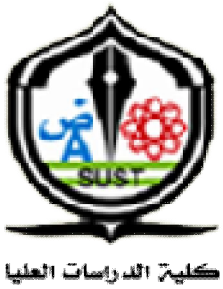

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Role of Ultrasound in Detection of Urinary Tract Infections as a Cause of Abortion

دور الموجات فوق الصوتية في الكشف عن التهابات المسالك البولية كسبب للاجهاض

A Thesis Submitted for Partial Fulfillment of Requirements of M.SC Degree in Diagnostic Medical Ultrasound

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Dedication

Overall I dedicate this work for my parent, then to my small and big family, my friends,and for everyone who teach me something through my educational Journey.

Special dedication to my college professors, and my collages whom teach me and always they been supportive.

I dedicate this research to my country’s doctors in a form of a tiny light to make them able to see our heath problems with special view which matching our realty.

Acknowledgement

My gratefulness to my supervisor Dr. AasmaEbrahimAhamed for here great effort in the advising and correcting me during this research.

Special acknowledgement to the ultrasound department of Ashik Mohamed Ali Fadul hospital By giving me a chance to collect the research data.

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Abbreviations

Abbreviation	Meaning
UTI	Urinary Tract Infection
DDSS	Double Decidual Sac Sign
CDC	Center of Disease Control
PID	Pelvic Inflammatory Disease
SPSS	Statistical Package for the Social Sciences
HIV	Human Immune deficiency Virus

Abstract

This research is designed to detect the urinary tract infection (UTI) as common cause of abortion using the ultrasound B-mode scan. At August 2016, in Alshik Mohamed Ali Fadull teaching hospital for obstetrics and gynecology in Omdurman city, republic of Sudan, the pelvic and kidneys of 100 aborted women were examined using B-mode scan, with transvaginal and convex probes for the pelvic examination, and convex porbe alone for the kidneys, andbeside that the clinical history of symptoms and signs of urinary tract infection just before the onset of abortion was taken. And the result was 95% of cases found to be have sonographic feature of cystitis, 71% have sonographic feature of pyelonephritis, 100% have symptoms and signs of urinary tract infections, 15% have sonographic feature of pelvic inflammatory disease, so with these results the UTI is considered as common cause of abortions.

ملخص الدراسة

صمم هذا البحث للكشف عناللتهابات المسالك البولية كمسبب للاجهاض باستخدام الموجاتفوقالصوتية بواسطة نمط الكشف-ب. في شهر اغسطس لسنة 2016 , في مستشفي الشيخ محمد علي فضل التعليمي لامراض النساء والتوليد بمدينة ام درمان, جمهورية السودان, تم الكشف علي حوض وكلي 100 سيدة لديها حالة اجهاض تلقائي, باستخدام جهاز الموجات فوفق الصوتيةبواسطة نمط الكشف- ب, مستخدمين مسبار الكشف عن طريق المهبل وعن طريق البطن, وهذا للكشف علي الحوض, اما الكشف علي الكلي فتم باستخدام مسبار الكشف عن طريق البطن فقط, بجانب ذلك تم اخذ التاريخالمرضي لاعراض ودلالات الاصابة بالتهابات المسالك البولية قبل الاصابة بالاجهاض مباشرة.نتيجة البحث كانت ان 95% من السيدات وجد لديهن علامات التهاب المثانة بتصوير الموجات فوق الصوتية, 71% منهن لديهم علامات الاصابة بالتهابات الكلي بتصوي الموجات فوقالصوتية, 100% من السيدات لديهم تاريخ مرضي حالي بالاصابة بالتهابات المسالك البولية,و 15% من السيدات لديهم سائل حر الحركة في التجويف الخلفي للرحم مما يشير الي الاصابة بالتهابات الحوض, من كل هذة النتائج يمكن ان نعتبر ان التهابات المسالك البولية من اهم الاسباب المؤدية الي الاجهاض.

Chapter One

Chapter One

1- 1Introduction:

Abortion is usually defined as pregnancy termination prior to 20 weeks' gestation or less than 500-g birth weightMiscarriage is the most common complication of pregnancy; it has been estimated that the overall miscarriage rate is around 50%. abortion divided in to two types spontaneous and induced, spontaneous abortion occur without medical or mechanical intervention.spontaneous abortion has many forms including missed abortion, blighted ovum, complete abortion, and incomplete abortion, also has a numbers of causes such as, chromosomal abnormalities of the embryo, congenital or acquired uterine abnormalities, autoimmune disease, chronic debilitating diseases, cervical incompetence, drugs or environmental toxins, physical trauma, dietary deficiency, endocrine abnormalities, and infections(F. Gary Cunningham et al 2005).

1-2 Problem of the study:

Abortion is the common complications that occur in the first trimester, and has many causes and the detection of the exact cause usually done after the management of abortion within a week, so this research well help in detection one of the causes of abortion using the ultrasound examination at the time of occurrence of the abortion, that cause is UTI.

1-3 Justification:

The UTI is diagnosed by many ways, such as urine analysis and urine culture, which cannot be diagnostic tool due to contamination of the urine sample with the products of the conception, so the fastest and easiest wayis ultrasound examination of the urinary system, and when the ultrasound examination isroutinely done

during management of the abortion, there for it ishelpful to scan the urinary system to detect the presence of UTI which is one of the causes of abortion, that known in the textbooks under the title of infection, so the UTI is the one of these types of infections that can affect the pregnant women and lead to the abortion.

1-4 Objectives:

1-4-1 General objective:

The main purpose of this study is to identify the UTI as a common cause of abortion in the Sudanese women.

1-4-2 Specific objectives:

- To make suggestion to creation a new stander protocol of ultrasound examination of aborted women, including the urinary system, to report the presence or absence of UTI.
- To identify the common type of abortion associated with UTI.
- To detect the common gestational age when the abortion thatinduced by UTI occur.

Chapter Two

Literature review

2-1 Anatomy:

2-1-1 Anatomy of uterus:

The uterus is a hollow, pearshaped organ with thick muscular walls. In the young nulliparous adult, it measures 3 in.(8 cm) long, 2 in. (5 cm) wide, and 1 in. (2.5 cm) thick. It is divided into the fundus, body, and cervix .The fundus is the part of the uterus that lies above the entrance of the uterine tubes.Thebody is the part of the uterus that lies below the entrance of the uterine tubes.The cervix is the narrow part of the uterus. It pierces the anterior wall of the vagina and is divided into the supravaginaland vaginal parts of the cervix.Thecavity of the uterine body is triangular in coronal section, but it is merely a cleft in the sagittal plane. The cavity of the cervix, the cervical canal, communicates with the cavity of the body through the internal osand with that of the vagina through the external os. Before the birth of the first child, the external os is circular. In a parouswoman, the vaginal part of the cervix is larger, and the external os becomes a transverse slit so that it possesses an anterior lip and a posterior lip(Richard s .Snell.et al,2012).

2-1-1-1 Relations of the uterus:

Anteriorly: The body of the uterus is related anteriorly to the uterovesical pouch and the superior surface of thebladder. The supravaginal cervix is related to the superior surface of the bladder. The vaginal cervix is related to the anterior fornix of the vagina.

Posteriorly: The body of the uterus is related posteriorly to the rectouterine pouch (pouch of Douglas) with coils of ileum or sigmoid colon within it.

Laterally: The body of the uterus is related laterally to the broad ligament and the uterine artery and vein. The supravaginal cervix is related to the ureter as it passes

forward to enter the bladder. The vaginal cervix is related to the lateral fornix of the vagina. The uterine tubes enter the superolateral angles of the uterus, and the round ligaments of the ovary and of the uterus are attached to the uterine wall just below this level(Richard s .Snell.et al,2012).

2-1-1-2 Function of the uterus:

The uterus serves as a site for the reception, retention, and nutrition of the fertilized ovum(Richard s .Snell.et al,2012).

2-1-1-3 Positions of the Uterus:

In most women, the long axis of the uterus is bent forward on the long axis of the vagina. This position is referred to as anteversion of the uterus. Furthermore, the long axis of the body of the uterus is bent forward at the level of the internal os with the long axis of the cervix. This position is termed anteflexionof the uterus. Thus, in the erect position and with the bladder empty, the uterus lies in an almost horizontal plane.In some women, the fundus and body of the uterus are bent backward on the vagina so that they lie in the rectouterine pouch (pouch of Douglas). In this situation, the uterus is said to be retroverted.If the body of the uterus is, in addition, bent backward on the cervix, it is said to be retroflexed(Richard s .Snell.et al,2012).

2-1-1-4: Blood Supply of the uterus:

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

uterine vein follows the artery and drains into the internal iliac vein.Lymph Drainage:The lymph vessels from the fundus of the uterus accompany the ovarian artery and drain into the para-aortic nodes at the level of the first lumbar vertebra. The vessels from the body and cervix drain into the internal and external iliac lymph nodes. A few lymph vessels follow the round ligament of the uterus through the inguinal canal and drain into the superficial inguinal lymph nodes(Richard s .Snell.et al,2012).

2-1-1-5 Nerve Supply of the uterus:

Sympathetic and parasympathetic nerves from branches of the inferior hypogastric plexuses(Richard s.Snell.et al,2012).

2-1-1-6 Supports of the Uterus:

The uterus is supported mainly by the tone of the levatoresani muscles and the condensations of pelvic fascia, which form three important ligaments:The Transverse Cervical, Pubocervical, and Sacrocervical Ligaments(Richard s .Snell.et al,2012).

2-1-1-7Uterus in Pregnancy:

During pregnancy, the uterus becomes greatly enlarged as a result of the increasing production of estrogens and progesterone, first by the corpus luteum of the ovary and later by the placenta. At first, it remains as a pelvic organ, but by the third month the fundus rises out of the pelvis, and by the ninth month it has reached the xiphoid process. The increase in size is largely a result of hypertrophy of the smooth muscle fibers of the myometrium, although some hyperplasia takes place(Richard s .Snell. et al,2012).

2-1-2 Anatomy of the Urinary Bladder:

The urinary bladder is situated immediately behind the pubic bones . Because of the absence of the prostate, the bladder lies at a lower level than in the male pelvis, and the neck rests directly on the upper surface of the urogenital diaphragm. The close relation of the bladder to the uterus and the vagina is of considerable clinical importance.The apex of the bladder lies behind the symphysis pubis. The base, or posterior surface, is separated by the vagina from the rectum. The superior surface is related to the uterovesicalpouch of peritoneum and to the body of the uterus. The inferolateral surfaces are related in front to the retropubic pad of fat and the pubic bones. More posteriorly, they lie in contact with the obturatorinternus muscle above and the levatorani muscle below. The neck of the bladder rests on the upper surface of the urogenital diaphragm(Richard s .Snell.et al,2012).

2-1-3Anatomy of the Kidneys:

The two kidneys function to excrete most of the waste products of metabolism. They play a major role in controlling the water and electrolyte balance within the body and in maintaining the acid–base balance of the blood. The waste products leave the kidneys as urine, which passes down the ureters to the urinary bladder, located within the pelvis. The urine leaves the body in the urethra.The kidneys are reddish brown and lie behind the peritoneum high up on the posterior abdominal wall on either side of the vertebral column; they are largely under cover of the costal margin. The right kidney lies slightly lower than the left kidney because of the large size of the right lobe of the liver. With contraction of the diaphragm during respiration, both kidneys move downward in a vertical direction by as much as 1 in. (2.5 cm). On the medial concave border of each kidney is a vertical slit that is bounded by thick lips of renal substance and is called the hilum. The hilum extends into a large cavity called the renal sinus. The hilum transmits, from the front backward, the renal vein, two branches of the renal artery, the ureter, and the

thirdbranch of the renal artery. Lymph vessels and sympathetic fibers also pass through the hilum(Richard s .Snell. et al,2012).

2-2 Physiology:

2-2-1Physiology of pregnancy:

2-2-1-1 Entry of the Ovum into the Fallopian Tube (Oviduct):

When ovulation occurs, the ovum,along with a hundred or more attached granulosa cells that constitute thecoronaradiata, is expelled directly into the peritoneal cavity and must thenenter one of the fallopian tubes to reach the cavity of the uterus. The fimbriated ends of each fallopian tube fall naturally around the ovaries. The inner surfaces of the fimbriated tentacles are lined with ciliated epithelium, and the ciliaare activated by estrogen from the ovaries, which causes the cilia to beat towardthe opening, or ostium,of the involved fallopian tube. One can actually see aslow fluid current flowing toward the ostium. By this means, the ovum entersone of the fallopian tubes.It seems likely that many ova might fail to enter the fallopian tubes. However,on the basis of conception studies, it is probable that as many as 98 percentsucceed in this task. Indeed, in some recorded cases, women with one ovaryremoved and the opposite fallopian tube removed have had several childrenwith relative ease of conception, thus demonstrating that ova can even enterthe opposite fallopian tube(Arthur C. Guyton. et al, 2006)**.**

2-2-1-2 Fertilization of the Ovum:

After the male ejaculates semen into the vagina duringintercourse, a few sperm are transported within 5 to 10 minutes upward fromthe vagina and through the uterus and fallopian tubes to the ampullae of thefallopian tubes near the ovarian ends of the tubes. This transport of the spermis aided by contractions of the uterus and fallopian tubes stimulated byprostaglandins in the male seminal fluid and also by oxytocin released from theposterior pituitary gland of the female during her orgasm. Of the almost half abillion sperm deposited in the vagina, a few thousand

succeed in reaching eachampulla.Fertilization of the ovum normally takes place in the ampulla of one of thefallopian tubes soon after both the sperm and the ovum enter the ampulla. Butbefore a sperm can enter the ovum, it must first penetrate the multiple layers of granulosa cells attached tothe outside of the ovum (the coronaradiata) and thenbind to and penetrate the zonapellucida surroundingthe ovum itself.Once a sperm has entered the ovum (which is stillin the secondary oocyte stage of development), theoocyte divides again to form the mature ovum plus a second polar body that is expelled. The mature ovum still carries in its nucleus (now called the femalepronucleus) 23 chromosomes. One of these chromosomes is the female chromosome, known as the Xchromosome.In the meantime, the fertilizing sperm has alsochanged. On entering the ovum, its head swells to forma male pronucleus. Later, the23 unpaired chromosomes of the male pronucleusandthe 23 unpaired chromosomes of the female pronucleus align themselves to reform a complete complement of 46 chromosomes (23 pairs) in the fertilizedovum (Arthur C. Guyton. et al, 2006).

2-2-1-3 Implantation of the Blastocyst in the Uterus:

After reaching the uterus, the developing blastocystusually remains in the uterine cavity an additional 1 to3 days before it implants in the endometrium; thus implantation ordinarily occurs on about the fifth toseventh day after ovulation. Before implantation,the blastocyst obtains its nutrition from the uterineendometrial secretions, called “uterine milk.”Implantation results from the action of trophoblast cells that develop over the surface of the blastocyst.These cells secrete proteolytic enzymes that digest andliquefy the adjacent cells of the uterine endometrium.Some of the fluid and nutrients released are activelytransported by the same trophoblast cells into the blastocyst, adding more sustenance for growth. Once implantation has taken place, the trophoblast cells and other adjacent cells (from theblastocyst

and the uterine endometrium) proliferaterapidly, forming the placenta and the various membranes of pregnancy (Arthur C. Guyton. et al, 2006).

2-2-2 Physiology of the kidneys:

Most people are familiar with one important function of the kidneys to rid the body of waste materials that are either ingested or produced bymetabolism. A second function that is especiallycritical is to control the volume and composition ofthe body fluids. For water and virtually all electrolytes in the body, the balancebetween intake (due to ingestion or metabolic production) and output (due toexcretion or metabolic consumption) is maintained in large part by the kidneys.This regulatory function of the kidneys maintains the stable environment of thecells necessary for them to perform their various activities.The kidneys perform their most important functions by filtering the plasmaand removing substances from the filtrate at variable rates, depending on theneeds of the body. Ultimately, the kidneys "clear" unwanted substances fromthe filtrate (and therefore from the blood) by excreting them in the urine whilereturning substances that are needed back to the blood. It is important to recognize that the kidneys serve multiple, including the following:

- Excretion of metabolic waste products and foreign chemicals.
- Regulation of water and electrolyte balances.
- Regulation of body fluid osmolality and electrolyte concentrations.
- Regulation of arterial pressure.
- Regulation of acid-base balance.
- Secretion, metabolism, and excretion of hormones.
- Gluconeogenesis(Arthur C. Guyton. et al, 2006).

2-2-3Physiology of the urinary bladder:

The urinary bladder is a smoothmuscle chamber composed of two main parts: (1) thebody, which is the major part of the bladder in whichurine collects, and (2) the neck,which is a funnel-shapedextension of the body, passing inferiorly and anteriorlyinto the urogenital triangle and connecting with theurethra. The lower part of the bladder neck is also called the posterior urethra because of its relation to theurethra.The smooth muscle of the bladder is called the detrusor muscle. Its muscle fibers extend in all directions and,when contracted, can increase the pressure in thebladder to 40 to 60 mm Hg. Thus, contraction of thedetrusor muscle is a major step in emptying the bladder.Smooth muscle cells of the detrusor muscle fuse with one another so that low resistance electrical pathways exist from one muscle cell to the other. Therefore, anaction potential can spread throughout the detrusormuscle, from one muscle cell to the next, to cause contraction of the entire bladder at once.On the posterior wall of the bladder, lying immediately above the bladder neck, is a small triangular areacalled the trigone. At the lowermost apex of the trigone,the bladder neck opens into the posterior urethra, andthe two ureters enter the bladder at the uppermostangles of the trigone. The trigone can be identified bythe fact that its mucosa,the inner lining of the bladder,is smooth, in contrast to the remaining bladder mucosa,which is folded to form rugae. Each ureter, as it entersthe bladder, courses obliquely through the detrusormuscle and then passes another 1 to 2 centimetersbeneath the bladder mucosa before emptying into thebladder.The bladder neck (posterior urethra) is 2 to 3 centimeters long, and its wall is composed of detrusormuscle interlaced with a large amount of elastic tissue.The muscle in this area is called the internal sphincter.Its natural tone normally keeps the bladder neck andposterior urethra empty of urine and, therefore, prevents emptying of the bladder until the pressure in themain part of the bladder rises above a critical threshold.Beyond the posterior urethra, the urethra passes through the urogenital diaphragm, which contains a layer of muscle called

the external sphincter of thebladder. This muscle is a voluntary skeletal muscle, incontrast to the muscle of the bladder body and bladderneck, which is entirely smooth muscle. The externalsphincter muscle is under voluntary control of thenervous system and can be used to consciously preventurination even when involuntary controls are attempting to empty the bladder(Arthur C. Guyton. et al, 2006).

2-3Pathology:

Hemorrhage into the decidua basalis, followed by necrosis of tissues adjacent to the bleeding, usually accompanies abortion. If early, the ovum detaches, stimulating uterine contractions that result in its expulsion. When a gestational sac is opened, fluid is commonly found surrounding a small macerated fetus (F. Gary Cunningham,et al.2005).

2-4Symptoms and signs:

Bleeding usually begins first,and cramping abdominal pain follows a few hours toseveral days later. The pain may present as anterior andclearly rhythmic cramps; as a persistent low backache, associatedwith a feeling of pelvic pressure; or as a dull, midline,suprapubic discomfort. The combination of bleedingand pain usually indicates a poor prognosis for pregnancycontinuation(Charles R. B. et al. 2010).

2-5 Types of abortion:

2-5-1Complete abortion:

Refers to a documented pregnancy that spontaneously passes all of the products of conception. Before 10 weeks, the fetus and placenta are often expelled completely(Charles R. B. et al 2010).

2-5-1-1Sonographic appearance of complete abortion:

The endometrium is very thin and regular. The ultrasound appearances are therefore comparable to those of the non-pregnant uterus in the early proliferative phase(Trish Chudleigh, et al. 2004).

2-5-2 Incomplete abortion:

The cervix is open and the products of conception are not completely evacuated(Charles R. B. et al. 2010).

2-5-2-1Sonographic appearance of incomplete abortion:

- Diffuse retraction of the uterus cavity
- Echo-free zone in the cervix.
- Abnormally thick central cavity complex.
- Dense echo by the placenta parts.
- The sac irregular, partially collapsed,or filled with unhomogenous echo.
- May associate with retrochorodecidual hematoma.
- Endometrial thickness varies between 5 and 15 mm.
- Retained products are usually seen as a well defined area of hyperechoic tissue within the uterine cavity as opposed to blood clots that are more irregular (NarendraMalhorta, et al 2014).

2-5-3Missed abortion:

Is the retention of a failed intrauterine pregnancy for an extended period, usually defined as more than two menstrual cycles. These patients have an absence of uterine growth and may have lost some of the early symptoms of pregnancy(Charles R. B. et al. 2010).

2-5-3-1Sonographic appearance of missed abortion:

- Inability to visualization the embryonic heart beat in at least one week interval.
- Abnormal trophoplastic reaction: thin less than 2 mm or irregular or in complete or weakly echcogenic.
- Absent double decidual sac sign(DDSS).
- Abnormal pregestational venous flow(Carol M. Rumack, et al 2011).

2-5-4Therapeutic abortion:

It is the medical or surgical termination of pregnancy before the time of fetal viability. In 2004, 839,226 legal induced abortions were reported to the center of disease control (CDC). Medical and/or surgical complications are associated with all choices, with the fewest complications related to elective abortion in the first trimester.

The most common form of suction curettage for first trimester abortions is vacuum aspiration, requires a rigid cannula attached to an electric powered vacuum source. Alternatively, manual vacuum aspiration uses a similar cannula that attaches to a handheld syringe for its vacuum source. Second trimester abortions are most commonly performed through the cervix, using suction or extraction forceps, or by the use of prostaglandins, as in the form of intra-amniotic injections or vaginal suppositories. Outpatient medical abortion is an acceptable alternative to surgical abortion in appropriately selected women with pregnancies less than 49 days of gestation (calculated from the first day of the last menstrual period). Beyond this point, surgical abortion is the preferred method of early abortion. Three medications for early medical abortion have been widely studied and used: the antiprogestin,mifepristone (RU-486); the antimetabolite, methotrexate; and the prostaglandin, misoprostol. These agentscause abortion by increasing uterine contractility either byreversing the progesterone induced inhibition of contractions—mifepristone and methotrexate, or by stimulating the myometrium

directly misoprostol. Abortion with thismedical method is not always complete. As a result, the patient should be made aware that suction curettage may berequired(Charles R. B. et al. 2010).

2-5-5Threatened Abortion:

The clinical diagnosis of threatened abortion is presumed when a bloody vaginal discharge or bleeding appears through a closed cervical os during the first half of pregnancy. About half of women with a threatened abortion proceed to spontaneous abortion. Those who carry to viability a pregnancy complicated by threatened abortion are at greater risk for preterm delivery and an infant of low birth weight. There does not, however, appear to be a higher incidence of congenital malformations in these newborns(Charles R. B. et al. 2010).

2-5-6Septic Abortion:

2-5-6-1Definition of Septic Abortion:

Any abortion associated with clinical evidences of infection of the uterus and its contents is called septic abortion. Although clinical criteria vary, abortion is usually considered septic when there are:

- Rise of temperature of at least 100.4°F (38°C) for 24 hours or more.
- Offensive or purulent vaginal discharge.
- Other evidences of pelvic infection such as lower abdominal pain and tenderness(DC Dutta, et al. 2015).

2-5-6-2Incidence of Septic Abortion:

It is difficult to work out the overall incidence of septic abortion. About 10% of abortions requiring admission to hospital are septic. The majority of septic abortions are associated with incomplete, while in the majority of cases, the infection occurs following illegal induced abortion but infection can occur even after spontaneous abortion(DC Dutta, et al 2015).

2-5-6-3 Mode of infection of Septic Abortion:

The microorganisms involved in the sepsis are usually those normally present in the vagina (endogenous). The microorganisms are:

-Anaerobic—Bacteroides group (fragilis),anaerobic Streptococci, Clostridium welchii and tetanus bacillus.

- Aerobic—Escherichia coli (E. coli), Klebsiella, Staphylococcus, Pseudomonas and group A beta-hemolytic Streptococcus (usually exogenous), methicillin-resistant Staphylococcus aureus (MRSA). Mixed infection is more common. The increased association of sepsis in unsafe induced abortion is due to the fact that:

- Proper antiseptic and asepsis are not taken.
- Incomplete evacuation of the uterus.
- Inadvertent injury to the genital organs and adjacent structures, particularly the bowels(DC Dutta, et al. 2015).

2-5-7Blighted ovum:

It is a sonographic diagnosis. There is absence of fetal pole in a gestational sac with diameter of 3 cm or more. Uterus is to be evacuated once the diagnosis made(DC Dutta, et al. 2015).

2-6: Etiologyof abortion:

2-6-1Fetal factors:

Include abnormal zygotic development, andchromosomal abnormalities(F.Gary Cunningham, et al 2005).

2-6-2Maternal factors:

2-6-2-1Infections:

Are the accepted causes of late as well as early abortions.Transplacental fetal infections occur with most microorganisms and fetal losses could be caused by any Infections could be :

- Viral: Rubella, cytomegalovirus, variola, vaccinia or HIV.
- Parasitic : Toxoplasma, malaria.
- Bacterial: Ureaplasma, chlamydia, brucella. Spirochetes hardly cause abortion before 20th week because of effective thickness of placental barrier(F. Gary Cunningham, et al 2005).

2-6-2-2 Chronic Debilitating Diseases:

Such as tuberculosis or carcinomatosis,etc.(F. Gary Cunningham, et al.2005).

2-6-3-3Endocrine abnormalities:

Thyroid autoantibodies are associated with an increased incidence of spontaneous abortion, even in the absence of clinical hypothyroidism. In women with type 1 diabetes, the degree of metabolic control in early pregnancy is associated with an increased risk of spontaneous abortion and major congenital malformation(Charles R. B. et al. 2010).

2-6-3-4 Dietary deficiency.

2-6-3-5Drug use and environmental factors:

Tobacco, alcohol, caffeine, radiation, oral contraceptives or spermicidal agents, arsenic, lead, formaldehyde, benzene, and ethylene oxide(Charles R. B. et al. 2010).

2-6-3-6ImmunologicalFactors:

There are a number of genetic disorders of blood coagulation that may increase the risk of both arterial and venous thrombosis. Some of the better studied thrombophilias are caused by mutations of the gene for factor V Leiden, pro-thrombin G20210A mutation, antithrombin III, proteins C and S, and methylene tetrahydrofolatereductase (hyper-homocysteinemia). These are most commonly associated with recurrent miscarriage(Charles R. B. et al. 2010).

2-6-4Physical trauma.

2-6-5Uterine factors:

Large and multiple uterine leiomyomas are common, and they may cause miscarriage. In most instances, their location is more important than their size, with submucousleiomyomata playing a more significant role than others, presumably because of their effect on implantation. In utero exposure to diethylstilbestrol (DES) has been associated with abnormally shaped uteri as well as cervical incompetence and spontaneous abortion, Intrauterine synechiae (Asherman syndrome), a condition that is caused by uterine curettage with subsequent destruction and scarring of the endometrium, may also be a cause of spontaneous abortion(Charles R. B. et al. 2010).

2-6-6IncompetentCervix:

Failure of the cervix to remain closed, in the absence of uterine activity or membrane rupture, occurs in 0.5% to 1.0% of all pregnancies, with a recurrence risk of 30%(Charles R. B. et al. 2010).

2-7: Urinary tract infectionin the pregnancy:

Pregnancy is associated with variety of anatomical changes in women followed by hormonal and physical changes which increases the possibility of urinary stasis which in turn causes the backward flow of urine from bladder to ureters. This as a consequence of physical aberrations enhances the occurrence of UTI among

women during pregnancy. UTI may present as asymptomatic bacteriuria, acute cystitis (bladder infection) or pyelonephritis (kidney infection) Asymptomaticbacteriuria occurs in 2 % to 10 % of all pregnancies. If untreated, up to 30% of mothers may develop acute cystitis and up to 50 % acute pyelonephritis .E.Coli is the most common pathogen associated with asymptomatic bacteriuria (> 80 % of isolates).Staphylococcus saprophyticus is the second most frequently cultured uropathogen while other Gram-positive cocci, such as group B streptococci, are less common. Other organisms include Granegative bacteria such as klebsiella, proteus or enterobacteriaceae(South Australian Perinatal Practice Guidelines, et al. 2013).

2-8Risk factors of urinary tract infectionin the female:

Include the history of urinary tract infection, frequent or recent sexual activity, increasing parity, diabetes mellitus, obesity, anatomical congenital abnormalities, urinary tract calculi, neurologic disorders or medical conditions requiring indwelling or repetitive bladder catheterization, poor perineal hygiene, rectocele, cystocele, urethrocele, or uterovaginalProlapsed(Charles R. B. et al. 2010).

2-9Sign and symptoms of urinary tract infection:

2-9-1Lower urinary tract infection symptoms and signs:

Lower UTI typically present with symptoms of frequency, urgency, nocturia, or dysuria. The symptoms found vary somewhat with the site of the infection.Symptoms caused by irritation of the bladder or trigone include urgency, frequency, and nocturia. Irritation of the urethra leads to frequency and dysuria. Some patients may report suprapubic tenderness or urethral or bladder base tenderness. Fever is uncommon in women with uncomplicated lower UTI(Charles R. B. et al. 2010).

2-9-2Upper urinary tract infection symptoms and signs:

Acute pyelonephritis frequently occurs with a combination of fever and chills, flank pain, and varying degrees of dysuria, urgency, and frequency(Charles R. B. et al. 2010).

2-10Cystitis:

Inflammation of the urinary bladder is referred to as cystitis. Cystitis is more common in women secondary to the short length of the urethra. The infection continues as an ascending infection, moving from the urethra into the bladder. Cystitis can present clinically with dysuria, urinary frequency, lower abdominal pain, nocturia , and even hematuria(Carol M. Rumack, et al. 2011).

2-10-1Sonographic feature of cystitis:

Inflammation of the urinary bladder will presents itself sonographically as bladder wall focally or diffusely thickened, its diameter will exceed 4 mm in a distended state and more than 8mm in the post voiding condition. Within the lumen, echogenic, layering material may be noted(Carol M. Rumack, et al. 2011).

2-11Sonographic feature of acute pyelonephriris:

kidneys with acute pyelonephritis appear normal. However, ultrasound findings of pyelonephritis include the following :

- Renal enlargement
- Compression of the renal sinus
- Decreased echogenicity (secondary to edema) or increased echogenicity (potentially from hemorrhage)
- Loss of corticomedullary differentiation

- Poorlymarginated mass(es)
- Gas within the renal parenchyma

- Focal or diffuse absence of color Doppler perfusion corresponding to the swollen inflamed areas(Carol M. Rumack, et al.2011).

2-12Sonographic feature of chronic pyelonephritis:

Recurrent kidney infections or chronic obstruction may lead to scarring of the calices and renal pelvis. This is referred to as chronic pyelonephritis. Chronic pyelonephritis can lead to xanthogranulomatous pyelonephritis and endstage renal disease. Patients present clinically much like the patients with acute pyelonephritis in that they suffer from flank pain, fever, and evidence of a urinary tract infection.Sonographically, the kidneys will appear small, echogenic, and have lobulated borders(Steven M. Penny, et al. 2011).

Chapter Three

Chapter Three

Materials &Methods

3-1Ultrasound device:

The ultrasound device is SonoScape A6 is a black-and-white system with transabdominal probe 3-5 MHz and transvaginal probe 5-7 MHz, personal computer for data storage and analysis.

3-2 Study design:

This is cross sectional survey research, designed to detect the UTIs as a cause of abortion using the ultrasound B-mode scan for uterus, urinary bladder, and kidneys.

3-3Area of study:

This study is conducted in Alshik Mohamed Ali Fadull teaching hospital for obstetric and gynecology, in Omdurman city, republic of Sudan.

3-4Study duration:

This study is conducted duringAugust 2016.

3-5 Sample of the study:

The sample of the study is 100 of the aborted women whom presented to ultrasound clinic ofAlshik Mohamed Ali Fadull teaching hospital for obstetric and gynecology.

3-6 Inclusion criteria:

Any pregnant women presented to the ultrasound department complain of vaginal bleeding during the first 20 weeks of gestation.

3-7 Exclusion criteria:

The flowing are excluded from the sample of the research including pregnant women with vaginal bleeding and the gestational age more than 20 week, threaten abortion, and ectopic pregnancy.

3-8 Type of the collected data:

The collected data include the age, gestational age, type of abortion, presence or absence of cystitis, presence or absence of pyelonephritis, presence or absence of free fluid in cul-de-sac.

3-9 Method of data collection and storage:

The data collected in the data sheet and then storage in the computer in form of Excel sheet.

3-10 Scanning technique:

3-10-1Transabdominal scan:

In this research This is the first scanning technique used for all aborted women and done in the flowing sequences , the patient lying flat, supine, with exposed abdomen, then with transabdominal probe applied vertically in the suprapubic area for longitudinal view of the uterus, urinary bladder and cul-de-sac, then the probe tilted 90degree to obtain the transverse view of uterus, urinary bladder, ovaries,

and adenxa, and the cul-de-sac, Then probe shifted to right and left lumber area for scanning the kidneys.

3-10-2 Trasnvaginal scan:

Thisapproach is used in this research when the transabdomial scan failure to peck up acquired diagnosis of abortion, the transvaginal probe introduced vertically into the vagina by gentile rocking maneuver, the longitudinal view of the uterus is taken, then the probe rotated 90 degree for the cross sectional view of the uterus and deviated to the right side for viewing the right adenxa, and to the left for the left adenxa.

3-11 Data analysis:

The data is analyzed by using Statistical Package for the Social Sciences (SPSS). Using frequency tables, crosstab, bar plots, to inter present the variables and found relationship between them.

Chapter Four

Chapter Four

Result and data analysis

The100 aborted women is selected for this research to be examined by ultrasound to detected associated UTIs as a cause of abortion, the following data presented in frequency tables, crosstab, and bar chart as following:

Table 4-1: Present the number of cases and the type of thecollected data.

		Type of Abortion	Presence of Cystitis	Fluid in Cul-de-sac	Presence of Pyelonephritis	History of UTIS	Gestational Age	Age
N	Valid	100	100	100	100	100	100	100
	Missing	0	0	0	0	0	0	0

Table 4-2: Present the frequency of occurrence of types of abortion.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Missed Abortion	13	13.0	13.0	13.0
	Blighted Ovum	14	14.0	14.0	27.0
	Incomplete Abortion	39	39.0	39.0	66.0
	Complete Abortion	34	34.0	34.0	100.0
	Total	100	100.0	100.0	

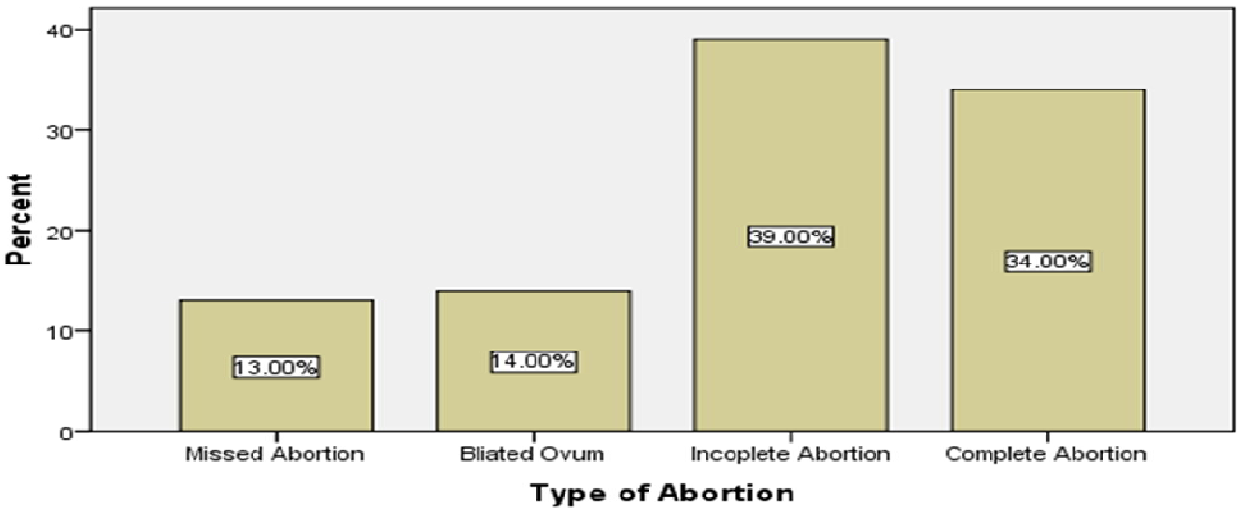


Figure 4-1. Show percentage of occurrence of each type of abortion.

Table 4-3. Present the frequency of the presence of fluid in cul-de-sacin association with abortion.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	positive	15	15.0	15.0	15.0
	negative	85	85.0	85.0	100.0
	Total	100	100.0	100.0	

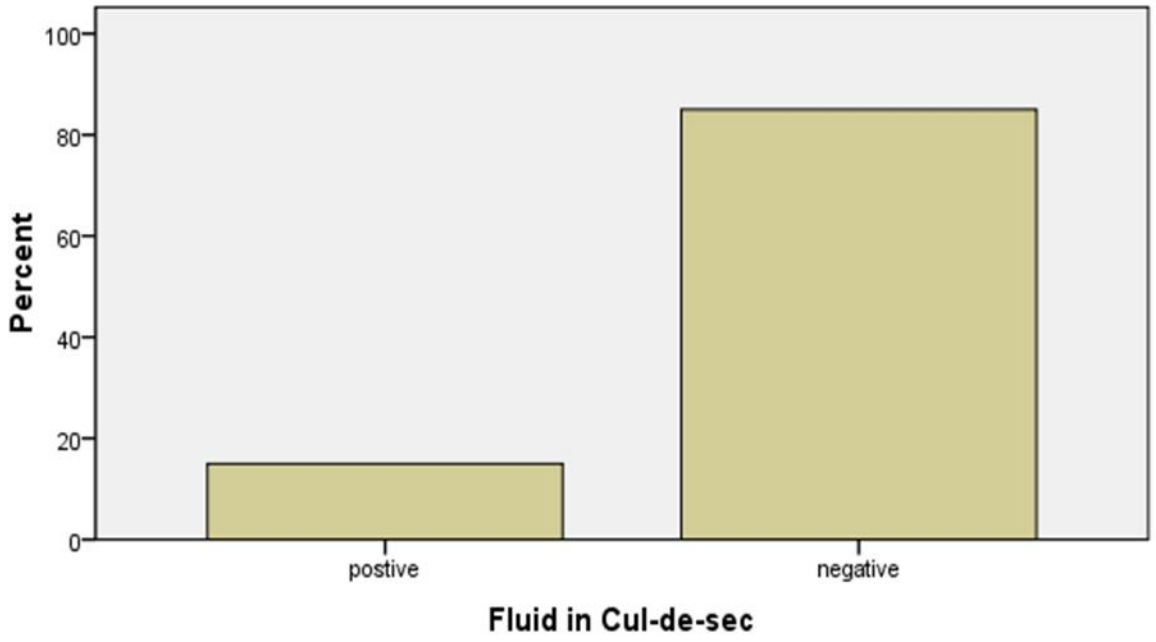


Figure 4-2. Show the percentage of presence of fluid in cul-de-sac in association with abortion.

Table 4-4. Present the frequency of coexistence of pyelonephritis with abortion.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	positive	71	71.0	71.0	71.0
	negative	29	29.0	29.0	100.0
	Total	100	100.0	100.0	

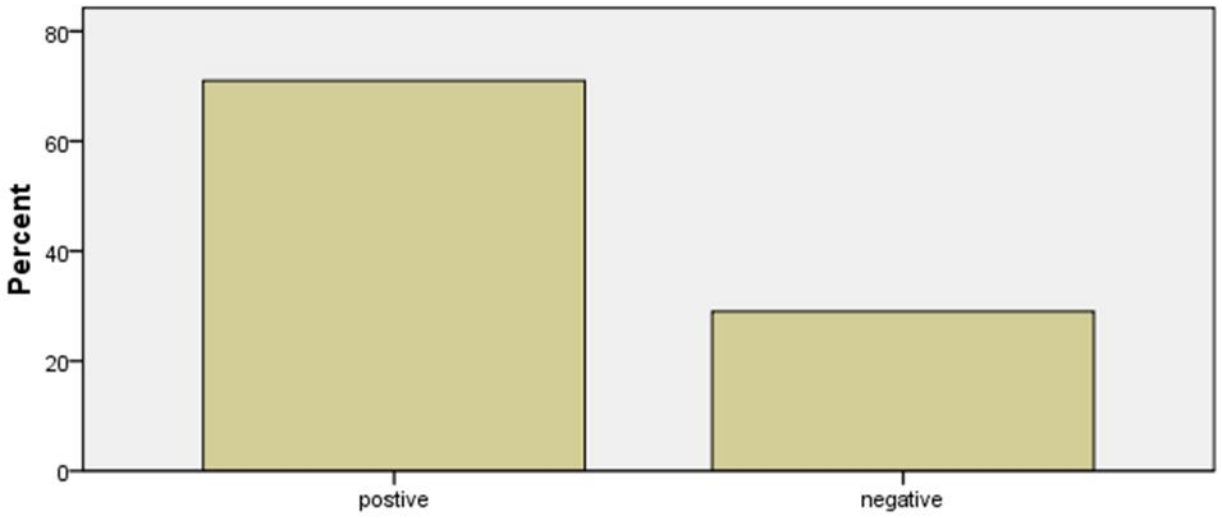


Figure 4-3. Show the percentage of coexistence of pyelonephritis with abortion.

Table 4-5. Present the frequency of coexistence of cystitis with abortion.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	positive	95	95.0	95.0	95.0
	negative	5	5.0	5.0	100.0
	Total	100	100.0	100.0	

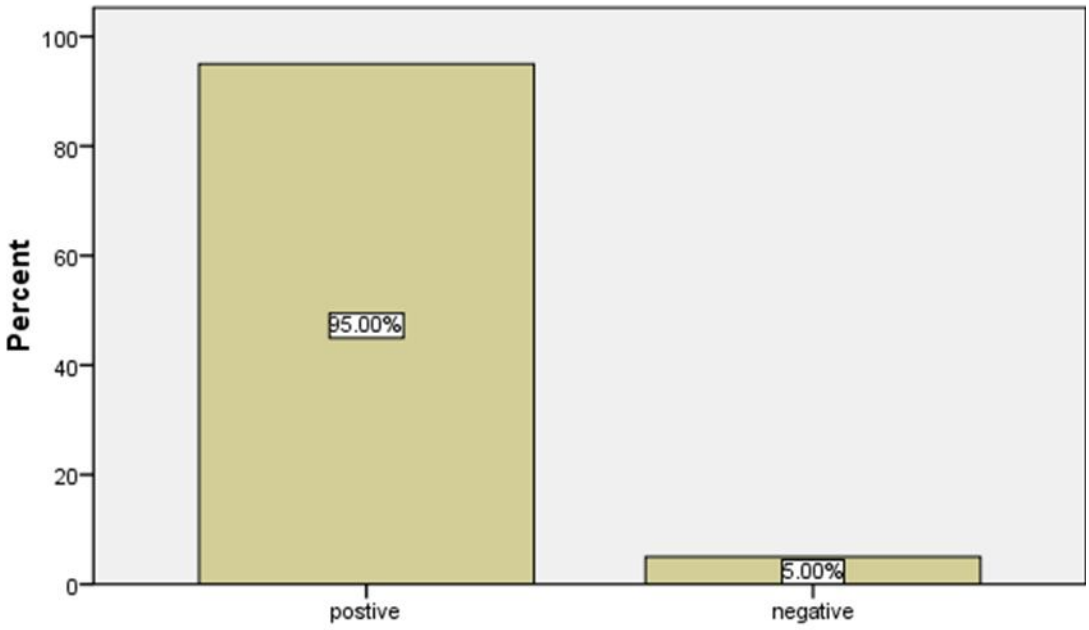


Figure 4-4. Show the percentage of coexistence of cystitis with abortion.

Table 4-6. Present the frequency of the presence of current symptoms of UTIs in abortedwomen.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	positive	100	100.0	100.0	100.0

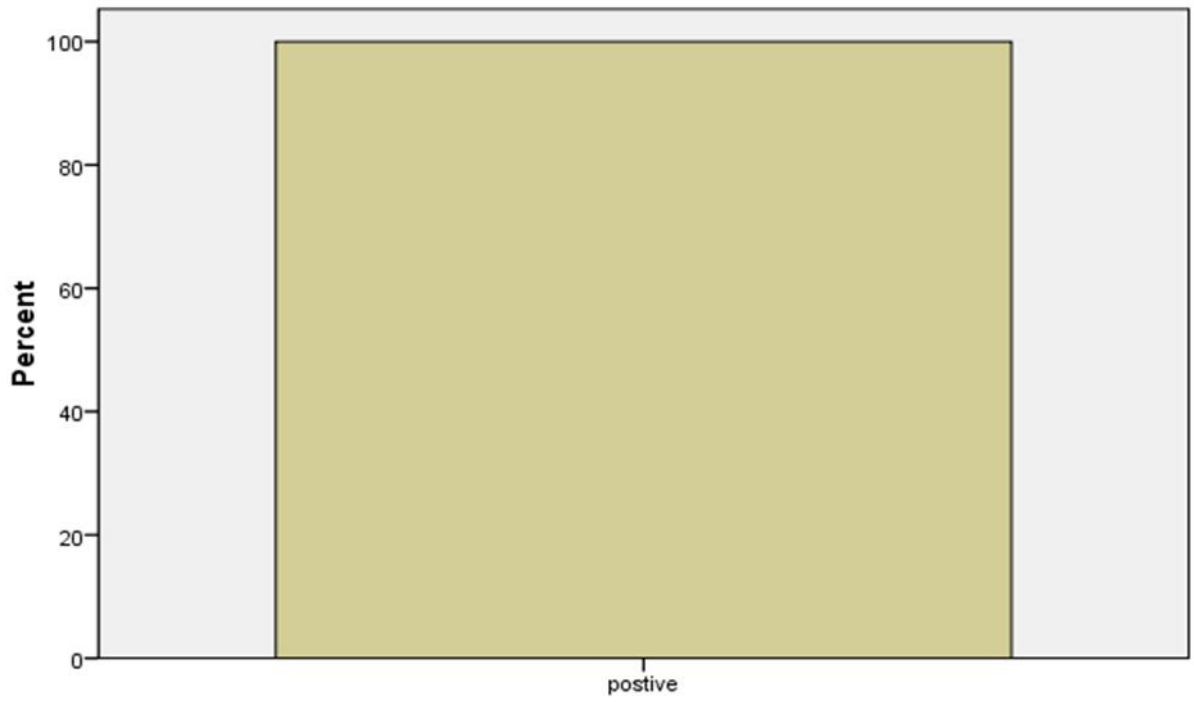


Figure 4-5. Show the percentage of presence of current symptoms of UTIs in aborted women.

Table 4-7. Present the common gestational age range when the abortion occurs.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5-10	63	63.0	63.0	63.0
	10-15	29	29.0	29.0	92.0
	15-20	8	8.0	8.0	100.0
	Total	100	100.0	100.0	

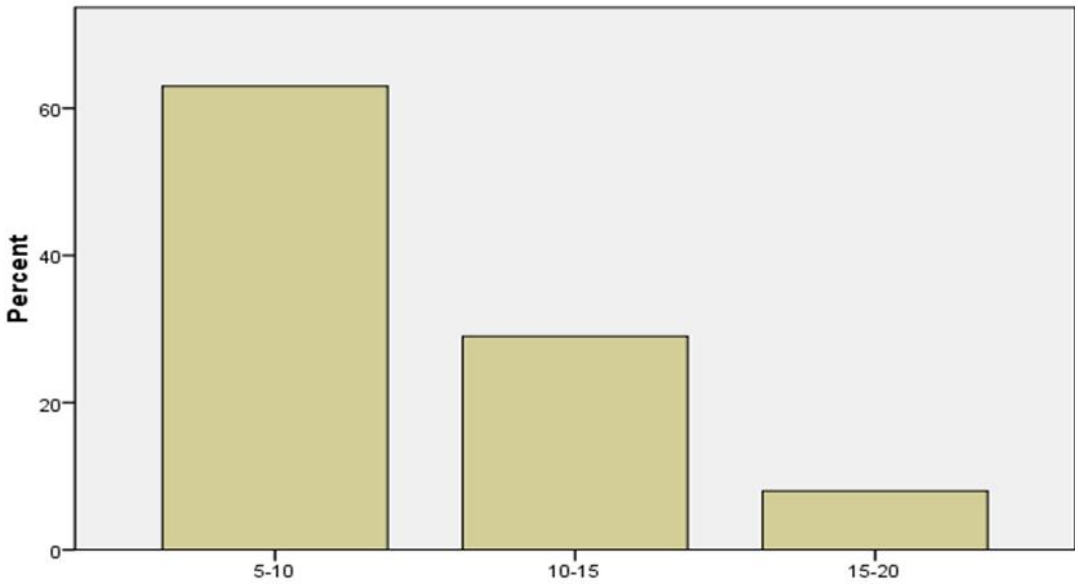


Figure 4-6. Show the common gestational age range when the abortion occurs.

Table 4-8. Present the common gestational age range when the each type of abortion occurs.

Count						
		Type of Abortion				
		Missed Abortion	Blighted Ovum	Incomplete Abortion	Complete Abortion	Total
Gestational Age	5-10	5	9	22	27	63
	10-15	8	5	10	6	29
	15-20	0	0	7	1	8
Total		13	14	39	34	100

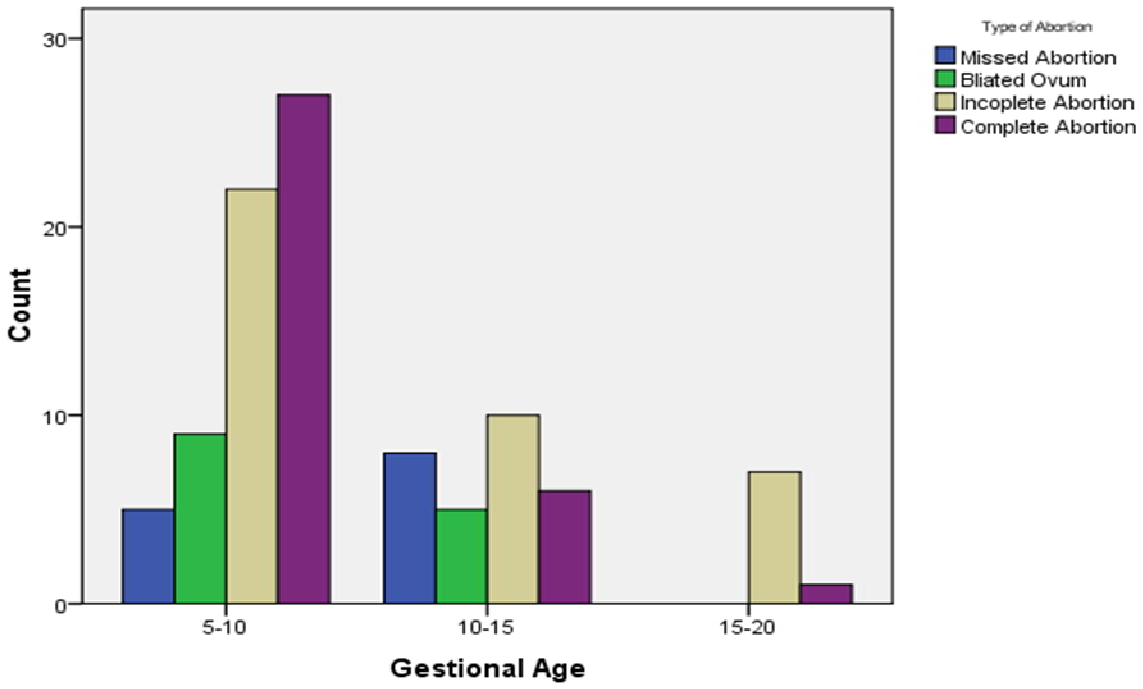


Figure 4-7. Show number of each type of abortion in different gestationalage ranges.

Table 4-9. Present the number of aborted women whom have cystitis in different gestational age ranges.

Count				
		Presence of Cystitis		
		positive	negative	Total
Gestational Age	5-10	58	5	63
	10-15	29	0	29
	15-20	8	0	8
Total		95	5	100

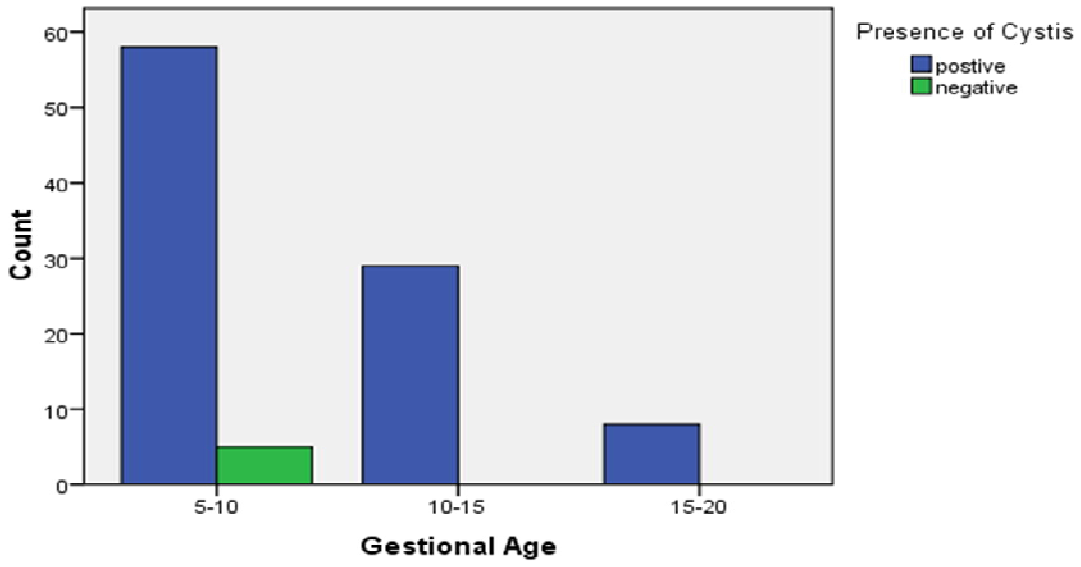


Figure 4-8. Show the number of aborted women whom have cystitis in different gestational age ranges.

Table 4-10. Present the frequency of the presence of free fluid in the cul-de-sac in association with abortion in different gestational age ranges.

Count				
		Fluid in Cul-de-sac		
		positive	negative	Total
Gestational Age	5-10	8	55	63
	10-15	7	22	29
	15-20	0	8	8
Total		15	85	100

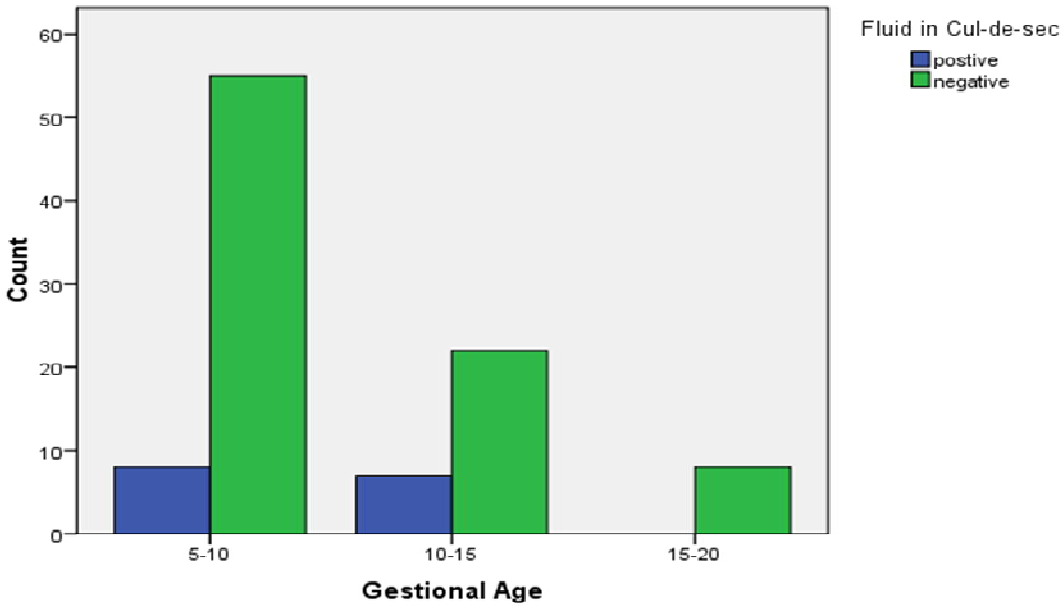


Figure 4-9. Show the frequency of presence of free fluid in the cul-de-sac in association with abortion in different gestational age ranges.

Table 4-11. Present the frequency of occurrence of pyelonephritis in different gestational age ranges in association with abortion.

Count				
		Presence of Pyelonephritis		
		positive	negative	Total
Gestational Age	5-10	47	16	63
	10-15	19	10	29
	15-20	5	3	8
Total		71	29	100

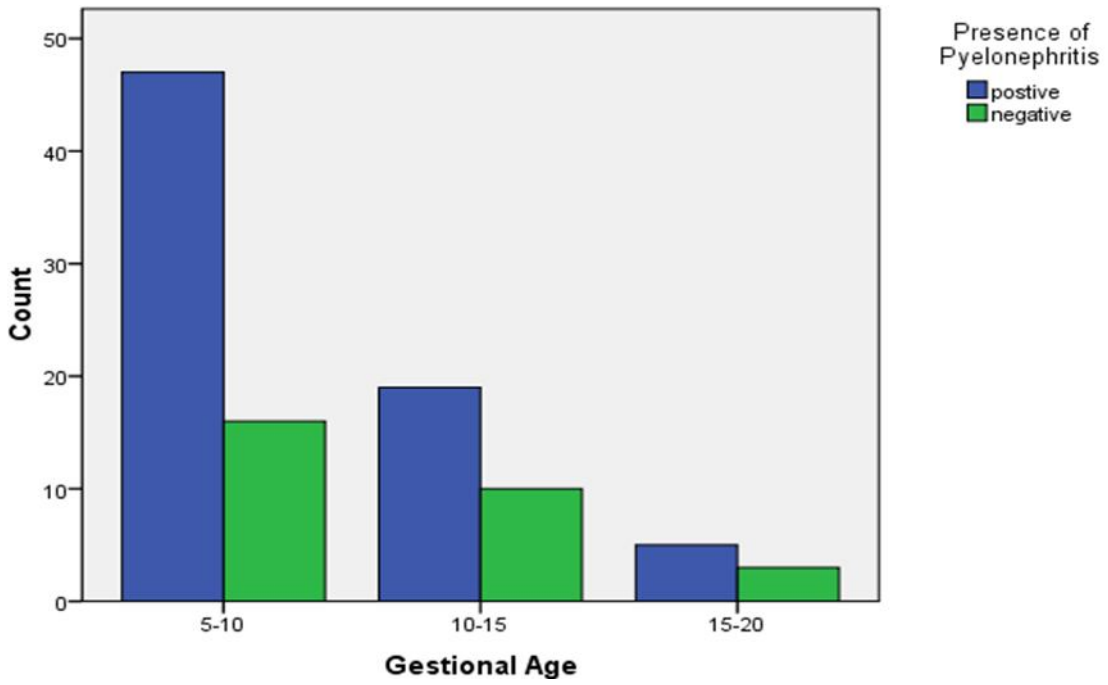


Figure 4-10. Show the frequency of occurrence of pyelonephritis in different gestational age ranges in association with abortion.

Tabe4-12. Present the presence of current history of UTI in each gestational agerange.

Count			
		History of UTI	
		positive	Total
Gestational Age	5-10	63	63
	10-15	29	29
	15-20	8	8
Total		100	100

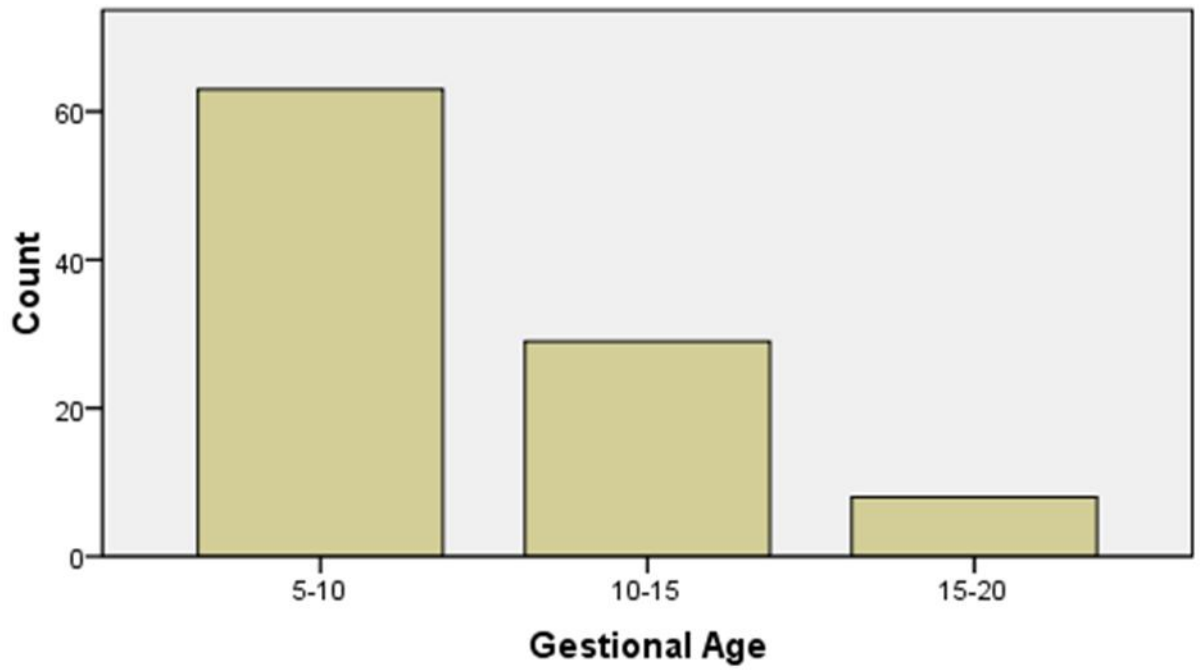


Figure 4-11. Show the presence of current history of UTI in each gestational age range.

Chapter Five

Chapter Five

Discussion,conclusion and recommendations

5-1Discussion:

From the above results we can see that the urinary tract infections is coexisted in the all types of abortion which evident by ultrasound finding of the urinary bladder that reveal cystitis in 95% of cases of abortion and the kidneysthat reveal 71% of cases havesonographic feature of pyelonephritisand the presence of symptoms and signsof UTI in all aborted women, this high incidence of UTI in pregnancy is due to,anatomical and pregnancy induced risks factors and other risk factors.

The anatomical risk factors include short female urethra, exposure of the urethral meatus to vestibular and rectal pathogens.Pregnancy induced risks factors include stasis of the urine that lead infection due to pregnancy hormone manly the progesterone that lead to dilation of the ureters and decrease the tone of the urinary bladder that lead to increase in the residual volume and dilate renal calyces and pelves, compression of the ureters by the fundus of the uterus when reach the pelvic brim, increase in the glucose execration in the urine during pregnancy make the urine a good media for the bacterial growth in the urine.

There are other risk factors that increase the incidence of UTI in the pregnant women such as frequent sexual intercourse, poor perineal hygiene.

The presence of the symptoms and signs of UTI before the onset of the abortion indicate that the ignorance or unawareness of these symptoms and signs is the one of the cornerstone risk factor that evident by lack of awareness of getting the medical care about these symptoms and signs, the other risk factor is the interference of the symptoms and sign of the early pregnancy with that of UTI in the presence of false

negative urine analysis (lab error), which is the first step in diagnosing of UTI this false negative result lead to wrong diagnosis of she is healthy in fact she is not.

There is other factors that contribute to that high incidence of the UTI in the early pregnancy is the traditionalbelieves that the pregnancy can causes any symptoms or signs that the women can feel in the first three months of pregnancy unless it is very sever, also the trustless, in the primary care provider in treating the pregnant women, and refuse of tacking any antibioticdrugs that prescribed by him, and all the trust is on the obstetrician, that delay the treatment of one of the serious disease that put the fetus in dinger of abortion due to high cost and the difficulty in accessibilityof the specialist care.

The common gestational age that found to be more affected is the range between the 5-10 weeks of gestation, this is due to lack of the fetus to its own cellular immunity, and manly depend on the mother cellular immunity to protect him from outside bacterial invasion, beside that the part that face the endometrium is less vascularized by the villus blood, and so less blood circulation that lead to decrease in the circulating mother's immune cells in that part.

Antibody transportation from the mother to the fetal blood circulation (IgG type) does not start until the 14 weeks of gestation, this also make the fetus lack of specific antibody against specific bacteria in period under the 14 week.

The common type of abortion is the complete abortion that due to the potent affect of the infection and the severity of it which leads to the fragility of the conception parts and the endometrium, make expulsion of the fetus and the chorionic tissue or placental tissue is easy, leaving empty uterine cavity.

5-2 Conclusion:

From the research results of ultrasound examination of pelvic and kidneys of 100 aborted Sudanese womenwe can conclude that the UTI is the common cause of abortion in the Sudanese women due to the following facts, firstly the symptoms and signs of the UTI isfound to be exist in all aborted women prior to the onset of abortion, secondly the ultrasound examination reveal 95% of aborted women have cystitis, 71% of them have sonographic feature of pyelonephritis, and 15% have free fluid in cul-de-sac that diagnostic sign of the coexistence of pelvic inflammatory disease (PID).

5-3:Recommendations:

From the above result I recommendto making the examination of the urinary system to be as a routine approach of scanning of any aborted women and should be reported to guide the health care provider in managing the current condition and prevent reoccurrence of similar problem in the next pregnancy.

This research's results need to be evidence base proved by workshop research including multispecialty team constitute of bacteriologist, pathologist, and sonographer, to combine the sonographic appearance of the urinary bladder to detect presence of cystitis, and kidneys to see if there is sonographic feature of pyelonephritis, with the result of blood culture of miscarriage blood to peck up causative organism that consist with UTI, and the pathological feature of shedding endometrial tissue to see if there is pathological feature of bacterial infection of the endometrium tissue.

Appendix

Appendix A: Data collection sheet.

NO	Age of women	Gestational age in weeks	Type of abortion	cystitis	Free fluid in cul-de-sac	Pyelonep h-ritis	Sign and symptoms of UTI
1.	29	6	Incomplete	positive	negative	positive	positive
2.	30	14	missed	positive	negative	negative	positive
3.	19	7	Blighted ovum	positive	negative	positive	positive
4.	32	12	Incomplete	positive	negative	positive	positive
5.	32	8	complete	positive	negative	positive	positive
6.	34	9	Blighted ovum	positive	negative	negative	positive
7.	30	13	complete	positive	negative	positive	positive
8.	20	6	Blighted ovum	positive	negative	positive	positive
9.	26	13	Incomplete	positive	negative	negative	positive
10.	23	15	complete	positive	positive	negative	positive
11.	35	8	complete	positive	negative	positive	positive
12.	25	9	complete	positive	negative	positive	positive
13.	31	16	complete	positive	negative	positive	positive
14.	20	8	Blighted ovum	positive	negative	positive	positive
15.	20	16	complete	positive	negative	positive	positive
16.	34	17	Incomplete	positive	negative	negative	positive
17.	30	6	Incomplete	positive	negative	positive	positive
18.	19	8	Incomplete	positive	negative	positive	positive
19.	25	6	complete	positive	negative	positive	positive
20.	19	8	complete	positive	negative	negative	positive
21.	32	13	missed	positive	negative	negative	positive
22.	33	7	complete	positive	positive	positive	positive
23.	46	8	missed	positive	negative	positive	positive
24.	36	8	missed	positive	negative	negative	positive
25.	25	8	complete	positive	negative	positive	positive
26.	30	8	complete	positive	positive	positive	positive
27.	25	13	complete	positive	positive	positive	positive
28.	30	6	Incomplete	positive	positive	negative	positive
29.	25	8	Blighted ovum	positive	negative	negative	positive
30.	33	8	complete	positive	negative	negative	positive
31.	25	13	complete	positive	negative	positive	positive
32.	20	14	complete	positive	negative	positive	positive
33.	18	12	complete	positive	negative	positive	positive
34.	35	13	complete	positive	negative	positive	positive
35.	40	8	complete	positive	negative	positive	positive
36.	26	8	complete	positive	negative	positive	positive
37.	37	7	Blighted ovum	positive	negative	negative	positive
38.	30	8	Incomplete	positive	positive	positive	positive

39.	20	6	Incomplete	positive	negative	positive	positive
40.	19	7	missed	positive	negative	positive	positive
41.	21	8	complete	positive	negative	negative	positive
42.	30	8	Blighted ovum	positive	positive	positive	positive
43.	22	6	Incomplete	positive	negative	positive	positive
44.	33	16	complete	positive	negative	positive	positive
45.	23	8	missed	positive	positive	positive	positive
46.	25	16	complete	positive	negative	negative	positive
47.	27	13	Blighted ovum	positive	negative	positive	positive
48.	35	6	Incomplete	positive	negative	positive	positive
49.	19	17	complete	positive	negative	negative	positive
50.	25	6	Incomplete	positive	negative	positive	positive
51.	37	13	missed	positive	negative	positive	positive
52.	28	8	complete	positive	negative	positive	positive
53.	29	12	Blighted ovum	positive	positive	positive	positive
54.	31	8	Incomplete	positive	negative	positive	positive
55.	30	6	Incomplete	positive	negative	negative	positive
56.	36	13	missed	positive	positive	positive	positive
57.	24	8	Incomplete	positive	negative	positive	positive
58.	18	8	Incomplete	positive	negative	positive	positive
59.	22	6	Incomplete	positive	negative	negative	positive
60.	20	8	complete	positive	positive	positive	positive
61.	31	9	Incomplete	positive	negative	positive	positive
62.	19	8	complete	positive	negative	positive	positive
63.	24	13	Incomplete	positive	positive	negative	positive
64.	23	8	complete	positive	negative	positive	positive
65.	33	6	Incomplete	negative	negative	positive	positive
66.	34	14	missed	positive	negative	positive	positive
67.	28	8	complete	positive	negative	positive	positive
68.	41	10	missed	negative	negative	negative	positive
69.	30	13	Incomplete	positive	negative	positive	positive
70.	26	14	Blighted ovum	positive	negative	positive	positive
71.	24	6	Incomplete	positive	negative	positive	positive
72.	20	12	Incomplete	positive	positive	negative	positive
73.	19	8	complete	positive	negative	positive	positive
74.	25	10	Blighted ovum	negative	negative	positive	positive
75.	30	8	Incomplete	positive	negative	negative	positive
76.	21	10	Incomplete	positive	negative	positive	positive
77.	18	8	complete	positive	negative	positive	positive
78.	32	13	missed	positive	negative	positive	positive
79.	30	8	Incomplete	positive	negative	positive	positive
80.	35	15	missed	positive	negative	positive	positive
81.	30	8	complete	positive	negative	negative	positive
82.	44	9	Blighted ovum	positive	negative	positive	positive
83.	24	17	complete	positive	negative	positive	positive

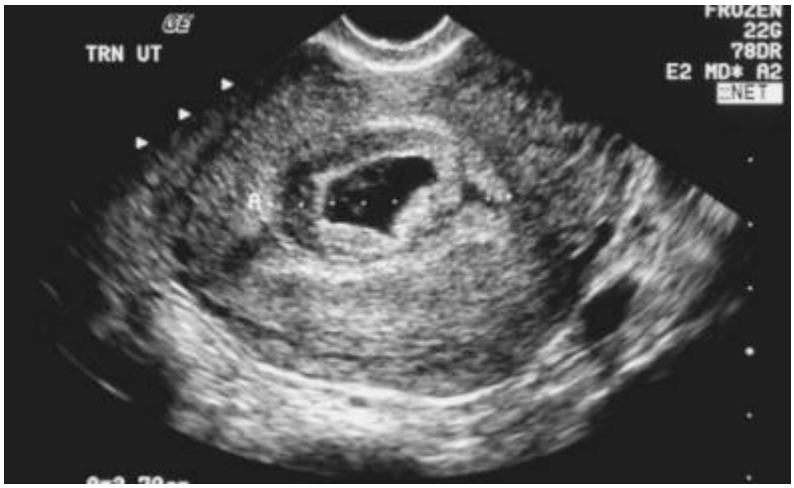
84.	33	8	Incomplete	negative	negative	negative	positive
85.	38	15	missed	positive	negative	positive	positive
86.	29	8	complete	positive	negative	negative	positive
87.	27	8	Incomplete	positive	positive	positive	positive
88.	19	12	complete	positive	negative	negative	positive
89.	32	13	Blighted ovum	positive	negative	positive	positive
90.	18	16	complete	positive	negative	positive	positive
91.	26	6	Incomplete	negative	negative	positive	positive
92.	34	8	Incomplete	positive	negative	positive	positive
93.	19	13	complete	positive	positive	positive	positive
94.	25	9	Incomplete	positive	negative	positive	positive
95.	42	13	Blighted ovum	positive	negative	negative	positive
96.	26	8	complete	positive	negative	negative	positive
97.	43	6	Incomplete	positive	negative	positive	positive
98.	29	14	Incomplete	positive	negative	negative	positive
99.	19	12	complete	positive	negative	negative	positive
100.	30	10	Incomplete	positive	negative	positive	positive

Complete: Complete abortion

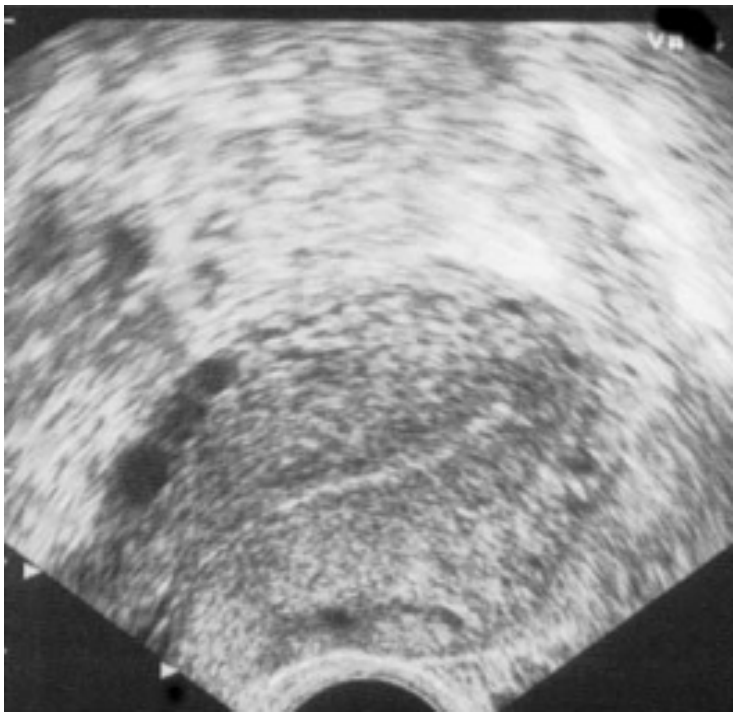
Incomplete: Incomplete abortion

Missed: Missed abortion

Appendix B: Images.



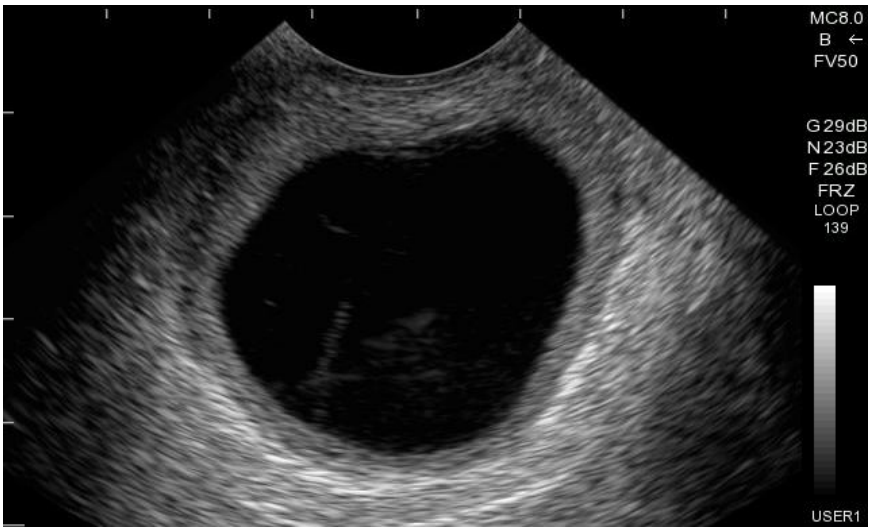
AppendixB-1: Image ofuterus of 30 year old woman showincomplete abortion.



Appendix B-2: Image of uterus of 35 year old woman show complete abortion.

Appendix B- 3: Image of uterus of 25 year old woman show blighted ovum.

Appendix B-4: Image of uterus of 26 year old woman show missed abprtion.



Appendix B- 5: Image of urinary bladderof 32 year old aborted womanshowsonographic feature of cystitis.

Appendix B- 6: Image of left kidney of 24year old aborted woman showsonographic feature of pyelonephritis.

Appendix B-7: Image of uterus of 33 year old woman show complete abortion and free fluid in cul-de-sac indicate pelvic inflammatory disease

Appendix B-8: Image of uterus of 22 year old woman Show normal uterus and empty cul-de-sac.

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