SJIF Impact Factor: 5.464

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

ISSN: 2457-0400
Volume: 3.
Issue: 6.
Page N. 91-98
Year: 2019

Review Article www.wjahr.com

REVIEW ON SPONTENEOUS ABORTION (MISCARRIAGE): PREVALENT CAUSES AMONG PREGNANT WOMEN IN ENUGU METROPOLIS, NIGERIA

[1*]Dr. Mgbe Emeka Kevin MBBS, fWACS and [2]Mgbe Chinenye Glory PhD

[1]University of Nigeria Teaching Hospital Enugu.
[2]Public Health, Enugu State University Teaching Hospital Parklane Enugu.

Received date: 01 October 2019 **Revised date:** 22 October 2019 **Accepted date:** 12 November 2019

***Corresponding Author: Dr. Mgbe Emeka Kevin MBBS, fWACS**

University of Nigeria Teaching Hospital Enugu.

ABSTRACT

Background: Spontaneous abortion (miscarriage) is a source of pregnancy loss globally. Its management, most especially in low resource countries remains hampered by inadequate facilities for evaluation. **Objectives**: To determine the risk factors associated with spontaneous abortion (miscarriages) at a tertiary hospital in Enugu, Nigeria. **Methodology:** A descriptive study of all miscarriages managed at Julius Memorial Hospital Enugu, Nigeria between March 1, 2015 and April 30, 2015. Data were collect from hospital record and also by interviewing the pregnant women with a prepared questionnaire. **Results:** There were 119 miscarriages with a prevalence of 62.6%; (61%) incomplete miscarriage was the most common 47 (61%),followed by threatened miscarriage with 21 (27.3%) were of low parity (Para 0-1) and 223 (37%) were having a repeat miscarriage. Of the 141 managed for threatened. There is no association between causes and types of miscarriage (X^2: 43.38 at P= 0.66). There is no significant association between occupation and miscarriage (X^2: 11.33 at P= 0.18). **Conclusion:** There is need of evaluation to improve facilities for investigating women with spontaneous abortions in developing countries to identify the causes of the losses and since intake of local medicine and lack of awareness is the most second causes of miscarriage, it is advisable that the Health Government should set up means of Educating pregnant women not only antenatal but through seminars, media or programs all over the world on the issue of miscarriage to enable them to be on a safe side of not having this miscarriage.

KEYWORDS: *Miscarriage, Causes, spontaneous abortion.*

INTRODUCTION

Miscarriage or Abortion is the spontaneous loss of a pregnancy before 24 weeks gestation, when the foetus has a chance of survival outside the womb. Early pregnancy loss occurs within less than 12 weeks and the late pregnancy loss is between 12-20 weeks. It has been suggested that abortion, ectopic pregnancy and hydatidiform mole are the major causes of early bleeding in pregnancy.

Miscarriage is the most common complication in early pregnancy affecting at least 15% of pregnancies and the most common reason for gynaecological admissions into hospital in Nigeria [13]. The rate of complications increases as the pregnancy progresses and the frequency decreases with increasing gestational age of which 75% of miscarriage occur during the first trimester and the incidence of first trimester miscarriage is 25%.[6]

Previous studies also suggest that about 50% of pregnancies miscarry before implantation in the womb. The most risky time is between six and eight weeks from the last menstrual period.[9]

Over half the babies who are miscarried during this period have a chromosomal abnormality and it occurs when the crossover of genes from the sperm and the egg takes place at the time of conception. Sometimes, the pregnancy cannot continue due to loss of genetic information.[7]

The miscarriage may not occur immediately which may be called missed miscarriage. This may not be picked up until some weeks later, following slight bleeding or period-type pains. Most common cause of miscarriage is the baby not implanting itself correctly in the womb lining.[17]

Factors influencing rate of spontaneous miscarriage

- **Fetal Factors**: Studies suggest that up to 60% all miscarriages are caused by chromosomal abnormality and the rate of genetic abnormalities is higher in embryonic miscarriages called Blighted ovum.
  In chromosomal abnormality, autosomal trisomy is the most frequently identified, followed by monosomy and triploidy. [11]
- **Maternal Factors**: Age of the mother is a risk factor in miscarriage which rises as maternal age increases. For women under 35years, the clinical miscarriage rate is 6.4% while at 35-40years, is 14.7% and over 40years is 23.1%.
  Medical conditions, infection, immunological cause, uterine anomalies, endocrinologic cause and incompetent cervix contribute to maternal causes of miscarriage.[11]
- **Environmental Factors:** This involve Smoking, caffeine, alcohol, radiation and environmental toxins like arsenic, lead carbondisulphide, organic solvent increase the risk of miscarriage.[16]

Clinical classification of miscarriage

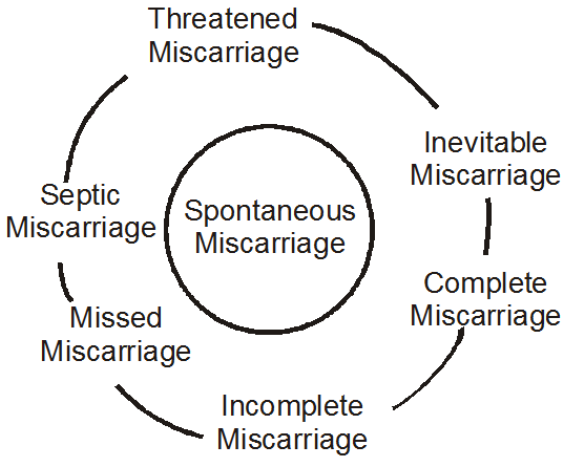

Fig. 1: Clinical Classification of Miscarriage.

Treathened Miscarriage: This miscarriage describes bleeding in early pregnancy, where the cervix found to be tightly closed and the pregnancy is likely to continue. The embryo is usually alive and cramping abdominal pain or less backache that gradually increase may result.[4]

Incomplete Miscarriage: this occurs when miscarriage has definitely started but little pregnancy tissue will still be left in the womb. The cervix is found to be open and it presents typical bleeding that can produce hemodynamic instability and also no viable conceptus.[4][10]

Complete Miscasrriage: This occurs when the pregnancy has been lost, the womb is empty and the cervix closed. It also happens when all the entire products of conception have been expelled and the entire products of conception have passed, bleeding and pains ceased.[4]

Missed Miscarriage: This occurs when the embryo dies in utero but is not passed. There may or may not be vaginal bleeding or other symptoms of threatened abortion.[4]

Inevitable Miscarrige: This is considered inevitable when there is gross rupture of the membranes, cervical dilation and cervix found open suggesting that the pregnancy will be lost.[10]

Septic Miscarrige: This result due to infection and may spread to pelvic or even leads to septicaemia.

Recurrent Miscarrige: This is three or more consecutive pregnancy loses.

Pathology of Miscarriage: There is haemorrhage into the deciduas basalis, necrotic changes in the tissue adjacent to the bleeding and detachment of the conceptus. These stimulate uterine contractions resulting in expulsion.[4]

Post Miscarriage Symptoms

Complication from miscarriage includes- Uncontrolled bleeding, infection, blood clots accumulating in the uterus, a tear in the cervix or uterus, severe pain, missed miscarriage where the pregnancy continues, incomplete abortion where some materials from the pregnancy remains in the uterus. Other symptoms include fever, heavy bleeding that soaks through more than one sanitary pad, foul-smelling discharge from the vagina and continuing symptoms of pregnancy.[2]

Diagnosis of Miscarriage

- **History:** where doctor lookout for amenorrhea, symptom of pregnancy, vaginal bleeding or pain from the patient.
- **Vaginal Examination:** doctor examines for dilation of cervix.
- **Ultrasonography:** viability of the foetus is being checked.
- **Pregnancy Test:** often early morning urine, serum and test for beta human chorionic gonadotropin.

Table 1: Clinical features/management of miscarriage.[5]

Type of Miscarriage (Abortion)	Clinical Features	Management
Threatened Miscarriage	▪ Short period of amenorrhea ▪ Mild pain ▪ Corresponding to duration. ▪ Spotting ▪ Closed cervical os. ▪ Pregnancy test (hCG)=positive ▪ Ultrasound-viable intra uterine fetus.	▪ Reassurance ▪ Rest ▪ Repeated ultrasound
Incomplete Miscarriage	▪ Partial expulsion of products ▪ Bleeding and colicky pain continue ▪ Open cervix, retained products may be felt through it. ▪ Ultrasound- retained products of conception.	▪ Reassurance ▪ Rest ▪ Repeated ultrasound
Complete Miscarriage	▪ Expulsion of all products of conception. ▪ Cessation of bleeding and abdominal pain. ▪ Closed cervix. ▪ Ultrasound-shows empty uterus.	
Inevitable Miscarriage	▪ Short period of amenorrhea. ▪ Heavy bleeding accompanied with clots (may lead to shock). ▪ Severe lower abdominal pain. ▪ Open cervical os. ▪ Positive pregnancy test. ▪ Ultrasound- shows non –viable fetus and blood.	▪ Given the patient fluids or blood. ▪ Ergometrin and sentocinom injection. ▪ Evacuation of the uterus by medical or surgical methods.
Missed Miscarriage	▪ Gradual disappearance of pregnancy symptoms signs. ▪ Brownish vaginal discharge. ▪ Milk secretion ▪ Negative pregnancy test but may be positive for 3-4weeks after the death of the fetus. ▪ Ultrasound-shows absent fetal heart pulsations.	▪ Wait 4weeks for spontaneous expulsion. ▪ Evacuation if spontaneous exposure does not occur after 4 weeks or if there is sign of infection. ▪ Manage according to the size of uterus, when uterus is <12weeks, dilation and evacuation will be need but when is > 12weeks, oxytocin injection will be given.

Statement of Problem

Abortion is considered as a major reproductive health matter and also as a health risk factor for mothers' well-being which also threaten mother's life and comfort.

Spontaneous abortion is a source of pregnancy loss globally. 68,000 women die of unsafe abortion annually while in Nigeria, early pregnancy loss accounts for over 20,000 admissions annually, making it one of the leading causes of maternal mortality.

AIMS/OBJECTIVES

- To determine the risk factors associated with miscarriage.
- To ascertain those that are at risk of miscarriage.
- To determine when it mostly occurs.

LITERATURE REVIEW

Miscarriage is the most common complication of early pregnancy[13] for at least 15% of pregnancies. Among women who know that they are pregnant, the miscarriage rate is roughly 10% to 20% while rates among all conception is around 30% to 50%.[15][14]

In the study done by Dr Joseph Olamijulo most miscarriages occur during the first few months of pregnancy. It is generally estimated that about 75 per cent miscarriages happen during the first trimester or first three months of pregnancy.

He also proved that between 50% to 70 % of first trimester miscarriages are thought to be random events caused by chromosomal abnormalities in the fertilized egg. He further said that over 30 percent of all pregnancies end up in miscarriages and about 30 to 40 percent of them result in miscarriage.

According to manual, it is estimated that about 40% of maternal deaths are from abortion and its complication.

Another study[1] said that pregnancy loss during the second trimester was uncommon and that age and lifestyle were other likely factors associated with miscarriages. "Pregnancy loss during the second trimester, that is, from 13 to 27 weeks, is uncommon. Then, advancing maternal age also is a risk factor. "The older the female, the higher the chances of miscarriages occurring. His studies have shown that from the age of 30, a woman is termed as high risk when it comes to pregnancy. "As she reaches the age of 42, her risk of having miscarriage increases to as high as 50 per cent. "Lifestyle such as smoking, consumption of alcohol and use of some drugs have all been associated with increased risks of miscarriages'.

Many things can cause miscarriage, but the most common cause of a miscarriage especially during the first trimester is usually chromosomal abnormalities of the foetus.[8]

MATERIALS AND METHODS

The descriptive cross sectional study was carried out in Enugu East LGA of Enugu state, Nigeria in 2016. With headquarters as Nkwo Nike, the LGA occupies a land mass of 383km^2 and has a population of 279,089 (National Population Commission, 2006). The study was done in Julius Memorial Hospital, a gynaecology hospital in Enugu Metropolis, Nigeria. A descriptive study of all spontaneous abortions (miscarriages) managed at Julius Memorial Hospital Enugu, Nigeria between March 1, 2016 and April 30, 2016.

Targeted Groups, Sample Size and Sample Collection
Two age groups were selected for this study, which were 15-30, 31-45 years of age respectively.

A total number of 119 pregnant women were studied. Data were collect from hospital record and also by interviewing the pregnant women with a prepared questionnaire. The following information were obtained: Age, period of pregnancy of which miscarriage occurs, occupation and educational background, causes of miscarriage like stress, infection, trauma, alcohol, smoking, local medicine, hypertension, recurrent of miscarriage, awareness and knowledge of miscarriage. Among the 119 pregnant women, were traders, farmers, students and civil servant.

Statistical Analysis: Data obtained were analysed using SPSS Statistic Base 17.0, where descriptive analyses such as median, variance, standard deviation, range skewness, kurtosis and chi-squared.

Ethical Consideration
Ethical assent was obtained from the Julius Memorial Hospital Ethical committee. Consent was also obtained from Medical directors of the health institutions, and Primary health care Coordinator of the Local Government Area. Informed consent was obtained from all participants. They were told that information given will be treated as confidential and of their right to withdraw from the study any time they wished.

RESULTS

The cross-sectional study of a total number of 119 Patients who have had miscarriage were obtained from a gynaecology clinic-Julius Ezenyirioha memorial Hospital, Enugu.

Based on the result of ultrasound scanning in table 2, the various types of miscarriage were obtained, of which incomplete miscarriage accounted for the highest percentage.

It was also observed in table 3, that among all the risk factor associated with miscarriage, stress is the major risk factor that causes miscarriage in pregnant women, followed by taking of local medicine or herbs during pregnancy and "I don't know" meaning lack of knowledge or awareness of miscarriage while infection, alcohol and spiritual attack contributed to some extent.

Table 4 showed that among the 15- 30years age group, threatened miscarriage was the most occurring miscarriage in pregnancy, while in age group of 31-45years, incomplete miscarriage occurred often. Therefore, among both age groups, incomplete miscarriage was more common but recurrent occurred least. Miscarriages are more common in older age group (31-45years).

In table 5, the period of pregnancy of which miscarriage occurred frequently was 1-10weeks of which incomplete miscarriage had the highest occurrence with 61%, followed by threatened miscarriage with 27.3%.

It was observed in table 6 that out of all the patients, 62.6% had miscarriage occurring between 1-10weeks i.e. in their early stage pregnancy.

In table 7, the mean age of the distribution was 33.7±3.98, the median age was 34, and the age range was 20. There is no association between causes and types of miscarriage (X^2: 43.38 at P= 0.66). There is no significant association between occupation and miscarriage (X^2: 11.33 at P= 0.18).

In table 8, it was observed that the age group of 31-45 years, miscarriage occurred high 76.5% than the age group of 15-30 years.

In table 9, it was observed that among all occupational status, it is more in civil servants, followed by farmers and then students.

Table 2: Types of Miscarriage.

Types of miscarriage				
	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Threatened miscarriage	33	26.8	27.7	27.7
Incomplete miscarriage	49	39.8	41.2	68.9
Complete miscarriage	24	19.5	20.2	89.1
Missed miscarriage	11	8.9	9.2	98.3
Recurrent miscarriage	2	1.6	1.7	100.0
Total	119	96.7	100.0	

Table 3: Causes of Miscarriage.

	Frequency	**Percent**	**Cumulative Percent**
Stress	24	19.5	19.5
Infection	15	12.2	31.7
Alcohol	12	9.8	41.5
Smoking	6	4.9	46.3
local medicine(herbal)	18	16.3	62.6
Age	1	.8	63.4
spiritual attack	12	9.8	73.2
unprescribed drugs	3	2.4	75.6
Trauma	4	3.3	78.9
Food	2	1.6	80.5
Hypertension	1	.8	83.7
recurrent abortion	1	.8	83.7
i dont know	20	16.3	100.0
Total	119	100.0	

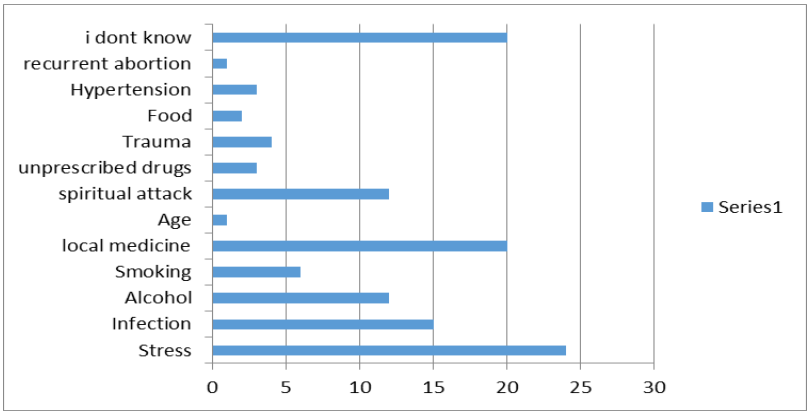

Fig. 2: Bar chart on causes of miscarriage.

Table 4: Types of miscarriage by age group.

Crosstab				
			Age group	
			15-30 years	**31-45 years**
Types of miscarriages	Threatened miscarriage	Count	9	24
		% within Age group	32.1%	26.4%
	Incomplete miscarriage	Count	7	42
		% within Age group	25.0%	46.2%
	Complete miscarriage	Count	8	16
		% within Age group	28.6%	17.6%
	Missed miscarriage	Count	3	8
		% within Age group	10.7%	8.8%
	Recurrent miscarriage	Count	1	1
		% within Age group	3.6%	1.1%
Total		Count	28	91
		% within Age group	100.0%	100.0%

Table 5: Period of pregnancy according to week and type of miscarriage.

Crosstab				
			Period of pregnancy code	**Period of pregnancy code**
			1-10 weeks	**above 10 weeks**
Types of miscarriages	Threatened miscarriage	12	21	12
		70.6%	27.3%	70.6%
	Incomplete miscarriage	2	47	2
		11.8%	61.0%	11.8%
	Complete miscarriage	0	1	0
		0.0%	1.3	0.0%
	Missed miscarriage	3	8	3
		17.6%	10.4%	17.6%
Total		Count	17	17
			100.0%	100.0%
		% within Period of pregnancy code	100.0%	100.0%

Table 6: Period of pregnancy for 1-10 weeks and above 10 weeks.

Period of pregnancy code		**Frequency**	**Percent**
Valid	1-10 weeks	77	62.6
	above 10 weeks	17	13.8
	Total	94	76.4
Missing	Complete miscarriage	25	23.6
Total		119	100.0

Table 7: Descriptive analysis according to age mean.

Descriptive				
			Statistic	**Std. Error**
AGE (yr)	Mean		33.7000	.36373
	95% Confidence Interval for Mean	Lower Bound	32.9798	
		Upper Bound	34.4202	
	5% Trimmed Mean		33.8056	
	Median		34.0000	
	Variance		15.876	
	Std. Deviation		3.98442	
	Minimum		23.00	
	Maximum		43.00	
	Range		20.00	
	Interquartile Range		6.00	
	Skewness		-.275	.221
	Kurtosis		-.435	.438

Table 8: Age Group.

Age Group	**Frequency**	**Percent**
15-30 years	28	23.5
31-45 years	91	76.5
Total	119	100

Table 9: Classification of occupation.

		Frequency	**Percent**
Valid	Civil servant	68	57.1
	Farmer	38	31.9
	Student	14	11.0
	Total	119	100.0

DISCUSSION

Based on the literature review on this topic, it has observed that there is less research consciousness on the topic especially in Africa.

Miscarriage is a common cause of fetal loss Spontaneous abortion is the most common type as seen the older literatures which are usually due to chromosomal abnormalities.[11]

It is also noted that if there are no predisposing factors like chromosomal abnormalities, congenital malformation and uterine abnormalities, stress and other presumed risk factors may still contribute significantly in causing miscarriage.

This study shows similar demographics in terms of age when compared to previous works. It is commoner in the older age group (31-45 years) which corroborates the study done by Abbe Victor.[1] This may not be unconnected to the decreased maternal sex hormones in older age group. It may also be natures own way of preventing genetic catastrophes as the chances of abnormal chromosomal formation like Down's syndrome is commoner among older women.

Therefore, for those with background abnormalities, there is need for precautions to reduce stress such that threatened miscarriages will not eventually lead to inevitable or complete miscarriage and so that threatened miscarriage will not result. This explains why bed rest should be the universal recommendation by gynaecologist to manage miscarriage outside surgery, most especially in the first trimester, therefore laws like taking bed rest in the first trimester should be inculcated in the Health Government rules (WHO) for every pregnant women both in business sector, civil service sector, academic sector and farming sector etc to reduce the risk and incidence of miscarriage.

The lower incidence of miscarriage in the younger age group of 15-30 years also supports the previous studies that encourage pregnancy between 20-35 years. This may be due to relative less chance of chromosomal abnormalities like Downs syndrome.[14]

More so, since intake of local medicine and lack of awareness is the most second causes of miscarriage, it is advisable that the Health Government should set up means of Educating pregnant women through seminars, media or programs all over the world on the issue of miscarriage to enable them to be on a safe side of not having this miscarriage.

This research also shows that the incidence of miscarriage was higher in the in the first 10weeks of pregnancy compared to above 10 weeks. This implies that registration for ante natal care should commence immediately a woman becomes pregnant that is after her first missed period. This will not only enable her to get her ante natal drugs on time but also grant her the opportunity to receive health education.

Early pregnancy loss that is, the 1-10 weeks was the most common period among the people under review. This agrees with Olamijulo's assertion that most abortion occur in the first trimester. The implication of this is that antenatal and medical education need to the targeted at this period.[8]

CONCLUSION

Miscarriage is a common complication of early pregnancy with high fetal and maternal health risk. This is particularly more obvious in developing counties like Nigeria where health care is not readily available and assessable.

Identifying the major risk factors associated with miscarriage will go a long way in aiding the management especially preventive measures. Even though there are many possible causes of miscarriage which include smoking, alcohol, unprescribed medication, stress, hypertension, intake of local medicine, spiritual attack etc, the most prevalent cause is stress and followed by intake of local medicine and lack of awareness or education on prevalence. Stress is of different forms which include like physical, emotional, financial, even sex can be stressful.

There is need of evaluation to improve facilities for investigating women with spontaneous abortions in developing countries to identify the causes of the losses and since intake of local medicine and lack of awareness is the most second causes of miscarriage, it is advisable that the Health Government should set up means of Educating pregnant women not only antenatal but through seminars, media or programs all over the world on the issue of miscarriage to enable them to be on a safe side of not having this miscarriage.

RECOMMENDATIONS

Women of child bearing age should be educated on importance of booking at antenatal clinic early as soon as pregnancy is detected because condition which predisposes to abortions can be detected and treated in the cause of antenatal visit. They can be given the information about good nutrition and importance of well balanced diet in pregnancy health education.

Frequent follow-up and evaluation by the government on gynaecological hospital on the need to improve facilities for investigating women with spontaneous abortions in developing countries to identify the causes of the losses is advised.

The ministry of Health and Child Welfare should gazette maternity fees which are affordable so that pregnant woman can be able to book early.

Health institutions should improve quality of care given following abortion investigations such as full blood count and ultrasound scan should be done as soon as possible to reduce delays in provision of post abortal care.

A research to be carried out on a wider scale to identify knowledge, attitudes and practices of women on abortion.

ACKNOWLEDGMENT

My gratitude goes to the Almighty God for his sufficient strength and good health.

I would like to thank all those subjects who participated in the study Dr. Ezenyirioha Ugochukwu from

Department of Obstetrics and Gynaecology, Julius Ezenyirioha Memorial Hospital, Enugu, Nigeria.

Thanks to Dr. Emeka Mgbe for his help in data analysis.

May God reward all of you.

LIMITATION

The study was limited to only patients who had reported of miscarriage at Julius memorial hospital Enugu, Nigeria.

Insufficient fund to carry out the research because if there was enough money the study could have been carried out on a large scale in the city Enugu to bring a clear true picture of the factors associated with spontaneous abortion.

REFERENCES

1. Abbe V.O, The Citizen, 13 November, 2013.
2. Association of Early Pregnancy Units – AEPU. Organisational, Clinical and Supportive Guidelines, 2004. (www.earlypregnancy.org.uk/guidelines.asp).
3. Brown DL, Emerson DS, Felker RE, Cartier MS, Smith WC. Diagnosis of early embryonic demise by endovaginal sonography. J Ultrasound Med, 1990; 9: 631-6.
4. Elson J, Salim R,Tailor A, Banerjee S, Zosmer N, Jurkovic D.Prediction of early pregnancy viability in the absence of an ultrasonically detectable embryo. Ultrasound Obstet Gynecol, 2003; 21: 57–61.
5. Kerkhoff, B. Management of Miscarriage in an Early Pregnancy Clinic. Modern Medicine, 2006; 36: 10.
6. Levi CS, Lyons EA, Lindsay DJ. Early diagnosis of nonviable pregnancy with endovaginal US.Radiology, 1988; 167: 383-5.
7. Nielsen S, Hahlin M, Moller A, Granberg S. Bereavement, grieving and psychological morbidity after first trimester spontaneous abortion: comparing expectant management with surgical evacuation. Hum Reprod, 1996; 11: 1767-70.
8. Olamijulo J., The Citizen, 13 November, 2013.
9. Trinder J., Brocklehurst R., Porter M., Read M., Vyas S., Smith, L. Management of Miscarriage: expectant, medical, or surgical? BMJ, 2006; 332: 1235-40.
10. Turner MJ, Flannelly GM, Wingfield M, Rasmussen MJ, Ryan R, Cullen S, Maguire R, Stronge JM. The miscarriage clinic: an audit of the first year. Br J Obstet Gynaecol, 1991; 98: 306-308.
11. Turner MJ: Spontaneous miscarriage: this hidden grief. Ir Med J, 1989; 82: 145.
12. Merck and the Merck Manuals 2015.
13. National Coordinating Centre for Women's and Children's Health (UK) (December 2012). "Ectopic Pregnancy and Miscarriage: Diagnosis and Initial Management in Early Pregnancy of Ectopic Pregnancy and Miscarriage". NICE Clinical Guidelines, No. 154. Royal College of Obstetricians and Gynaecologists. Retrieved 4 July 2013.
14. Tabor A, Alfirevic Z. "Update on procedure-related risks for prenatal diagnosis techniques." Fetal diagnosis and therapy, 2010; 27 (1): 1–7. doi:10.1159/000271995. PMID 20051662.
15. The Johns Hopkins Manual of Gynecology and Obstetrics (4 ed.). Lippincott Williams & Wilkins, 2012; 438–439. ISBN 9781451148015.
16. Wak G., Williams J., Oduro A., Maure C., Zuber P.L.F., Black S. The safety of PsA-TT in pregnancy: an assessment performed within the Navrongo health and demographic surveillance site in Ghana. Clin Infect Dis, 2015; 61(Suppl. 5): S489–S492. [PMC free article] [PubMed] [Google Scholar].
17. Council for International Organizations of Medical Sciences. CIOMS form I; n.d. <http://www.cioms.ch/index.php/cioms-form-i> (accessed June 23, 2016).