

Original Investigations

Expulsion rate of intrauterine device: mediate vs. immediate puerperium period Intrauterine device postpartum placement

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Abstract

Objectives: To evaluate the rate of expulsion of intrauterine device (IUD) inserted during the immediate and mediate puerperium. To evaluate whether the type of delivery is a predictor of expulsion of the IUD when inserted in the puerperium period.

Materials and Methods: This was a prospective observational study. Patients whose IUD (TCU-380 copper) were placed during puerperal period were divided in two groups according to the time of placement: immediate and mediate puerperium. The decision regarding the time of IUD insertion was made in a nonrandomized manner. The Chi-square test, Mann-Whitney test, Spearman's correlation test and logistic regression were used.

Results: The total rate of expelled IUDs was 28.8% (49/170). There was no significant association between the presence of expelled IUD and the moment of IUD insertion (immediate vs. mediate puerperium; 26.6% vs. 34.78%, $p = 0.296$). Among patients diagnosed with expelled IUD, 79.6% (39/49) had undergone insertion after vaginal delivery, whereas 20.4% (10/49) had the IUD inserted during cesarean section. There was no significant correlation between the time between IUD insertion and the diagnosis of expelled IUD regarding to number of pregnancies ($r = -0.160$, $p = 0.271$) or gestational age at delivery ($r = -0.058$, $p = 0.939$). The type of delivery was significant predictor for expelled IUD ($p < 0.0001$). Vaginal delivery was 4.23 times

more likely than cesarean section to expel IUD inserted in the puerperal period (odds ratio [OR]: 4.23, 95% confidence interval [CI] = 1.94-9.25).

Conclusion: Vaginal delivery was the most prevalent type of delivery in patients who underwent IUD insertion during the immediate and mediate puerperium. The risk of IUD expulsion after vaginal delivery was greater than cesarean section.

Keywords: Intrauterine device; contraception, puerperium, delivery; expulsion; postpartum

Introduction

The postpartum period is marked by a transition for the woman and her family, during which the new mother experiences physical adjustments as she returns to her prepregnancy state and psychosocial changes as a result of the presence of a new family member (1). Currently, the World Health Organization recommends and emphasizes early medical follow-up during this period, with the goal of preventing and reducing neonatal and maternal morbidity in this stage of the female reproductive cycle (2,3). One concern during the postpartum period is the possible occurrence of a new pregnancy in a short period of time, which not only can cause maternal-fetal complications but also can have serious psychological, social, and economic repercussions.

Pregnancy and the postpartum period are appropriate times to discuss contraception, because there is an increased motivation for its use. This moment favors the patient-physician relationship and the evaluation of individual contraceptive needs. Physician guidance directly influences with the woman's decision about the use and type of contraception. Currently, some of the most recommended options include long-term methods (e.g., long-acting reversible contraceptives), such as a copper or hormonal intrauterine device (IUD) and implant.

The copper IUD is one of the most widely used reversible contraceptive methods in the world, and it has an extremely low failure rate, with failure occurring in less than 1 in 100 women in the first year of use. It is indicated because of its ease of use, high efficiency, and association with safety and few side effects. One study showed that its use immediately after delivery was safe for both the mother and the newborn, with advantages including convenience and ease of insertion (3).

The literature indicates that the need for effective contraception in women immediately after delivery has been underestimated, because, unfortunately, unplanned pregnancies can occur during this period. Recent research has shown that almost 50% of mothers return to having sex within 6 weeks after delivery, and many of these women do not use contraception (4).

Thus, there is a need for greater dissemination and understanding of the use of the IUD in the immediate postpartum period as well as an assessment of its advantages and disadvantages. These questions encouraged us to analyze the use of this method in our practice.

Materials and Methods

This was a prospective observational study conducted at the Gynecology and Obstetrics Sector, from June 2018 to September 2019. The study was approved by the Local Research Ethics Committee (CAAE: 20502719.5. 0000.5145). Patients whose IUD were placed during puerperal period were divided in two groups according to the time of placement: immediate puerperium and mediate puerperium. A signed consent form was obtained from all patients.

The inclusion criteria included pregnant women ≥ 18 years old who expressed a desire to insert the IUD in the puerperal period. The exclusion criteria were the following: 1) IUD insertion between more than 72 hours and less than 4 weeks after delivery; 2) chorioamnionitis; 3) rupture of membranes >18 hours; 4) HIV; 5) puerperal sepsis; 6) puerperal endometritis; 7) abnormal uterine bleeding with uninvestigated etiology; 8) Müllerian anomaly; 9) postpartum hemorrhage; and 9) extensive lacerations of vagina. The decision regarding the time of IUD insertion (immediate puerperium period = between 10 and 15 minutes after placental delivery and 48 hours after delivery; mediate puerperium period = between 48 hours and 6 weeks after delivery) was made in a nonrandomized manner. We used the TCU-380 copper IUD, which was inserted by medical residents in gynecology and obstetrics (first, second, and third years). We defined partial expulsion as the protrusion of the IUD from the external cervical os or visualization on transvaginal ultrasound of the distal end of the IUD below the internal os of the cervix [5].

Insertion technique after vaginal delivery in anesthetized patients without the need for additional instruments

After uterine massage and prior to perineal repair, new sterile gloves were placed and oxytocin was administered (10 UI intravenously [IV]). No specific antibiotic prophylaxis was used for the procedure. Subsequently, the IUD was removed from the insert. The IUD was placed between the index and middle fingers, and the opposite hand was inserted to stabilize the uterus externally. In the period between 10 and 15 minutes after placental delivery, the IUD was introduced until contact was made with the uterine fundus. To confirm that the IUD came into contact with the uterine fundus, the examiner used manual tactile perception through the placement of one hand on the uterine fundus. As the inner hand was being removed, a rotation of about 45 degrees clockwise or counterclockwise was performed, an act that was used to prevent the exteriorization of the IUD. Then, the threads were cut at the height of the external orifice of the cervix. The threads were visualized and trimmed on the follow-up visit 4 weeks after insertion. All cases in which the IUD wire was not visible inside the vaginal canal were referred for ultrasound examination to assess the position of the IUD. This technique was used in all patients underwent vaginal delivery with peridural anesthesia.

Insertion technique after vaginal delivery in nonanesthetized patients using Foerster or De Lee forceps

This technique was used posteriorly and consisted of putting on sterile gloves, uterine massage, perineal repair, and administration of antibiotic prophylaxis and oxytocin (10 UI IV) as routine. Immediately after these steps, the IUD was removed from the insert. The IUD was then captured using De Lee's forceps, taking care not to activate the rack and to avoid damaging the copper, so that the sphere of the stem and the wires was parallel to the forceps. The upper tip of the IUD was placed flush with the tip end of the forceps. The wires were positioned away from the axis of the forceps, thus preventing them from becoming tangled or attached to the instrument when it was removed from the uterus. Then, using a hand or Doyan valve, the anterior lip of the cervix was exposed and visualized. A soft grip of the anterior lip of the cervix was performed using another De Lee's forceps. The cervix was pulled slightly, the IUD was inserted under direct visualization. Soon after, the hand that pulled the cervix was repositioned on the abdomen to stabilize the uterine fundus. Then, the IUD was precipitated to the uterine fundus, and the funicular position with confirmed with both the abdominal hand and the insertion hand. As the inner hand was being removed, a rotation of about 45 degrees

clockwise or counterclockwise was performed, which was used to prevent the exteriorization of the IUD. The threads were cut at the height of the external orifice of the cervix and then visualized and trimmed during the follow-up visit 4 weeks after insertion. All cases in which the IUD wire was not visible inside the vaginal canal were referred for ultrasound examination to assess the position of the IUD.

Insertion technique for cesarean delivery

After placental delivery, the IUD was inserted at the top of the uterine fundus either manually or using De Lee's forceps. Before hysterorrhaphy, the threads were incorporated in the lower segment of the uterus to allow them to hang naturally through the cervix during the puerperium period. Before hysterorrhaphy was performed, the IUD was confirmed to still be in the fundus. The threads were visualized and trimmed during the follow-up visit 4 weeks after insertion. All cases in which the IUD wire was not visible inside the vaginal canal were referred for ultrasound examination to assess the position of the IUD.

The following variables were evaluated: age, number of pregnancies, number of deliveries, number of abortions, gestational age at delivery, type of delivery, time between IUD insertion and ultrasound examination, rate of IUD expulsion, time to diagnosis of IUD expulsion, rate of false path of IUD.

Statistical Analysis

The data were analyzed using SPSS version 20.0 (SPSS Inc., Chicago, IL, USA) and Prisma GraphPad version 7.0 (GraphPad Software, San Diego, CA, USA). The quantitative variables were initially subjected to the normality test (Kolmogorov-Smirnov) and were presented from the median and the 25th and 75th percentiles. The categorical variables were described from the absolute and percentage frequencies and represented in tables and graphs. To assess the difference between categorical variables and their proportions, the chi-square test was used. The Mann-Whitney test was used to analyze continuous variables. To perform the correlation between continuous variables, Spearman's correlation test was used. Logistic regression was performed to determine the best predictors for IUD misplacement. The level of significance (p) for all tests was <0.05 .

Results

Between June 2018 and September 2019, 1,939 deliveries occurred in our service. During this period, 322 copper-T IUDs were inserted. A total of 152 cases were excluded because of lack of clinical follow-up after insertion. Thus, 170 cases were included in the final statistical analysis. The included cases were divided into two groups according to the IUD insertion period: insertion during the immediate puerperium period ($n = 124$) and insertion during the mediate puerperium period ($n = 46$; Figure 1).

There was no significant difference in IUD insertion based on age ($p = 0.174$), number of pregnancies ($p = 0.855$), parity ($p = 0.896$), number of abortions ($p = 0.570$), gestational age at delivery ($p = 0.570$), time between IUD insertion and ultrasound examination ($p = 0.179$), and time between IUD insertion and the diagnosis of IUD expulsion ($p = 0.751$; Table 1).

A significant association was observed between the IUD insertion and type of delivery ($p = 0.044$). The rate of vaginal deliveries was higher in those undergoing immediate puerperium IUD insertion (52.42 vs 47.58%) and mediate puerperium IUD insertion (69.57 vs 30.43%) as compared with the rate of cesarean sections (Figure 2).

Considering all of the cases included in the study, the total rate of expulsion of the IUDs was 28.8% (49/170). There was no significant association found between the presence of expulsion of the IUD and the moment of IUD insertion (immediate puerperium vs mediate puerperium; 26.6% vs 34.78%, $p = 0.296$), either clinically or with transvaginal ultrasound (Table 1). There were no significant association of IUD false path between immediate and mediate puerperium groups (1,6% vs. 0%, respectively) (Table 1). There was not any case of endometritis in both groups.

A significant association was observed between the type of delivery and IUD position ($p = 0.0002$). Among patients diagnosed with an expelled IUD, 79.6% (39/49) had undergone insertion after vaginal delivery, whereas 20.4% (10/49) had the IUD inserted during cesarean section. On the other hand, both for patients who underwent IUD insertion after vaginal delivery (59.80% vs 40.20%) and for those who underwent insertion during cesarean section (86.30% vs 13.70%), the rate of a correctly positioned IUD was higher than the rate of an expelled IUD (Table 2).

All IUDs were inserted by medical residents of gynecology and obstetrics in the first ($n = 4$), second ($n = 4$), and third ($n = 4$) years of residency, and none had previous experience inserting an IUD in the puerperal period. Physicians received only theoretical training prior to the start of the study. The first case of IUD insertion after vaginal delivery in the immediate puerperium period, the first case inserted after vaginal delivery in the mediate puerperium period, and the first case inserted after cesarean section by each physician were excluded. We did not observe a significant association between the level of training of the medical residents, who had the same level of IUD placement training, and the rate of IUD expulsion ($p = 0.626$; Table 3).

There was no significant correlation between the time between IUD insertion and the diagnosis of expelled IUD in number of pregnancies ($r = -0.160$, $p = 0.271$) or gestational age at delivery ($r = -0.058$, $p = 0.939$; Figure 3).

A binary logistic regression was performed to determine whether the type of delivery in patients who had an IUD inserted in the puerperal period is a predictor of IUD expulsion. The model containing the type of delivery was significant for the prediction of an expelled IUD ($\chi^2[1] = 15.14$, $p < 0.0001$, R^2 Nagelkerke = 0.12). Patients who delivered vaginally were 4.23 times more likely than patients who had cesarean sections to expel the IUD when it was inserted in the puerperal period (odds ratio [OR]: 4.23, 95% confidence interval [CI] = 1.94-9.25; Table 4).

A binary logistic regression analysis was performed to determine whether the type of delivery in patients who had an IUD inserted in the immediate puerperium period was a predictor of expulsion of the IUD. The model containing the type of delivery was significant for the prediction of expulsion of the IUD when it was inserted in the immediate puerperium period ($\chi^2[1] = 20.58$, $p < 0.0001$, R^2 Nagelkerke = 0.22). Patients who delivered vaginally were 8.17 times more likely than patients who had cesarean sections to expel the IUD when it was inserted in the immediate puerperium period (OR: 8.17, 95% CI = 2.89-23.11). On the other hand, the model containing the type of delivery was not significant for the prediction of expulsion of the IUD when the IUD was inserted in the mediate puerperium period ($\chi^2[1] = 0.008$, $p < 0.930$, R^2 Nagelkerke = 0.000; Table 4).

Discussion

In our study, we evaluated if the type of delivery was a predictor of expulsion and rate of expulsion of IUD inserted during the immediate and mediate puerperium. Our results have shown that the insertion of IUD during puerperal period is a safe technique even though when the insertion is performed by professionals with no previous experience in

puerperal IUD inserting. The copper-T IUD is classified as a long-acting reversible contraceptive and is recommended by the American College of Obstetrics and Gynecology (ACOG) as one of the best contraceptive options in the immediate postpartum period (6). ACOG's guideline on this method aims to improve the spacing of pregnancy, thus contributing to the improvement of maternal and child health care, especially in developing countries.

Our results showed a low acceptance of IUD insertion in the mediate or immediate postpartum period in the population studied, with only 16.6% of women agreeing to its use. Another important finding was the loss of 47.2% of women who chose to insert an IUD after delivery and did not return for follow-up. Similar values were observed in the literature, which describes that about 10% to 40% of puerperal women do not return for follow-up and that 40% to 70% of those who planned to use an IUD are unable to have it placed (7,8). These results show the benefit of offering this contraceptive method during the immediate postpartum period, as puerperal women have a lower likelihood of undergoing IUD insertion because of the difficulty of the procedure and lack of follow-up.

Our results showed that IUD insertion in the immediate postpartum period was safe, is similar to findings of other studies (9,10). The advantages of this procedure include the IUD's adequate stay inside the uterus and the fact that is a safe and efficient, long-term contraceptive method. In our study, the rate of uterine perforation was low (1.6%). Conversely, previous studies have shown high rates of IUD translocation when the insertions was performed in the puerperal period (11,12). Moreover, we did not have any case of endometritis diagnosed during the period of the study.

One of our objectives was to evaluate the positioning of the IUD after its insertion via ultrasound or physical examination performed in the first 60 days. We found no difference in relation to age, number of pregnancies, or age among women of both groups. Interestingly, our findings showed that pregnant women who underwent vaginal delivery had a higher incidence of IUD acceptance than those who delivered via cesarean section.

One concern about IUD insertion after delivery is the higher rate of expulsion when compared with IUD insertion during other time periods. Our rate of IUD expulsion was 28.8% after ultrasound or physical examination in the first 60 days. We did not find any difference in the frequency of IUD expulsion between insertions that took place during the mediate and immediate postpartum periods.

The definition of IUD expulsion is not always clear, and diagnostic criteria are rarely reported. Expulsions as reported in the literature may have been determined by a variety of methods, including clinical, physical, or ultrasound examinations. In a systematic review published in 2018, the authors reported that, depending on the time of IUD placement, there was a change in the incidence of expulsion. In the immediate, early, and interval of IUD insertion, the expulsion rate was 10.0%, 29.7%, and 1.9%, respectively, including all follow-up periods (13). The expulsion rate was 14.9% for vaginal deliveries, which was 3.6% higher as compared with cesarean deliveries at all follow-up intervals (13). Similarly, in our study, patients who underwent IUD insertion after vaginal delivery were more likely to have a poorly positioned IUD (8.17 times higher) than those who underwent cesarean section (OR: 8.17, 95% CI = 2.89-23.11). Braaten et al. (14) claimed that in approximately 10% of their users, the IUD was mispositioned. Currently, good positioning is considered when the end of the vertical IUD nail is above the internal os (15). In cases suspicious for poorly positioned IUD on ultrasound examination, the presence of symptoms such as pain and increased or

irregular bleeding should lead to further investigation. We did not observe a change in IUD expulsion when the IUD was inserted 4 to 6 weeks after the delivery.

With regard to the type of delivery as a factor for IUD expulsion, we found in this study that 79.6% (39/49) of women had undergone insertion after vaginal delivery, whereas 20.4% (10/49) had the IUD inserted during cesarean section, and in both types of delivery, the rate of adequate positioning was higher than the rate of poor positioning. A randomized comparative study, in which both immediate and late postpartum IUD insertions were performed, demonstrated that the failures were not influenced by the moment of insertion, cervical dilation, or distance between the apex of the IUD and the fundus of the uterine cavity (16).

In our study, women who underwent vaginal deliveries were 4.23 times more likely than women who underwent cesarean sections to expel the IUD when it was inserted in the puerperal period. Aoun et al. (17) reported the following risk factors for expulsion: history of previous expulsion of another copper-T IUD (with a probability of a new expulsion of 30%), increased menstrual flow, and severe dysmenorrhea. Lopes et al. (18) in a systematic review compared immediate (within 10 minutes of placental delivery) versus early postpartum placement of the IUD and found no difference in expulsion rates. A trial from Uganda showed that expulsion was more likely in the immediate group, although the estimate was imprecise. In a meta-analysis, expulsion by 6 months was more likely for the immediate group, but the confidence interval was wide (OR: 4.89, 95% CI = 1.47-16.32; participants = 210; studies = 4). The authors concluded that the benefit of effective contraception immediately after delivery may outweigh the disadvantage of increased risk for expulsion.

O'Hanley and Huber (19) proposed that previous training was not necessary for IUD placement, which is in agreement with our study. We involved professionals with no previous experience in inserting puerperal IUD. In the same sense, Cwiak and Cordes (20) reported that both experienced clinicians and interns can successfully insert IUDs within a medical residency program of gynecology and obstetrics. Our study did not observe a significant association between the level of medical resident training in gynecology and obstetrics and the rate of expulsion of the puerperal IUD ($p = 0.626$). Although previous studies have shown that previous experience was not necessary for IUD insertion, we believe that the overall high expulsion rates, demonstrated in our study, may have been influenced by the lack of prior training of the professionals. We also did not evaluate the necessary amount of IUD that must be inserted in the training period to obtain lower expulsion rates. On the other hand, we believe that the low experience of the professionals reflects the reality of several regions with low socio-economic status, in which the IUD insertion in the puerperal period can contribute to better family planning.

Conclusion

In summary, vaginal delivery was the most prevalent type of delivery in patients who underwent IUD insertion during the immediate and mediate puerperium. The risk of IUD expulsion after vaginal delivery was greater than after cesarean section.

Ethics

Ethics committee approval: Local Research Ethics Committee (CAAE: 20502719.5.0000.5145)

Informed Consent: It was obtained.

Authorship Contributions: Surgical and Medical Practices: JTH; KSL, Concept: ABP; MKOG, Design: ABP; KSL, Data Collection or Processing: ABP, Analysis or Interpretation: CAFG, Literature Search: JTH, Writing: EAJ

Conflict of Interest: No conflict of interest is declared by the authors.

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	Immediate puerperium (n=124)	Mediate puerperium (n=46)	p
Age (years)	26 (22-32)	24 (21-30)	0.174*
Number of pregnancies	2 (1-3)	1 (1-3.25)	0.855*
Number of deliveries	2 (1-3)	2 (1-3)	0.896*
Number of abortions	0 (0-1)	0 (0-0)	0.570*
Gestational age at delivery (weeks)	40 (39-40.4)	40 (38.6-40.6)	0.831*
Type of delivery			0.044**
Vaginal	65 (52.42%)	32 (69.57%)	-
Cesarean section	59 (47.58%)	14 (30.43%)	-
Time between IUD insertion and ultrasound examination	51 (37-70)	45 (32-61.5)	0.179*
IUD expulsion	33 (26.61%)	16 (34.78%)	0.296**
Time to diagnosis of IUD expulsion	49 (30-80)	41 (16-71)	0.751*
Uterine perforation	2 (1.61%)	0 (0%)	>0.999

n: absolute number of cases included and each study group, IUD: intrauterine device
 *Mann-Whitney - Median (25th-75th), p <0.05, **Chi Square - Frequency (percentage), p <0.05

	Vaginal delivery (n=97)	Cesarean section (n=73)	p*
			0.0002
IUD expulsion	39 (40.20%)	10 (13.70%)	
IUD positioned	58 (59.80%)	63 (86.30%)	

*Chi Square - Frequency (percentage) p <0.05

	MR1	MR2	MR3	p*
				0.626
IUD expulsion	30 (29.12%)	11 (25%)	3 (18.75%)	
IUD positioned	72 (70.58%)	33 (75%)	13 (81.25%)	

MR1: medical resident of first year, MR2: medical resident of second year, MR3: medical resident of third year.
*Chi Square, p <0.05.

	OR	CI 95%	R ₂ Nagelkerke	p*
IUD insertion in the puerperal period	4.23	1.94-9.25	0.12	<0.0001
IUD insertion in the immediate puerperium	8.17	2.89-23.11	0.22	<0.0001
IUD insertion in the mediate puerperium	0.94	0.25-3.50	0.000	NS

CI: confidence interval, NS: not significant
*Binary logistic regression, p <0.05

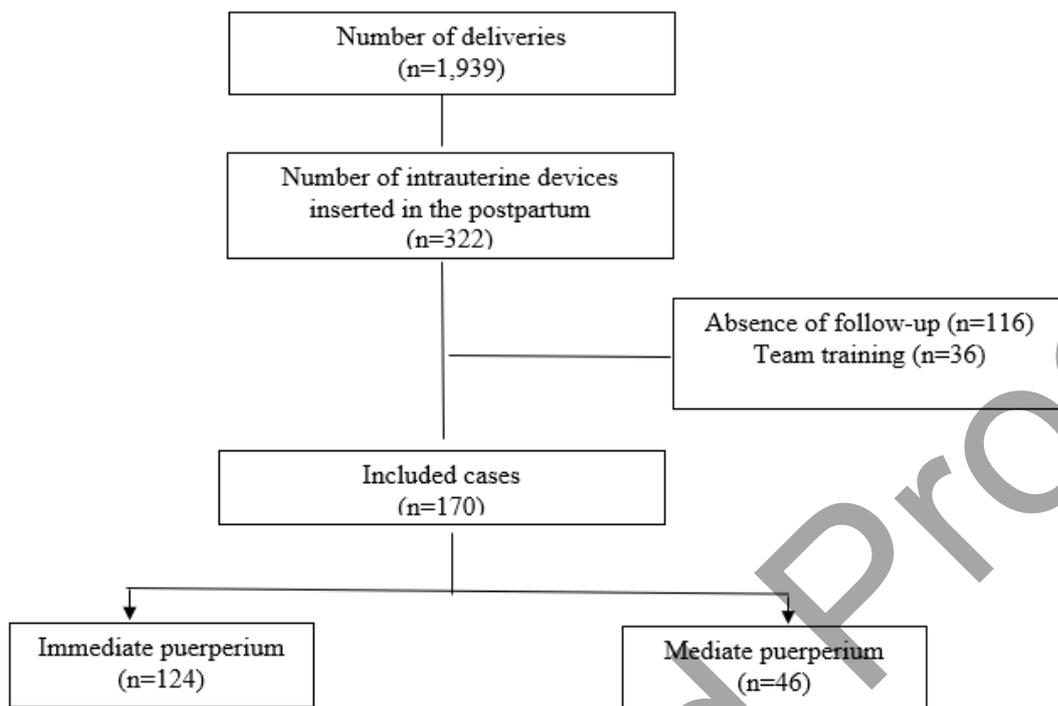


Figure 1. Flowchart of the included and excluded cases

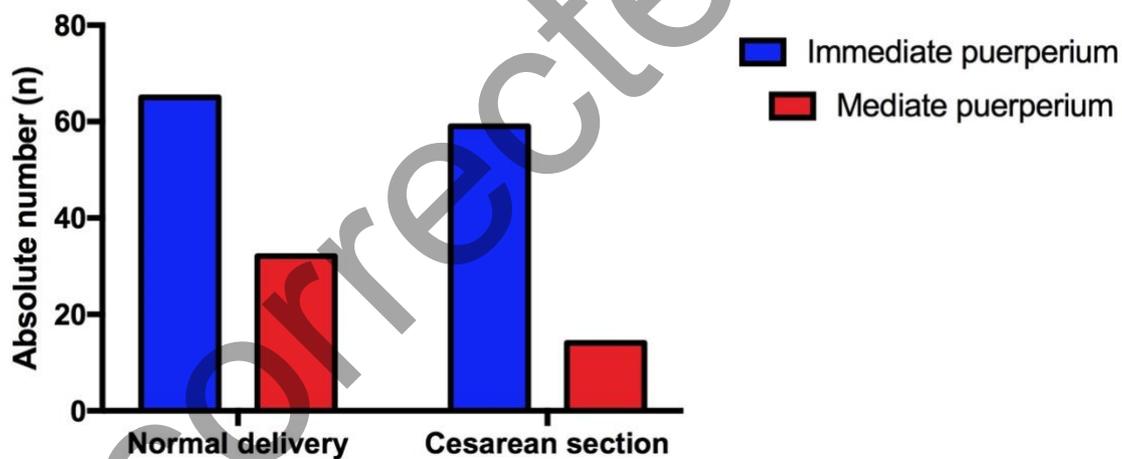
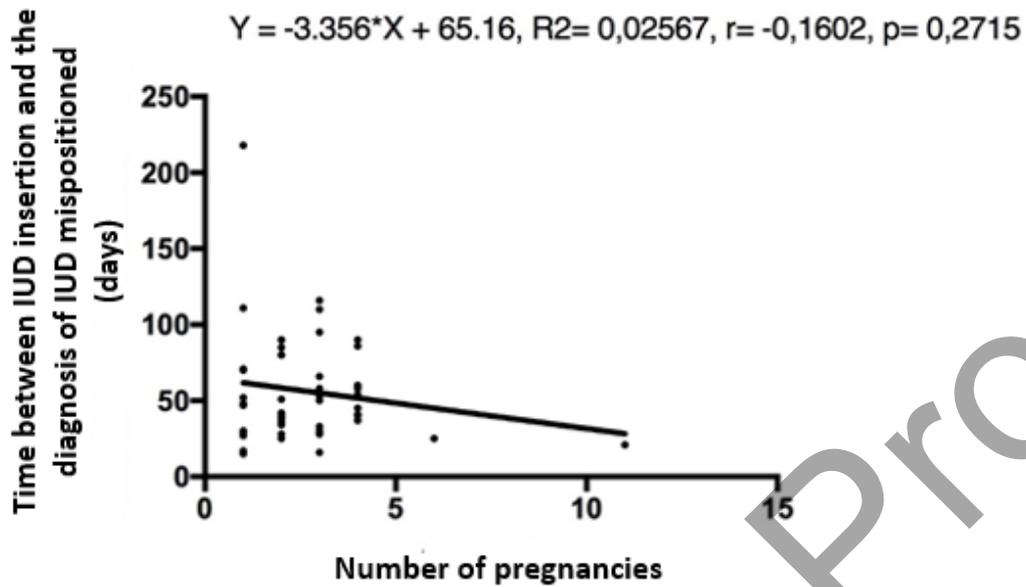
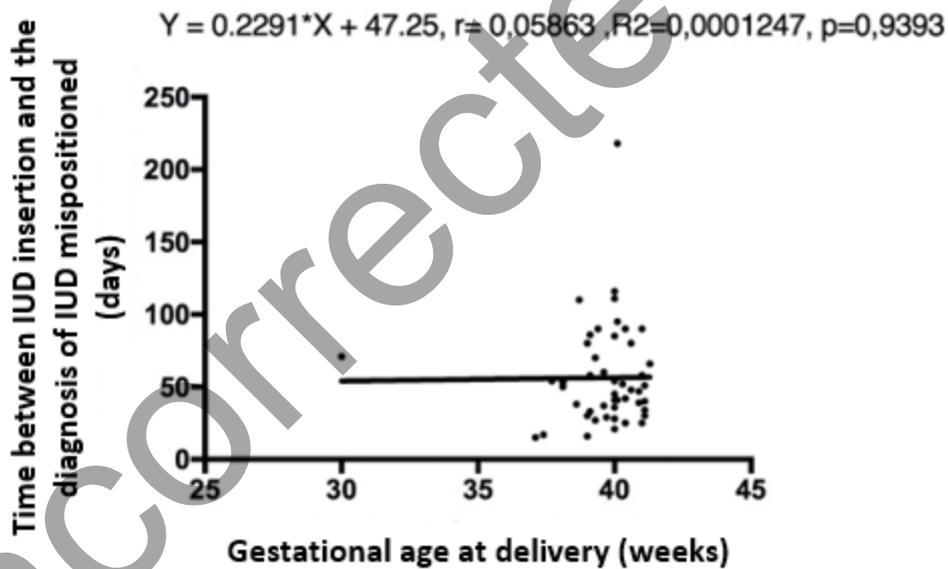


Figure 2. Bar graph showing the association between intrauterine device (IUD) insertion and type of delivery. Chi-square, $p < 0.05$



A



B

Figure 3. Scatter plot showing the correlation between the number of days between intrauterine device (IUD) insertion and the diagnosis of IUD expulsion in terms of number of pregnancies (A) and gestational age at delivery (B). Linear regression and Spearman's correlation test, $p < 0.05$