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Patterns of Abortion Presentation by Using Ultrasound

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ABSTRACT

Obstetric Ultrasound is the use of ultrasound scans in pregnancy. Since its introduction in the late 1950's ultrasonography has become a very useful diagnostic tool in Obstetrics. This study was designed with an aim to determine the patterns of abortion presentation by using ultrasound in Sudanese ladies, present in the areas of study. In this retrospective cohort study, a group of 100 subjects between the ages of 12 and 49 years, examined for various types of abortion in the Ultrasound Department's of Mohammed Ali Fadl Hospital and Elshaheed Khalid Medical Center in Khartoum- Sudan between the period of October 2010 and February 2011. Ultrasound brightness mode (B-mode) for the pelvis was performed using real time General Electric (GE) medical system, logic 5 expert ultrasound machine (Sony Corporation, Japan). The applied ultrasound transducer was a convex probe of a frequency 3.5 MHz. Depending on the sonographic features and characteristics of miscarriage, different and common type of abortion were diagnosed, which include such conditions; complete abortion was found in (39%) of cases; (30%) incomplete abortion, (11%) missed abortion, (7%) threatened abortion, (5%) inevitable abortion, (4%) recurrent; habitual abortion, (3%) septic abortion and (1%) criminal abortion. Complete abortion is the commonest type of spontaneous abortion while criminal; illegal abortion is pervasive among the types of induced abortion in females. Pregnant ladies exposed to smoke emitted from cigarettes by current smoker husband in addition to females affected by hypertension and diabetes mellitus considered to develop spontaneous abortion due to these predisposing factors.

Key words: Abortion, Diabetes mellitus, Hypertension, Ultrasound

1. Introduction

Since the 1970s, obstetric ultrasound has become a commonplace feature of prenatal care in North America. Ultrasound is a visualizing technique in which a transducer, lubricated with a gel, is placed on a pregnant woman's abdomen (Joanne, 2004).

Abortion is the termination of pregnancy by the removal or expulsion from the uterus of a fetus or embryo prior to viability. Although an abortion can occur spontaneously, in which case it is usually called a miscarriage, or it can be purposely induced. Abortion, when induced in the developed world in accordance with local law, is among the safest procedures in medicine (Grimes et al., 2006).

However, unsafe abortions result in approximately 70 thousand maternal deaths and 5 million disabilities per year globally (Shah and Ahman, 2009).

The most common cause of spontaneous abortion during the first trimester is chromosomal abnormalities of the embryo or fetus accounting for at least 50% of sampled early pregnancy losses (Schorge et al., 2009; Stoppler, 2009; Jauniaux et al., 1999).

Other causes include vascular disease (such as lupus), diabetes, other hormonal problems, infection, and abnormalities of the uterus (Stoppler, 2009). Advancing maternal age and a patient history of previous spontaneous abortions are the two leading factors associated with a greater risk of spontaneous abortion. A spontaneous abortion can also be caused by accidental trauma; intentional trauma or stress to cause miscarriage is considered induced abortion (Jauniaux et al., 1999).

In addition, the significance of the ultrasound use in detecting the type of the abortion and how does it work was described in the role of ultrasound imaging in diagnosing and investigating early pregnancy failure, where expectant management of miscarriage, using ultrasound parameters to determine miscarriage, could significantly reduce the number of unnecessary evacuations of the retained products of conception, depending on the criteria used (Jauniaux, 2005).

This study was designed with an aim to determine the patterns of abortion presentation by using ultrasound in Sudanese ladies, present in the Ultrasound Department's of Mohammed Ali Fadl Hospital and Elshaheed Khalid Medical Center in Khartoum- Sudan.

2. Methodology

2.1 Selection and description of participants

In this planed cross sectional study, a group of 100 females between the ages of 12 and 49 years, examined for various types of abortion in the Ultrasound Department's of Mohammed Ali Fadl Hospital and Elshaheed Khalid Medical Center in Khartoum- Sudan between the period of October 2010 and February 2011.

After the nature of the procedure was fully explained, informed consent was obtained from both the consecutively enrolled healthy outpatient and the ultrasound departments. Data on the characteristics of the subjects, including socio-demographic data such as occupation, residence, smoking and marital status, clinical history and physical examination findings were recorded. Prior to females scanning, a formal approval was obtained from Ethics and

Scientific Committee of Mohammed Ali Fadl Hospital and Elshaheed Khalid Medical Center, Khartoum-Sudan.

The inclusion criteria were Sudanese women had a singleton pregnancy with findings of abortion in the first trimester of pregnancy beside no or minimal vaginal bleeding. Exclusion criteria were females with cerclage (tracheloplasty) and indicated preterm birth.

2.2 Technical information identifies

Ultrasound brightness mode (B-mode) for the pelvis was performed using real time General Electric (GE) medical system, logic 5 expert ultrasound machine (Sony Corporation, Japan). The applied ultrasound transducer was a convex, curved linear probe of a frequency 3.5 MHz, made by the Yokogawa medical system, Ltd. 7-127 Asahigaoka 4-chome Hino-shi Tokyo, Japan. Model 2302650 with serial number of 1028924YM7 and manufactured date of April 2005. Printing facility issued through the ultrasound digital graphic printer, 100 V; 1.5 A; and 50/60 Hz. made by Sony Corporation- Japan, with serial number of 3-619-GBI-01.

The gynecological sonography scanning protocol followed was the protocol of the American Institute of Ultrasound in Medicine (AIUM) as well as the American College of Radiology (ACR), and American College of Obstetrics and Gynecology (ACOG).

In order to avoid inter observer variance; ultrasound scan was done by the same radiologist. Selected females were scanned for gynecology in long axis or short axis, while the patient lying relaxed, comfortable and breathing quietly in supine position. For a complete trans-abdominal pelvic sonogram, the patient's bladder should, in general, be distended adequately to displace the small bowel from the field of view, especially in early pregnancy, since too little fluid may not provide the window necessary for adequate pelvic scanning.

Occasionally, over distention of the bladder may compromise the evaluation. A bladder that is it too full can compress or displace structures so they are not visualized. An overfull bladder can also create the disappearance of pathology. Lower abdomen was lubricated with coupling agent to avoid trapping of air bubbles between the skin and ultrasound transducer. After the scans performed, if there is any doubt about the influence of the full urinary bladder on adjacent structures, have the patient partially void and rescan (Palmer, 1995).

Clinically the most common signs of miscarriage are vaginal spotting or vaginal bleeding, passing of tissue and cramping. Ultrasound is usually used to diagnose miscarriage on the basis of that fetus is no longer in the uterus beside the absence of fetal heartbeat.

The following sonographic and clinical criteria used to make the diagnoses in each type of abortion, such as: Sonographic signs and evidence of a missed abortion include absence of any growth of the gestational sac or fetal pole over a 5-day period of observation., gestational sac larger than 12 mm mean diameter (around 5 weeks 5 days) without visual evidence of a yolk sac, absence of a visible fetal heartbeat when the crown-rump length (CRL) is greater than 5 mm, yolk sac larger than 6 mm diameter, yolk sac that is abnormally shaped or echogenic (sono dense rather than the normal sono lucent) and absence of fetal cardiac activity, especially when it was previously seen.

An incomplete abortion may demonstrate a variety of sonographic findings as follows: The gestational sac may be misshaped or collapsed, or it may be intact, containing a nonliving embryo. In addition, an irregular complex mass within the endometrial or endocervical canal

may be present. Echogenic material or debris within the endometrial canal may represent retained products of conception or clotted blood.

The criteria used to make the diagnosis of a complete abortion were: If the uterus is well contracted and patient is not spotting, the endometrium will look like a single curvilinear line that is uninterrupted from fundus to isthmus; if the uterus is not well contracted and the patient is still spotting, the endometrium will look like two parallel curvilinear echogenic lines extending from fundus to the isthmus, separated by a thin echolucent layer.

A threatened miscarriage is a pregnancy where vaginal bleeding has taken place but an ultrasound has shown a healthy fetus and fetal heartbeat.

Inevitable abortion is diagnosed when a bleeding of intrauterine origin with continuous and progressive dilation of the cervix but without expulsion of conception products before the 20^{th} week of gestation.

In a patient with recurrent; habitual abortion, or a history suggestive of cervical incompetence, ultrasound scans can be performed and serially thereafter to measure the cervical length, as this predicts risk of preterm birth. A cervical length of more than 25 mm in the second trimester of pregnancy is associated with a reduced risk of preterm delivery.

Septic abortion was diagnosed when a woman has a temperature of at least 101 F, plus other signs and symptoms of the condition. Other reasons for the fever, such as a cold or urinary tract infection, must be ruled out. As a result, a physical exam and pelvic exam will be done. Diagnostic tests, including the following: a CBC, or complete blood count, to look for signs of infection. A pregnancy ultrasound, which may show an unborn child that has died, or an empty sac in the uterus and cultures of blood or uterine contents, to check for the presence of bacteria that cause an infection.

2.3 Statistical analysis

The results were statistically analyzed by using Microsoft Excel Software and Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) version 15. Participants' results were described as means, standard deviations (SD); mean±SD and percentages in a form of comparison, tables, graphs, frequency and correlations.

3. Results

A total of 100 Sudanese women had a pregnancy with findings of abortion either in the first and second trimester of pregnancy beside no or minimal vaginal bleeding. Age range from 12 and 49 years; mean age of 27±1.7 years. Marital status of (97%) was married while the rest (3%) were single. Patient mean height was 161.7±11.1 cm; minimum value of 105.0 cm and maximum value of 180.0 cm, while mean weight was 71.6±11.5 kg; minimum value of 18.00 cm and maximum value of 89.0 cm. Patients occupations were recorded, where (29%) were housewives, employers (20%), farmers (15%), labors (17%), students (11%), and other forms of occupations were (8%) out of scanned females (Table 1).

Table (1): Characteristics of study samples

Parameters	No of females (%) out of 100
Age ranges (years)	**Percentage (%)**
12-19 years	(2%)
20-29 years	(42%)
20-39 years	(32%)
40-49 years	(24%)
Marital status	**Percentage (%)**
Married	(97%)
Single	(3%)
Occupation	**Percentage (%)**
Housewives	(29%)
Employers	(20%)
Farmers	(15%)
Labors	(17%)
Students	(11%)
Others	(8%)

Common clinical findings presents with different types of abortion were varied and include vaginal bleeding in (59%) of cases, (42%) of lower abdominal and pelvic pain and (21%) were fever and septicaemia. Patient medical history such as a current smoker partner; husband was detected in (13%) of cases, (9%) of hypertension (HTN) and (5%) of scanned cases had diabetes mellitus (DM) (Table 2).

Table (2): Clinical findings and medical history of samples

Parameters	No of females (%) out of 100
Clinical findings	**Percentage (%)**
Vaginal bleeding	(16%)
Lower abdominal and pelvic pain	(42%)
Fever and septicaemia	(11%)
Medical history	**Percentage (%)**
Current smoker partner; husband	(13%)
Hypertension (HTN)	(9%)
Diabetes mellitus (DM)	(5%)

Depending on the sonographic features and characteristics of miscarriage described in the methodology section, different and common type of abortion were diagnosed, which include such conditions; complete abortion was found in (39%) of cases; (30%) incomplete abortion, (11%) missed abortion, (7%) threatened abortion, (5%) inevitable abortion, (4%) recurrent; habitual abortion, (4%) septic abortion (Table 3 and Fig. 1).

Table (3): Common type of abortion diagnosed by ultrasound in females

The common type of abortion diagnosed by ultrasound	Percentage (%)
Complete abortion	(39%)
Incomplete abortion	(30%)
Missed abortion	(11%)
Threatened abortion	(7%)
Inevitable abortion	(5%)
Recurrent; habitual abortion	(4%)
Septic abortion	(4%)
Total	(100%)

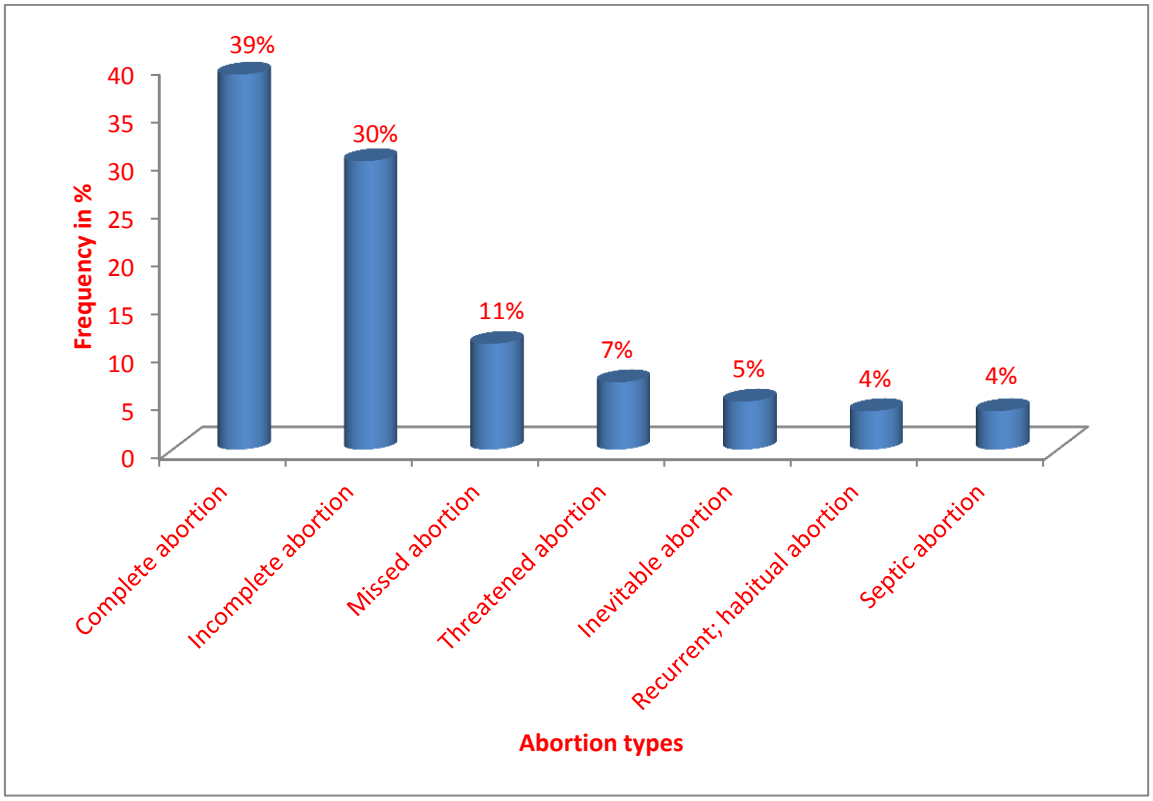

Fig. 1: Common type of abortion diagnosed by ultrasound

An important relation obtained between types of abortion and its related clinical findings, where vaginal bleeding presents in threatened, inevitable, habitual, septic types of abortion. Lower abdominal and pelvic pain contribute (100%) of symptoms and signs of incomplete abortion. Fever and septicemia presents in (100%) in cases diagnosed as septic abortion (Table 4).

Table (4): Types of abortion and its related clinical findings

Types of abortion		**Clinical findings; signs and symptoms**		
		Lower abdominal & pelvic pain	Vaginal bleeding	Fever & septicaemia
Complete abortion	Count	0	0	7
	% of total	(0%)	(0%)	(18%)
Incomplete abortion	Count	30	0	0
	% of total	(100%)	(0%)	(0%)
Missed abortion	Count	0	0	0
	% of total	(0%)	(0%)	(0%)
Threatened abortion	Count	2	7	0
	% of total	(28.6%)	(100%)	(0%)
Inevitable abortion	Count	5	5	0
	% of total	(100%)	(100%)	(0%)
Habitual abortion	Count	1	4	0
	% of total	(25%)	(100%)	(0%)
Septic abortion	Count	4	0	4
	% of total	(100%)	(0%)	(100%)

Also the relation between females medical history and miscarriage was present in (Table 5). Current smokers partner; husband was popular in (28.6%) of threatened abortion, (60%) of inevitable abortion, (25%) of habitual abortion and (66.7%) of septic abortion cases. HTN were prevalent in (12.8%) of complete abortion and (13.3%) of incomplete abortion. DM was widespread in complete type of abortion (10.3%) and missed abortion (9.1%) of cases.

Table (5): Types of abortion and its related medical history

Types of abortion		**Medical history**		
		Current smoker partner; husband	Hypertension (HTN)	Diabetes mellitus (DM)
Complete abortion	Count	1	5	4
	% of total	(2.6%)	(12.8%)	(10.3%)
Incomplete abortion	Count	3	4	0
	% of total	(10%)	(13.3%)	(0%)
Missed abortion	Count	1	0	1
	% of total	(9.1%)	(0%)	(9.1%)
Threatened abortion	Count	2	0	0
	% of total	(28.6%)	(0%)	(0%)
Inevitable abortion	Count	3	0	0
	% of total	(60%)	(0%)	(0%)
Habitual abortion	Count	1	0	0
	% of total	(25%)	(0%)	(0%)
Septic abortion	Count	2	0	0
	% of total	(66.7%)	(0%)	(0%)

4. Discussion

This study intended to determine the patterns of abortion presentation by using ultrasound . In this study a total of 100 patients was investigated by ultrasound in Mohammed Ali Fadl Hospital and Elshaheed Khalid Medical Center in Khartoum- Sudan between the period of October 2010 and February 2011, to determine the incidence of common types of either spontaneous or induced abortion. The incidence of spontaneous abortions in females was arranged in descending, depending on the sonographic features and characteristics; were complete abortion presents in (39%), (30%) incomplete abortion, (11%) missed abortion, (7%) threatened abortion, (5%) inevitable abortion, (4%) recurrent; habitual abortion and (3%) were septic abortion. There was no legal induced abortion detected in the scanned females. These percentages related to abortion incidence could be compared to many studies that conducted worldwide, where in each year Nigerian women obtain approximately 610 000 abortions, a rate of 25 abortions per 1000 women aged 15-44 years. The rate is much

lower in the poor, rural regions of northern Nigeria than in the more economically developed southern regions. An estimated 40% of abortions are performed by physicians in establishing health facilities, while the rest is performed by non physician providers (Stanley et al., 1998).
In Uganda, The rate of abortion was 17 induced abortions per 1000 women of childbearing age. There were 19 abortions per 100 pregnancies (or 27 abortions for every 100 live births). The majority (60%) of women who had an abortion was younger than 30 years, and (36%) were nulliparous. Forty five percent had obtained their abortions before the 7^{th} week of gestation, and 90% had done so before the 10^{th} week (Susheela et al., 2005). In the Philippines, many women obtain abortions often in unsafe conditions to avoid unplanned births. In 1994, the estimated abortion rate was 25 per 1000 women per year. In 2000, an estimated 789 00 women were hospitalized for post abortion care, 473 400 women had abortions and the abortion rate was 27 per 1000 per year in women aged 15-44 years. The national abortion rate changed little between 1994 and 2000 (Juarez et al., 2005).
Clinical findings presents were related to types of abortion, and these findings include vaginal bleeding in (16%) of cases, (42%) of lower abdominal and pelvic pain and (11%) were fever and septicaemia. Such clinical findings were in line with a study about the clinical feature of missed abortion, wherein 92% of the missed abortion cases a vaginal spotting was observed before the diagnosis was established. The obtained results confirm that the onset of vaginal bleeding does not reflect the moment of an embryo or fetal death (Baszak et al., 2001).
In a study of threatened abortion prediction of viability based on signs and symptoms, vaginal bleeding present in (97.3) of the subjects, represented a 50.6% chance that the pregnancy was non-viable. Subjects who reported abdominal pain had a 55.9% chance of having a non-viable pregnancy, which was higher than 42.6% of those who did not report pain. A history of the passage of blood clots was associated with a 81.4% chance of a spontaneous abortion, compared with 37.9% where no clots had been passed ($p < 0.01$) (Chung et al., 1999).
In this study the clinical assessment is not capable of making an adequate assessment of the status of the pregnancy in most cases. Nevertheless, the researchers have clarified the relationships between certain signs and symptoms and the state of the pregnancy in women presenting with spontaneous, where vaginal bleeding presents in (0%) of cases diagnosed as complete, threatened (100%), inevitable (100%), habitual (100%), septic (0%) types of abortion. Lower abdominal and pelvic pain contribute (100%) of symptoms and signs of incomplete abortion alone. Fever and septicemia presents in (100%) in cases diagnosed as missed abortion in females.
The relation between females medical history and miscarriage was studied and the researcher found that current smokers partner; husband was popular in (28.6%) of threatened abortion, (60%) of inevitable abortion, (25%) of habitual abortion and (66.7%) of septic abortion conditions. Smoking during pregnancy is a risk factor for spontaneous abortion and the relation between smoking and abortion was supported when compare smoking habits in early pregnancy among pregnant women and their partners; husbands. Women who had aborted spontaneously reported smoking during pregnancy more often than those with delivery after 28 weeks' gestation: (41%) of cases and (28%) of controls smoked. The association did not vary with age or previous obstetric events (Jennie et al., 1999).
After controlling for interfering variables (age, exposure to trace anesthetic gases, pregnancy history, and mailing response), a statistically significant increase in risk associated with

maternal cigarette smoking was found for spontaneous abortions and congenital abnormalities. The risk of spontaneous abortion for the heavy smoker is estimated to be as much as 1.7 times that of the nonsmoker in certain risk groups. The risk for congenital abnormality for babies born of smoking mothers is estimated to be as much as 2.3 times that of the nonsmoker, depending on age, pregnancy history, and other factors (David et al., 1990).

Maternal exposure to environmental tobacco smoke for 1 hour or more per day was associated with spontaneous abortion for both maternal direct and environmental exposure. The association appeared to be stronger in second trimester abortions. Several studies have found stronger associations of smoking with late versus early abortions, perhaps reflecting smoking associated placental insufficiency and fetal hypoxia (Gayle et al., 1992).

A prospective study using a biomarker of pregnancy to correlate paternal smoking and pregnancy loss, conclude that heavy paternal; husband smoking increased the risk of early pregnancy loss through maternal and or paternal exposure (Scott et al., 2004).

In addition, HTN were prevalent in (12.8%) of complete abortion and (13.3%) of incomplete abortion. DM was widespread in complete abortion (10.3%) and missed abortion (9.1%) of cases. Maternal HTN and intrauterine fetals death in mid pregnancy were analyzed in 156 pregnancies which terminated spontaneously between 16 and 27 weeks gestation, inclusive, indicated that in 41 patients where fetal death was the primary event, maternal arterial pressure was raised in early pregnancy when compared with matched groups of women whose pregnancies had a successful outcome. It is suggested that maternal HTN predisposes to intrauterine fetal death in the mid-trimester of pregnancy as it does in the third trimester (Silverstone et al., 1990).

Also valuable information which adds to discuss the information here another dimension found in the abortion and its effect on risk of preeclampsia and transient HTN, among nulliparous women with a history of one abortion. A decreased risk of both hypertensive disorders was observed among women whose aborted pregnancy ended at $\geq$ 3 month's gestation. These findings suggest that a history of abortion in nulliparous women is a protective factor against the risk of preeclampsia in the subsequent pregnancy (Eras et al., 2000).

A population based survey of frequencies of self reported spontaneous and induced abortions in Danish women with type-1 DM, confirm our findings about DM as an induced factor of abortion. The frequency of spontaneous abortions and induced abortions reported from women diagnosed with type-1 DM prior to pregnancy was 17.5% and 18.0% respectively (Lorenzen et al. 1999).

Diabetic women with good metabolic control are no more likely than nondiabetic women losing a pregnancy, but those diabetic women with elevated blood glucose and glycosylated hemoglobin levels in the first trimester have a significantly increased risk of having a spontaneous abortion (James et al. 1999).

4. Conclusion

In conclusion, complete abortion is the commonest type of spontaneous abortion while Recurrent; habitual abortion and septic abortion are the least types of abortion detected in females in this study. Pregnant ladies exposed to smoke emitted from cigarettes by current smoker husband in addition to females affected by hypertension and diabetes mellitus considered to develop spontaneous abortion due to these predisposing factors.

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