



# Contraceptive Conundrum: Unraveling the IUD's Role in Ectopic Pregnancies - Risk Factors, Causes, and Effective Management

Haya Mohammed Abujledan<sup>1</sup>; Asim Mehmood<sup>2\*</sup>; Shaharyar Mughal<sup>3</sup>; Alaa Saed Mallah<sup>4</sup>; Faizan Akram<sup>5</sup>

<sup>1</sup>Genetics and Bioinformatics Association; Genetic Engineering, Hashemite University, Jordan.

<sup>2</sup>Medicine, Shifa College of Medicine, Islamabad, Pakistan.

<sup>3</sup>Medicine, Shifa College of Medicine, Islamabad, Pakistan.

<sup>4</sup>General practitioner, Graduated from Medicine College, Hashemite university, Jordan.

<sup>5</sup>Faculty of Pharmacy, Department of Pharmaceutics, The Islamia University of Bahawalpur, Pakistan.

## \*Corresponding Author(s): Asim Mehmood

Medicine, Shifa College of Medicine, Islamabad, Pakistan.

Email: asim.mehmood@live.com

## Abstract

**Background:** An ectopic pregnancy occurs outside the uterine cavity and represents a life-threatening health problem for mothers, constituting 1.2-1.4% of all reported pregnancies and causing an increasing proportion of maternal deaths and miscarriage rates.

**Main body:** The purpose of this article is to focus on an Ectopic pregnancy; causes, risks, the relationship between IUD; intrauterine devices, and Ectopic pregnancy, and we highlight the treatment of ectopic pregnancy in the end.

**Conclusions:** IUD use can lead to ectopic pregnancy, the risk of complications from an ectopic pregnancy increases if diagnosis or treatment is delayed, or if the condition has never been diagnosed; such as infertility, mortality in early pregnancy, Damage to fallopian tubes, and subsequent ectopic pregnancy.

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**Keywords:** Ectopic pregnancy; IUD Device; Mortality; Miscarriage; Reproduction; Methotrexate.

## Background

A migratory pregnancy is the implantation of an embryo outside the uterine tube [1]. It presents as a considerable major health issue for women in their childbearing age [2]. An ectopic pregnancy is diagnosed in the first trimester when the pregnancy is 6 to 10 weeks old [3]. The frequency of occurrence of ectopic pregnancy has increased more than six times during 25 years [4]. Most common site of implantation of the fertilized ovum is the posterior wall of the uterus [5]. Almost more than 95% of ectopic pregnancies occur inside of the fallopian tube. 70% of these tubal ectopic pregnancies occur in the ampulla, more than 12% in the isthmus, and almost 11% in fimbria. How-

ever ectopic pregnancies can also occur if the fertilized ovum is implanted outside the fallopian tube which, occurs in approximately 4% of the cases. When this happens, the fertilized ovum is implanted in the ovary (rarest), cervix, abdomen, and cesarean delivery scar [6,7,8]. On the other hand, almost 60 million women use intrauterine devices (IUD) across the globe [9]. IUD is defined as an object that is deposited inside the uterus for the sole purpose of averting the fertilization of the ovum [10].

The Intrauterine Devices work by prompting the inflammatory reactions that interrupt the normal working mechanism of the myometrium and endometrium which alters the optimum conditions and microenvironment of the uterine cavity required



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for the fertilization of the ovum and thereby also prevents the implantation in the myometrium [11]. IUDs are classified into two major types i.e.: hormonal IUDs and copper IUDs [12]. The copper releasing IUD is a better option for women since it can be utilized for almost 10 years as compared to short-lived hormonal-based contraceptives [13]. Advancement in Medical Technology and use of laparoscopy, ultrasound, and beta-hCG pregnancy testing has led to an increase in diagnosed ectopic pregnancies which helps in management before damage to maternal health. [14]. There is a spike in the number of cases of ectopic pregnancies after the insertion of intrauterine devices [15]. The relationship is positive between the risk of ectopic pregnancy and intrauterine devices. A study reported that out of 711 subjects studied for ectopic pregnancy, 70 were found to be associated with intrauterine device usage, which in the duration of nine years consisted 10% of all the ectopic pregnancies [16].

## Main Text

### Causes of Ectopic pregnancy

The spike in increasing cases of ectopic pregnancies is believed to be associated with multiple factors. The intrauterine device can also be a cause of infection by bringing bacteria from exogenous sources [17]. Ectopic pregnancy accounts for most of the deaths reported of pregnant women in the first trimester [18]. The reasons for the occurrence of migratory pregnancy are still not completely clear, but some confirmed reasons will be reviewed. Since the 1970s, migratory pregnancies began to rise, the cause of the increase in cases was searched, and according to studies, the use of an intrauterine device (IUD) was one of the reasons and that pregnant women who use the IUD have higher odds ratios for ectopic pregnancy [3]. Meta-analysis was done during the period between 1977 to 1994 using Medline search. The analysis calculated the odds ratios of ectopic pregnancy and uses of intrauterine devices. For comparison between the current usage of intrauterine devices of the pregnant control group, it was found that there was an increase in the risk of ectopic pregnancy. (OR:10.63,95%CI:7.66-14.74). Secondly, when cases were compared with the no pregnant control group, it was deduced that there was no such risk imposed ectopic pregnancy (OR:1.06,95% CI:1.23-1.59). Whereas utilization of intrauterine devices (IUD) in the past can increase the risk of pregnancy mildly (OR:1.40,95% CI:1.23-1.59). Therefore, the current usage of intrauterine devices (IUD) does not increase the chances of ectopic pregnancy. But, pregnancy with an IUD installed comes out as ectopic pregnancy more regularly. Past usage of IUD before pregnancy might slightly increase the likelihood of ectopic pregnancy [19].

The most major and common cause of ectopic pregnancy is considered to be a pelvic inflammatory disease [20]. Pelvic inflammatory disease is firmly related to sexually transmitted diseases, but PID can also have endogenous sources. Usage of IUD and procedures used for abortions can also cause pelvic inflammatory disease [15]. It is reported that the probability of ectopic pregnancy is 1.6 times higher in IUD users as compared to subjects who do not use IUD. The incidence of ectopic pregnancy was considerably higher in women who were never pregnant before versus those who had previous pregnancies [21]. Infections due to sexually transmitted diseases can also increase the risk of ectopic pregnancy by 9-fold [22]. Chlamydia Trachomatis infection and endometriosis can also induce ectopic pregnancy [23]. The spike in increasing cases of ectopic pregnancies is believed to be associated with multiple factors. The intrauterine

device can also be a cause of infection by bringing bacteria from exogenous sources [24]. A positive relation was found between infertility and ectopic pregnancy thus infertility also increases the risk of ectopic pregnancy [25]. In an ectopic pregnancy, the Containment of the embryo inside the fallopian tube is hypothesized due to lack of smooth muscle contractions and changes in the micro environment of the tube [26]. Moreover, maternal smoking can also increase the incidence of ectopic pregnancy, due to the interaction of tobacco with the oviduct. [27]. It is also being reported that using artificial methods for conception i.e in vitro fertilization can also increase the risk by 2.5-5 times as compared to natural methods used for conception [28].

### The relationship between IUD and Ectopic pregnancy

A study on the distribution site of EP, in which most of the sites were ampulla and isthmic with no cervical pregnancies. In multivariate analysis, the main factor associated with the EP site was the current use of IUD, with more frequent distal ectopic pregnancies [29]. In both IUDs that are LNG-IUS and Copper IUD, the rate of contraception failure was low. But the LNG IUS has a significantly low risk of ectopic pregnancy, as compared to copper IUDs. In Twenty-one ectopic pregnancies seven LNG IUS and fourteen copper IUD [30]. Ectopic pregnancy is not associated with the current use of Intrauterine devices. An ectopic pregnancy is more often with IUD than a pregnancy without IUD. Previous use of IUD can be related to and causing EP [19]. Among all failures of contraception, the ratio for ectopic pregnancies was higher in users of LNG IUS as compared to copper IUD. But the overall risk of contraceptive failure in LNG IUS users is very low so the risk for ectopic pregnancies was much lower in LNG IUS users than in copper IUD users [31].

In a comparison study for the users of plastic and copper IUD devices, the rates of ectopic pregnancies were lower for the users of plastic IUD than the copper IUD in most of the cases [32]. The use of IUDs can be associated with pelvic inflammatory diseases (PID) and Neisseria or Chlamydia infection which can be in turn a cause of ectopic pregnancy [33]. Ectopic pregnancy and *Chlamydia trachomatis* infection were found to be strongly associated. So, If IUDs are causing this infection. It can be related to ectopic pregnancy [34]. In a study it was found that contraceptives use can minimize the risk for ectopic as well as intrauterine pregnancy; however, if the method of contraceptive fails, it has more chances to cause ectopic pregnancy than those who don't use contraceptive methods. and especially the women with current use of LNG-IUS and IU devices. Past use of IUD was associated with more EP risk, even if the device had been removed [35]. A comparison between the occurrence of ectopic pregnancy and IUD use duration shows a decrease in an ectopic pregnancy with the increase in IUD use duration [36].

The levonorgestrel-releasing intrauterine device (LNG-IUD) use can protect from pelvic inflammatory disease and ectopic pregnancies as compared to other copper or plastic IUD. The overall pearl Index in LNG-IUD use for ectopic pregnancy is 0.02 per hundred women [37]. In one of the studies, researchers concluded that in IUD users, the cumulative rate of a year for intrauterine pregnancies was 87% and was 86% for deliveries with no ectopic pregnancy recurrence; however, for IUD non-users, the cumulative rate of two years ectopic pregnancy recurrence was 28% [38]. The ratio of ectopic pregnancies are very much low in IUD users than those in women who are not using any contraception method; But, about one of twenty pregnancies in IUD user is ectopic pregnancy. And IUDs do not protect women from sexually transmitted diseases and often can lead

to very heavy menstrual bleeding [39]. So women having sexually transmitted infections like Chlamydia have an increased risk of ectopic pregnancy [40].

The prevalence of ectopic pregnancy has increased significantly over the past few years. While studying ectopic pregnancies in IUD and Non-IUD users, it was observed that the prevalence of ectopic pregnancies was increasing in both IUD users and non-users. But, the ratio for ectopic pregnancies in IUD users was found to be significantly higher than IUD non-users. Examination via ultrasonography indicates that the ectopic pregnancy in IUD users is related to IUD disposition in the uterine cavity [41]. A study explaining the relative risk of previous IUD users as compared to women who never used an IU device signifies 1.4 times more risk of developing ectopic pregnancy than a woman who is a nonuser of IUD. It can be said that IUD use is not directly related to ectopic pregnancy, But IUD use can lead to ectopic pregnancy [42].

### Risks of an Ectopic pregnancy

According to some studies, an ectopic pregnancy is indicated to cause permanent infertility in 20-60% of cases, mortality in early pregnancy [43]. Damage to fallopian tubes, and subsequent ectopic pregnancy [44]. hemorrhage from ectopic pregnancy is the leading cause of pregnancy-related death in the first trimester of pregnancy [45] and is related to approximately 10% Of all pregnancy-related deaths with a pregnancy-related mortality rate of 31.9 deaths per 100,000 pregnancies [46]. According to a study in Denmark, it says: we found that daughters of mothers with a history of ectopic pregnancy had 50% more likely to have an ectopic pregnancy and 30% more likely to experience an induced miscarriage [47,48]. There were 102 deaths from an early ectopic pregnancy that were reviewed from 1950 to 1974 by the Michigan Maternal Mortality Commission [49]. The risk of complications from an ectopic pregnancy increases if diagnosis or treatment is delayed, or if the condition has never been diagnosed.

A woman who has an ectopic pregnancy and does not receive a diagnosis or treatment in the first months is more likely to have severe internal bleeding. This could lead to dangerous results, in terms of psychological aspect: grief will lead to pregnancy loss and anxiety about a future pregnancy, which increases the mother's depression [50].

### Management and treatment of ectopic pregnancy

The management of ectopic pregnancy in the fallopian tube depends on the stability of the patient, the availability of resources, and the future fertility. In general, medical management is preferred for an early ectopic pregnancy, and surgery is reserved for unstable patients, uncertain diagnosis, and failed medical therapy [50]. Expectant management criteria include asymptomatic and have no evidence of rupture or hemodynamic instability, objective evidence of resolution, such as declining (B-hCG), must be fully complain and be willing to accept the potential risk of tubal rupture, gestation is 4cm or less in its greatest dimension, absence of fetal heart motion, b-hCG level <1,000 mIU [51]. Management of ectopic can be medical or surgical, Medical treatment is preferable because the costs are lower, with otherwise similar outcomes. Methotrexate, this folate antagonist attacks rapidly proliferating tissues including trophoblastic villi [52]. Criteria for methotrexate include The patient must be hemodynamically stable, the patient must be reliable, complainant, and able to return for follow-up care,

no evidence of tubal rupture, the size of the gestation should not exceed 4cm at greatest dimension (or exceed 3.5 cm with cardiac activity), Absence of fetal cardiac activity on ultra-sonographic findings, B-hCG level less than 5000 mIU/ml, no history of folic supplementation. Single dose 1 mg/kg is 90% successful [53]. The Best predictor of success of medical therapy is the initial B-hCG level. Obtain repeat B-hCG levels 4 days and 7 days after the methotrexate injection. An initial increase in B-hCG levels often occurs by the third day and is not cause for alarm. A decline in B-hCG levels of at least 15% from days 4 to 7 post injection indicates a successful medical response. Failure of medical treatment is defined when B-HCG level increases, plateaus, or fails to decrease adequately by 15% from days 4 to 7 post injection. At this time, surgical intervention may be warranted. A repeat single dose of methotrexate can also be a viable option [52]. Contraindications to MTX: Documented hypersensitivity to methotrexate, breastfeeding, immunodeficiency, alcoholism. [54] Adverse effects due to MTX is nausea, stomatitis and vomiting [55]. Treatment effect of methotrexate is the increasing in abdominal pain (occurring in up to two thirds of patients [56].

Salpingectomy and Salpingectomy laparoscopy is the recommended approach in most cases, laparotomy is usually reserved for patients who are hemodynamically unstable or for patients with corneal ectopic pregnancies. [57], it also is a preferred method for surgeons inexperienced in laparoscopy and in patients in whom a laparoscopic approach is difficult (e.g. secondary to the presence of multiple dense adhesions, obesity, or massive hemoperitoneum) [58], linear salpingectomy along the anti-mesenteric border to remove the products of conception is the procedure of choice for ectopic pregnancies in the ampulla portion of the tube [52]. Total salpingectomy is the procedure of choice in a patient who has completed child-bearing and no longer desires fertility, in a patient with a history of an ectopic pregnancy in the same tube, or in a patient with severely damaged tubes [58].

### Conclusions

Ectopic pregnancy is the most common cause of death in women during the first trimester, at approximately 10% of the total. The reasons for the occurrence of ectopic pregnancy are still not completely clear, but some confirmed reasons will be reviewed and the major risk factors of ectopic pregnancy include maternal age, low parity, low gravidity, pelvic inflammatory disease, sexually transmitted diseases, prior tubal surgery, history of infertility, intrauterine contraceptive device use, smoking and previous ectopic pregnancy. Ectopic pregnancy is not associated with the current use of Intrauterine devices, we can be said that IUD use is not directly related to ectopic pregnancy, But IUD use can lead to ectopic pregnancy. The risk of complications from an ectopic pregnancy increases if diagnosis or treatment is delayed, or if the condition has never been diagnosed; such as infertility, mortality in early pregnancy.

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