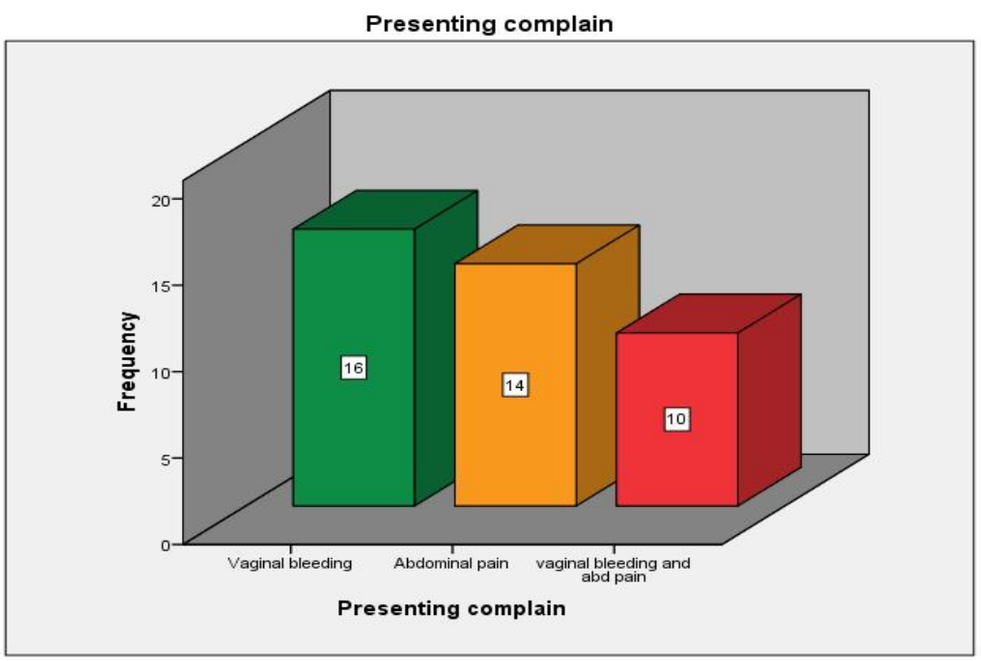

Figure 4.6: frequency distribution of presenting complain.

Table 4.5 distribution of possible causes of complications

causes	No	%
fibroid	7	17.5
trauma	4	10
unexplained	24	60
Febrile disease	1	2.5
IUCD	1	2.5
Uterine abnormality	1	2.5
c-section	1	2.5
aneuploidy	1	2.5
total	40	100%

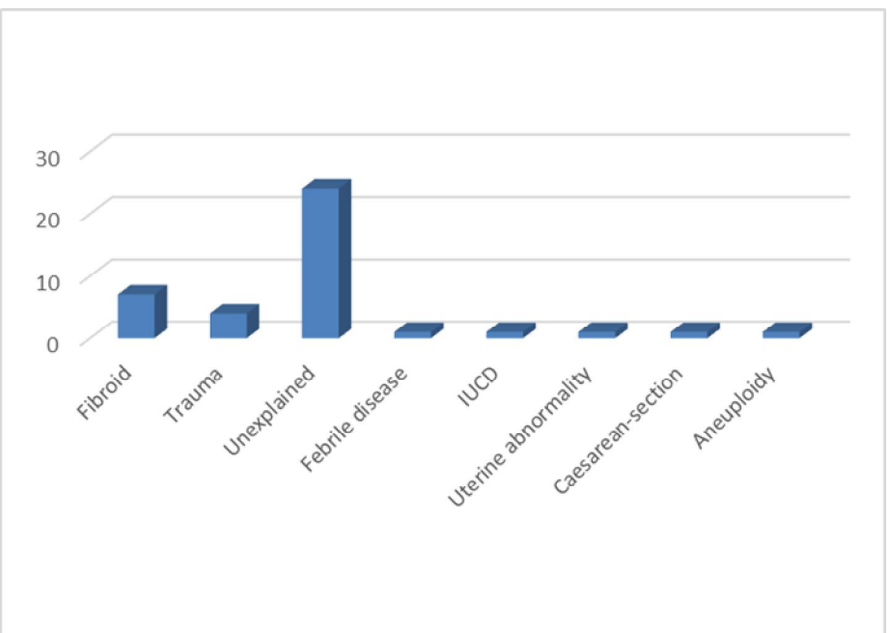

Figure 4.8 distribution of Causes of complications

Table 4.8 distribution of type of complications

type	No	%
Threatening abortion	11	27.5
Complete abortion	3	7.5
Incomplete abortion	9	22.5
Inevitable abortion	2	5
Missed abortion	4	10
Blighted ovum	5	12.5
Ectopic pregnancy	5	12.5
Molar pregnancy	1	2.5
total	40	100%

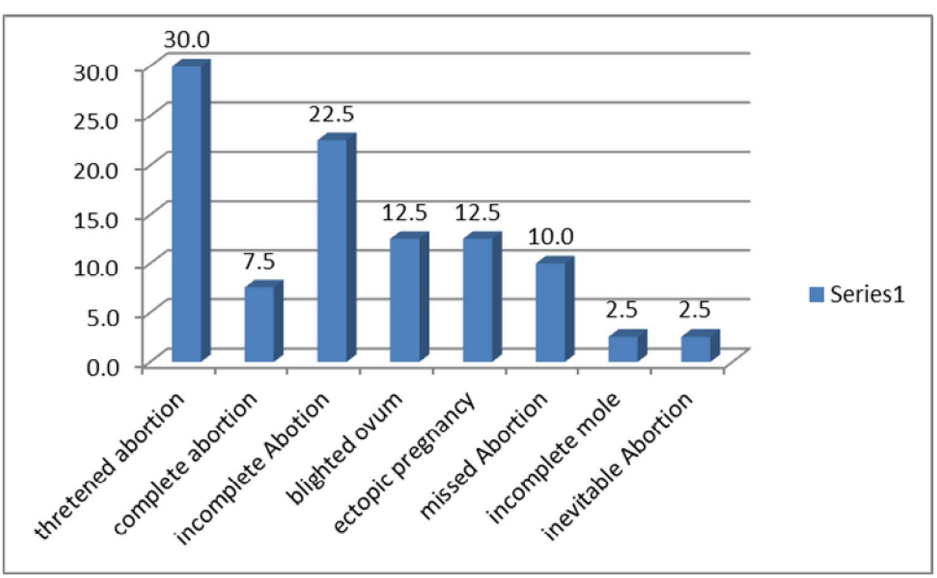

Figure 4.8: frequency distribution of type of complications as percentage .

Table 4.9 ultrasound finding and uterine cavity contains

type	No	%
empty	8	20
Retained product	9	22.5
Gestational sac	7	17.5
Viable embryo	10	25
Dead embryo	6	15
total	40	100%

Table 4.10 frequency distribution of uterine size

Uterine size	No	%
Normal	6	15
Bulky	34	85
total	40	100%

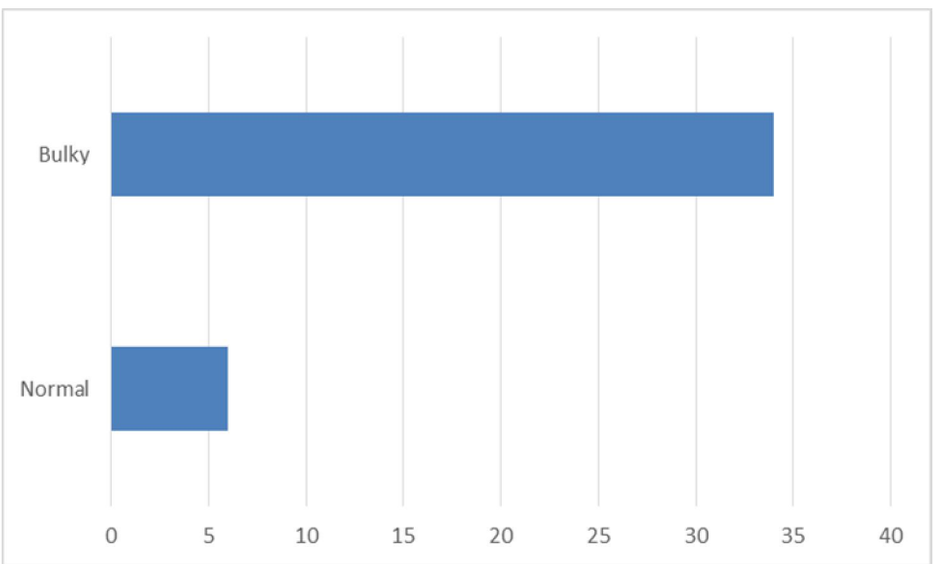

Figure 4.10: US finding and uterine size

Table 4.11 type of complications and presenting complain cross tabulation

Type of complications	Vaginal	Abdominal	both	total
Threatening abortion	2	7	2	11
Complete abortion	2	0	1	3
Incomplete abortion	5	0	4	9
Inevitable abortion	1	1	0	2
missed	2	2	0	4
Blighted ovum	1	4	0	5
Ectopic pregnancy	1	1	3	5
Molar pregnancy	0	0	1	1
total	14	15	11	40

Table 4.12 age in years and type of complications cross tabulation

Type of complications	19-28	29-38	39-48	total
Threatening abortion	3	7	1	11
Complete abortion	1	2	0	3
Incomplete abortion	2	6	1	9
Inevitable abortion	1	1	0	2
missed	2	2	0	4
Blighted ovum	2	1	2	5
Ectopic pregnancy	2	2	1	5
Molar pregnancy	1	0	0	1
total	14	21	5	40

Chapter Five

Discussion, conclusion and recommendations

Chapter Five

Discussion, conclusion, and recommendations

5.1 Discussion

Pregnancy failure is termed a miscarriage or failed early pregnancy when fetal demise occurs before 20 weeks gestational age and fetal death in utero (FDIU) when it occurs after 20 weeks gestation. Early pregnancy loss is common. It happens in about 10% of known pregnancies (ACOG, 2015). Early pregnancy problems, including miscarriage, ectopic pregnancy and pregnancy of unknown location, occur commonly and have significant medical, psychological and economic consequences. While the rate of miscarriage has remained predictable to some extent, better diagnosis will help to decrease the rate of complications. This study intended to evaluate the cause of early pregnancy complications in Nyala city, western Sudan. Below I will present in details the sample characteristics in order to draw aconclusions regarding the cause of early pregnancy failure for the entire patient population.

Table 4.1 shows the age distribution of the sample. The highest number of patients were found within age group of 25-34 years (20 patients (50%) while the lowest were found for age group of 45-54 years (1 patients (2.5%). Age has proportional relation with pregnancy complications. Both miscarriage and ectopic pregnancy are more common in older women.

The rate of miscarriage increases steadily, so that by the age of 40, the woman have about a one-in-two risk of miscarrying. Women of advanced maternal age (AMA), typically defined as 35 or more years old at deliver have an increased risk of adverse pregnancy outcomes as compared to younger women (Benli et al., 2015). The risk of miscarriage steadily increases as women age. Women ages 35-39 are 25% more likely to have a miscarriage, and that chance increases to 51% for ages 40-44. Even after the fetal heart activity is detected, older women are still at a risk for later first trimester and early second trimester losses. It was estimated that the likelihood of early pregnancy loss occurring increases as a woman gets older. Early

pregnancy loss occurs in more than one third of pregnancies in women older than 40 years. (Carnegie imaging, 2017).

Patient parity: (table 4.2) parity is defined as the condition of a woman with respect to her having borne viable offspring (WHO 2008).

Commonly parity is noted with the total number of pregnancies and represented by the letter P or the word para. A para 4 (P4) gravida 5 (G5) has had 4 deliveries after 20 weeks and one abortion or miscarriage before 20 weeks. (Hately, 1995) (WHO 2008)

In this study, among 40 pregnant women in which the highest number of patient parity were P2 and P4 (17.5%) where P7 and P10 is zero, as illustrated in Table 4.2. 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, 2004). In this study, in agreement with previous studies (Majoko , 2004, Rooney 1992), higher complications were reported with patient's with low parity. Parity has been used as a risk marker with nulliparous and grand multiparous women classified as at higher risk of pregnancy complications.

Previous studies reported that nulliparous women are considered to be at risk of pregnancy-induced hypertension and fetopelvic disproportion leading to operative delivery, whereas the grand multiparous are considered to be at risk for hemorrhage, malpresentation, anemia, uterine rupture and complications associated with chronic medical problems such as diabetes and hypertension (Samueloff et al, 1998).

Gravity, which is defined as the number of times a female is or has been pregnant, regardless of the pregnancy outcome, affect significantly the pregnancy complications (Borton, 2009). Figure 4.3 and Table 4.3 demonstrate the patient gravity distribution of the sample. The highest number of patients were found within G5 & G7 (12.5%) while the lowest were found for G11 (0 %). As illustrated in Table 4.3, pregnancy complication inversely proportional with the number of pregnancies. The lesser number of pregnancies (nulligravida), the higher possibility

of complications. Hence, The number of previous pregnancies and deliveries will also influence the risks associated with the current pregnancy.

In addition to that, Table 4.4 and figures 4.4 illustrate the duration of pregnancy, which is reported as the number of completed weeks of gestation. The highest frequency gestational age from 7-9.9 (23, 57.5%) of all procedures. Transvaginal ultrasound is important at 6–7 weeks from the LMP because it help in estimating the correct dating of gestational age since 10–15% of women will have inaccurate assignment of gestational age of more than 1 week based on menstrual history, identification of missed abortion, ectopic pregnancy, and C-section scar pregnancies and early identification of multiple gestation and correct determination of chorionicity. The standard of care for performing routine ultrasound examination at 6–7 weeks varies from country to country. The disadvantages of performing this examination routinely are related to cost, errors in diagnosing ectopic pregnancies that in fact are intrauterine, increased training requirements for providers, and potential biologic hazards to the fetus that are presently unknown (Richardson et al., 2015).

Table 4.5 and Figure 4.5 show the majority of the patients were house wives (67%) while the little portion of the patients are workers (33%). Previous studies (Nurminen 1998; Ahlborg 1995) have indicated that shift work, long working hours and prevalent workplace exposures such as lifting, standing and physical workload increase the risk of miscarriage, but the evidence is conflicting (Bonde et al., 2013). In this study the majority of pregnant ladies are house wives (67.5%). However, physical activities (standing, lifting, etc) can not be ruled out due to the style of life and women in this part of Sudan involve in physical activities in daily basis. It is important to note that, the EU Council Directive 92/85/EEC on the safety and health of pregnant women (CE, 1992), requires that pregnant women be informed about potential occupational hazards to pregnancy and the fetus, and that necessary preventive actions are taken, potentially including their exemption from night working subject to medical certification. Advice on such exemptions in

women with a healthy uncomplicated pregnancy should recognize the limitations in depth and quality of existing risk information on miscarriage. Women with at-risk pregnancies should receive tailored individual counseling.

Table 4.6 shows patient complain and clinical indication for ultrasound procedure. The dominant cause is vaginal bleeding along with abdominal pain (15 (37.5%) patients for each category. In 25% of the patients both indications are present. Table 4.7 and Figure 4.7 shows the cause of complications during pregnancy of the entire patients group. Fibroids (7(17.5%) and trauma (4 (10%) are the main causes while the vast majority remain unexplained (24 cases 60%). In literature, patients with spontaneous complete abortion usually present with a history of vaginal bleeding, abdominal pain, and passage of tissue. After the tissue passes, the vaginal bleeding and abdominal pain subsides. Other symptoms, such as fever or chills, are more characteristic of infection, such as in a septic abortion. Septic abortions need to be treated immediately, otherwise they may be life-threatening (Puscheck et al., 2017). Smoking, alcohol, and caffeine also have been studied as causes of early pregnancy loss. Some research suggests that smoking increases the risk, while other research suggests that it does not. Alcohol use in the first trimester may slightly increase the risk of early pregnancy loss, but the research is not clear. In any case, it is best to avoid smoking and drinking alcohol during pregnancy. Consuming 200 mg or less of caffeine a day (the amount in two cups of coffee) does not appear to increase the risk of early pregnancy loss. (ACOG, 2015)

5.2 Conclusions

This study intended to evaluate the cause of early pregnancy complications in Nyala city, western Sudan in order assess the causes of early pregnancy failure for the entire patient population. Sonography has a vita the role in diagnosis of early pregnancy failure with greater confidence. This is vital point in decreasing morbidity and even mortality from early pregnancy failure. Ultrasound significantly impacts diagnosis and management of patients with first trimester bleeding and other clinical conditions. Higher abortion incidences was noticed with certain clinical conditions include: history of vaginal bleeding, abdominal pain, and heavy workload. This study revealed higher complications were reported with patient's with low parity, older patients and inversely proportional with the number of pregnancies.

5.3 Recommendations

- Training of medical staff on early pregnancy failure detection and diagnosis is important to improve health care.
- Early pregnancy loss, or miscarriage, is a tragic event, therefore, patient care improvement is important.
- The author recommend this study should be widen into other localities of rural areas is Darfur in order to have wide information which may help decision makers on health care planning.
- Ultrasound, if available, is the preferred modality to verify the early pregnancy failure

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Appendices

Appendix 1

Image 1: Missed abortion of IUP for a 22years old female patient c/o bleeding, with 10wks of pregnancy(no heart activity)

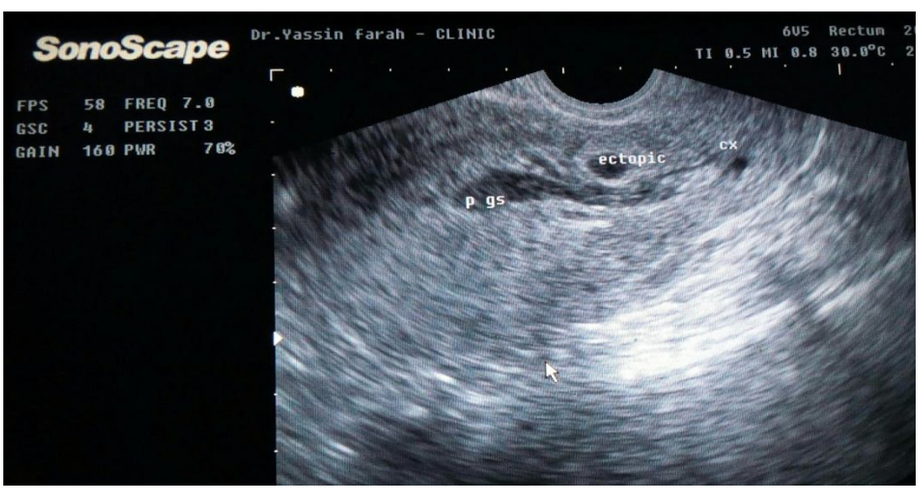

Image 2: Scar site Ectopic pregnancy of 27years old female patient, 5w pregnancy, complain of bleeding and cramping

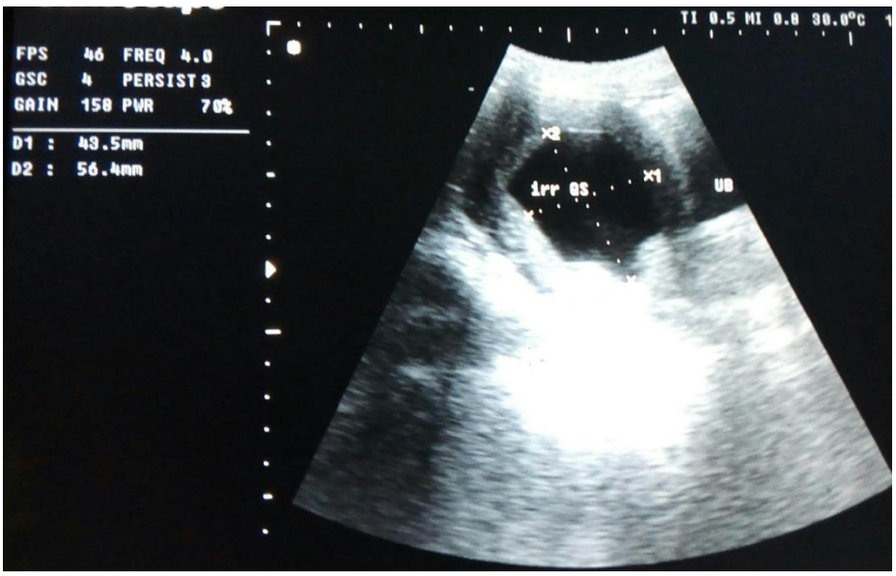

Image 3: irregular GS for inevitable pregnancy A 25year old female 6w pregnant and c/o abdominal pain, no heart activity

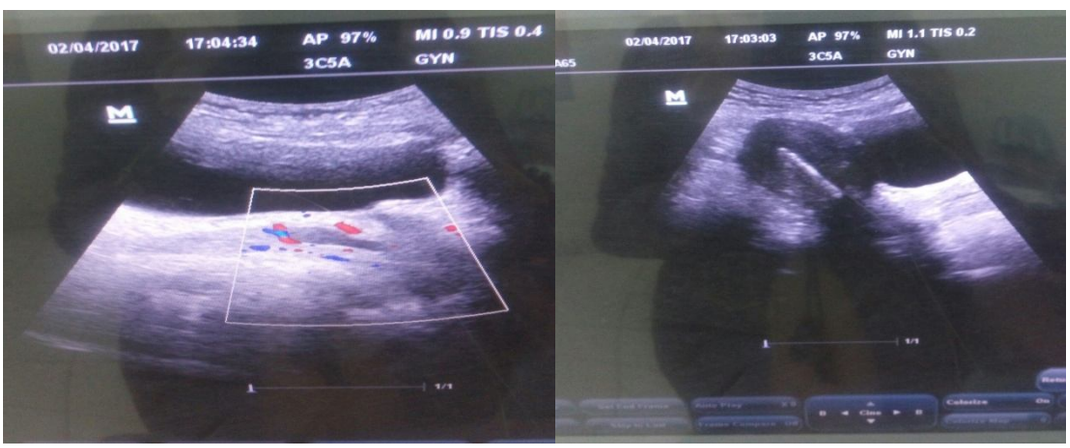

Image 4: cervical ectopic pregnancy of 29years old female patient, 7w pregnancy, complain of bleeding and abdominal pain, she have IUCD

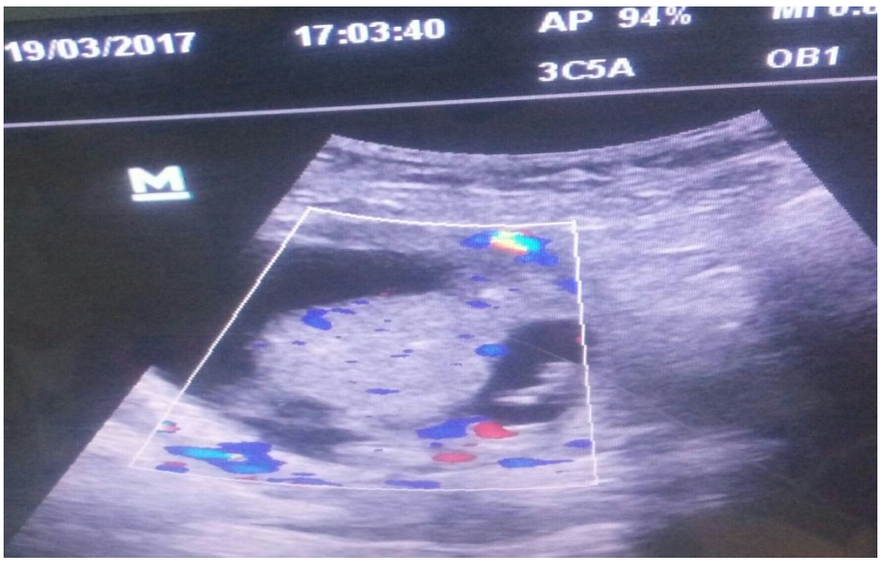

Image 5: A 35years old female patient, 11w pregnancy , c/o abdominal pain (with a viable embryo), and a large fibroid intramural. The mass shows absence of degenerative changes or calcification, Color Doppler image of the uterus shows rim of vessels around the fibroid.

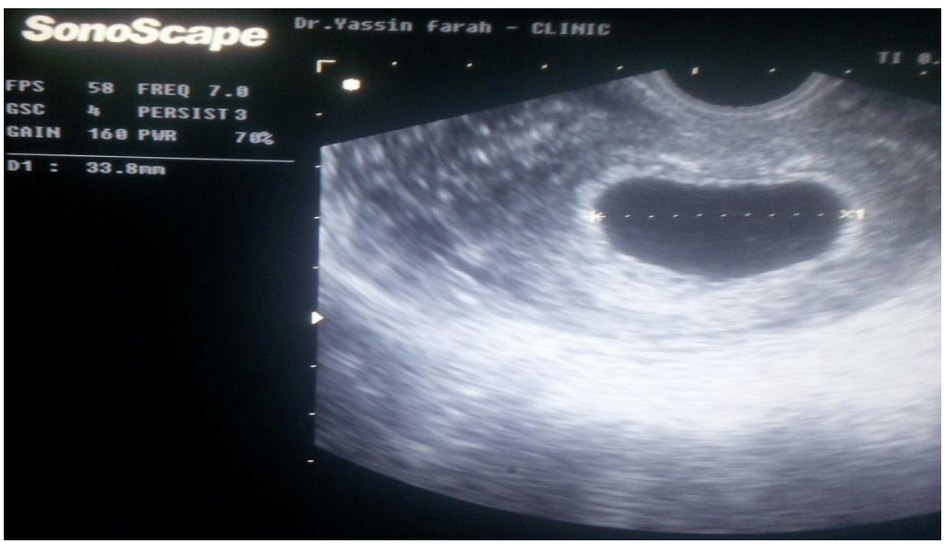

Image 6: A 5w pregnancy with blighted ovum for 35years old female patient with abdominal pain (no heart activity).

Image 7: A 5w pregnancy with blighted ovum and mega yolk sac (size 14.2mm) for 46years old female patient with vaginal bleeding

Image 8: Incomplete abortion pregnancy, show retained products in the uterus, 7W pregnancy and 32 years old female patient

Image 9: Complete miscarriage 25 years old pregnancy woman with 6Wpregnancy (test positive), she c/o bleeding

A B

Image 10: (B) partial mole in 19 years old female patient at 8 w pregnancy, in (A) show dead embryo and thica luten cyst in the ovary

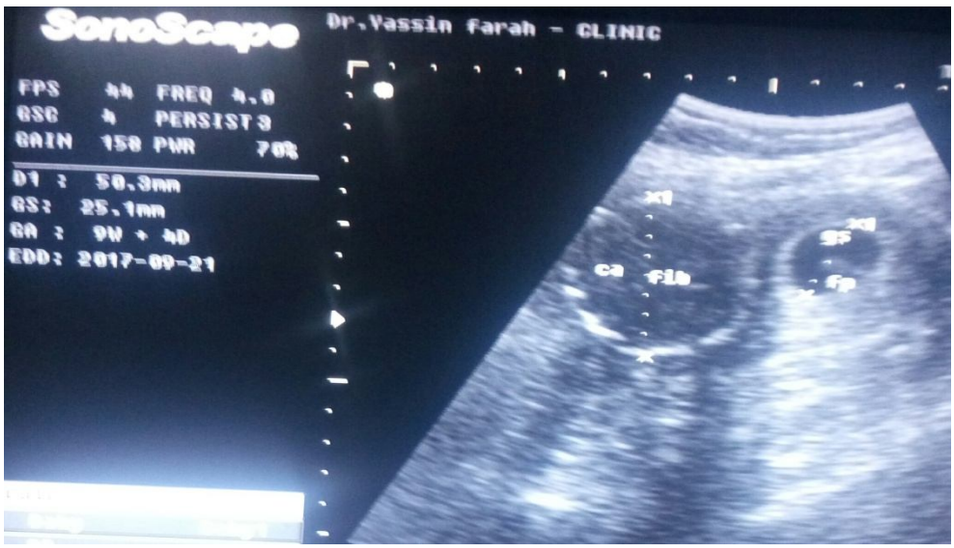

Image 11 : A 37years old female patient, 9w pregnancy , c/o abdominal pain (with a viable embryo), and a large calcified fibroid(50.3*25.1 mm)

Image 12: tubal ectopic pregnancy(viable embryo) of 19years old female patient, 5w pregnancy, complain of bleeding and abdominal pain, show pseudo GS in the uterus

Image 13: Mindray DCN6 2016 ultrasound machine

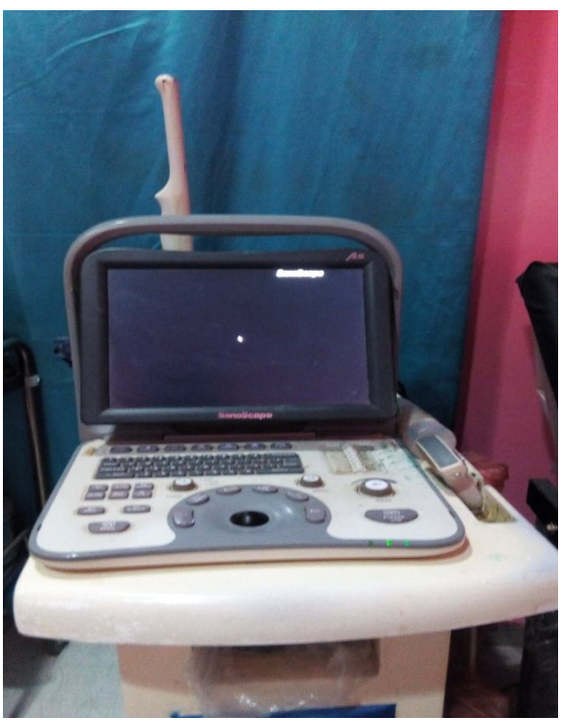

Image 14: SonoScape A5 ultrasound machine

Image 15: Mindray DP 1100 plus ultrasound machine

Appendix 2

Data collecting sheet

no	
age	( ) years
gravity	
parity	
GA	( ) weeks
occupation	House wife ( ) Worker ( )
Presenting complain	Vaginal bleeding( ) abdominal pain ( )
Possible cause complications	Fibroid ( ) uterine abnormality( ) trauma ( ) Febrile disease ( ) unexplained( ) others( )
Ultrasound finding	Uterine size: normal( )
	Cavity content: retained products( ) GS( ) empty( ) viable embryo( ) Dead embryo( )
Type of complication	Threatened miscarriage( ) complete miscarriage( ) incomplete miscarriage( ) Missed miscarriage ( ) inevitable abortion ( ) blighted ovum ( ) ectopic pregnancy ( ) molar pregnancy ( )