

# Prophylactic Bilateral Internal Iliac Artery Ligation in Placenta Praevia Increta and Percreta Could Prevent Hysterectomies and Massive Blood Transfusion

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## ABSTRACT

Worldwide, caesarean section delivery is considerably increased; this resulted in increase in cases of pathological placental adhesion which in turn has increased burden on obstetric units. Internal iliac artery ligation (IIAL) has been recommended as an efficient means of managing intractable PPH and preventing maternal death. To evaluate the efficacy of prophylactic bilateral hypogastric arteries ligation on maternal outcome in diagnosed cases of morbidly adherent placenta.

This retrospective study was carried out in a high risk pregnancy unit, Alryan private clinic and Gharian teaching hospital, Libya, from April 2018 To Jan 2019.

A total of 65 patients diagnosed by color Doppler with an abnormally adherent placenta praevia were studied; 52 (52/65 = 80.3%) of these patients presented with antepartum hemorrhage and 13 were diagnosed accidentally during routine ultrasound scanning (Table 1). Sixty-two (95%) patients had undergone previous single or multiple CS. There was a history of previous placenta praevia in two patients. Pregnancy was terminated in six patients because of antepartum hemorrhage before 36 weeks, whereas 59 patients (90.7%) completed their pregnancy beyond 36 weeks. Bilateral internal iliac artery ligation was performed in all patients with morbid invasive placenta (59/65 = 90.7%), whereas uterine artery ligation was performed in five patients (6/65 = 9.23%) in who placenta praevia was not pathologically adherent. Satisfactory hemostasis was achieved in 54 patients (54/65 = 83%), whereas additional uterine compression suture was performed in one patient (1/22 = 4.5%). Hysterectomy was performed in five patients with placenta praevia increta (6/22 = 27.2%) complicated by intraoperative uncontrollable hemorrhage (Table 2). The mean intraoperative blood loss was  $1255 \pm 589$  mm<sup>3</sup>. Blood transfusion was recorded in 49 patients (49/65 = 75%) during the operation and in two patients (3/65 = 4.6%) on the first day after the operation.  $9.8 \pm 1.3$  and  $31.4 \pm 2.3$  are the results of mean haemoglobin and hematocrit respectively one day postoperatively.

Abnormal placentation such as placenta accreta or increta is a potentially life-threatening hemorrhagic condition that carries a high rate of maternal morbidity and mortality. Prophylactic bilateral internal iliac artery ligations before extraction of placenta accrete seemed to be an effective and safe technique to decrease intrapartum and postpartum complications, and to avoid emergent peripartum hysterectomy

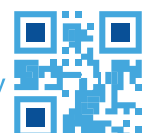
**Keywords-** Internal iliac artery; Postpartum haemorrhage; Hysterectomy; Morbidly adherent placenta.

## INTRODUCTION

Placenta praevia is a pathological condition in which the placenta is abnormally implanted in the lower segment and overlying the internal cervical os, often is associated with placenta accreta, Increta or percreta. If the placenta is abnormally implanted on the previous caesarean scar, it may lead to severe postpartum haemorrhage.<sup>1</sup> Associated risk factors for placenta praevia include previous caesarean section scar, uterine myoma, previous curettage, recurrent abortion, grand multi-parity and advanced maternal age.<sup>2</sup>

Additionally, placenta praevia convey a high risk of massive bleeding and hysterectomy and it increases the risk of neonatal complications due to preterm deliveries, low birth weight and nursery intensive care units admission.<sup>3</sup>

The current management of invasive placenta praevia is by caesarean hysterectomy. However, in some cases of major invasive placenta praevia even hysterectomy could be difficult and hard to control severe bleeding.<sup>4</sup> Unfortunately, pathological adherent placenta is one of the causes of increased maternal mortality and morbidity in obstetrics worldwide. The incidence of adherent placenta is increasing, studies from 1970s and 1980s found the prevalence of placenta accreta as 1/2510 and 1/4017 in comparison with 1/533 in 1982 to 2002. The increasing rates of morbidly adherent placenta over the past decades are likely to be based on changes in the risk factors and the trend towards caesarean delivery.<sup>5</sup> Postpartum haemorrhage accounts for a quarter of the maternal mortality worldwide. Postpartum haemorrhage (PPH) is a major cause of worldwide maternal mortality ranging from 13% in developed countries to 34% in



developing countries.<sup>6</sup> It is reportedly responsible for over 125 thousands maternal deaths each year and is associated with morbidity in 20 million women per year.<sup>7</sup> Major PPH or loss of over 1000 ml of blood occurs in 1–5% of deliveries. Uterine atony is the common cause of PPH that accounts for 80% of cases.<sup>8</sup> Other causes include retained placental fragments, lower genital tract lacerations and uterine rupture. Known risk factors for occurrence of atonic PPH include a history of PPH, history of retained placenta, placental abruption, placenta praevia, uterine fibroids, hydramnios, multiple pregnancies, augmentation of labour, prolonged labour and instrumental delivery. Although an assessment of risk factors is important, PPH typically occurs unpredictably and no parturient is exempt from the risk of PPH. When PPH persists despite appropriate medical treatment, early consideration should be given to surgical intervention. The choice of procedure will depend on the parity of the women and her desire for childbearing, the extent of haemorrhage and, most importantly, the experience and judgment of the surgeon. In most catastrophic situations, hysterectomy is preferred in order to arrest further blood loss and compromise with certainty. Although a life-saving procedure, it may not be appropriate for women who need to preserve their reproductive potential. Hysterectomy either performed for elective or emergency cases, in haemodynamically unstable patients to control severe bleeding and prevent other complications associated with massive haemorrhage. Complications of hysterectomy include intensive care admissions, massive blood transfusion, coagulopathy, urological injury. Elective hysterectomies were planned in some selected cases.<sup>9</sup>

Uterine cavity tamponade, selective uterine artery embolization, uterine artery ligation and uterine brace sutures are the procedures that considered for haemostasis to preserve the uterus.

Pathologically adherent placenta occurs as a result of chorionic villi penetration into the decidua basalis deep into the uterine wall in the absence of the Nitabuch's layer. Placental adhesion is classified into three categories accreta, percreta and increta on the basis of the degree of invasion to the myometrium.<sup>10</sup> Between 0.3 and 2% is the prevalence of placenta accreta spectrum in the last trimester of pregnancy, this accounts for 90% of blood transfusions in these patients and is considered as life-threatening condition.<sup>11</sup> In a case-control study, biopsy from the placental bed was obtained during caesarean section in 50 women with placenta praevia and in 50 women with normal placenta. In about half of the placenta praevia samples spiral myometrium arterioles had invaded trophoblastic giant cells, in contrast only 20% of the samples taken from normal women had such finding.<sup>12</sup> In adherent placenta there is an abnormal attachment of all or part of the placenta to the uterine wall<sup>13</sup>, this finding is attributed to the partial or complete loss of regular decidua and insufficient development of the fibrinoid layer or the Nitabuch's membrane, the feathers of the placenta cohere to the myometrium. With regard to placenta increta the villi invade the myometrium, the cervix or other pelvic

organs. Various types of placenta accreta spectrum are significant causes of maternal mortality due to haemorrhage during pregnancy or post-delivery.<sup>13</sup>

Worldwide, caesarean section delivery is considerably increased, this resulted in increase in cases of pathological placental adhesion which in turn has increased burden on obstetric units.<sup>14</sup> The management of these conditions relies on establishing an effective haemostasis by using special surgical techniques. These methods are haemostatic sutures in the placental bed, compression sutures of the uterus, uterine balloon tamponade and uterine artery ligation.<sup>15</sup> If all the mentioned measures have failed to control bleeding, hysterectomy is the last solution to save the patient's life.<sup>17</sup> However, massive haemorrhage often makes surgical management even more demanding. Therefore, preventative measures to minimize blood loss can be valuable.<sup>16</sup> These relatively new preventative measures can be used as conservative methods for managing severe bleeding from placenta praevia during caesarean section. These measures include uterine or iliac artery ligation, bilateral uterine artery embolization or balloon occlusion of the internal iliac artery or aortic artery.<sup>15</sup>

Internal iliac artery ligation (IIAL) has been recommended as an efficient means of managing intractable PPH and preventing maternal death. Burchell described a method for controlling pelvic haemorrhage, the internal iliac artery ligation, this ligation of internal iliac artery has significantly minimized the pulse pressure by changing the pelvic arterial circulation into venous like system with minimal blood flow. The reduced blood flow at the slow rate prevents blood loss. As it was shown by Burchell, internal iliac artery ligation could reduce pelvic blood flow by 49% and pulse pressure by 85% leading to venous pressures in the pelvic arterial circulation therefore enhancing haemostasis. Failures were more evident in atonic PPH than in other causes of PPH. IIAL is thought to be technically difficult, and although much quicker than a hysterectomy, it is seldom attempted.<sup>18</sup>

The surgical techniques for internal iliac artery have general considerations, such as that the abdominal incision either done as a midline or transverse incision, the surgeon better stands in the opposite side of the pelvis for better visualization i.e to work on the contralateral side, the side could be changed during the operation. The intra-abdominal approach is preferable except in cases of extreme obesity, where it might be performed by extra-peritoneal approach. The suturing material depends on the surgeon preference. Number 1-0 chromic catgut, double strand 2-0 black silk and umbilical artery tape all have been used. Two ties should be applied firmly, 0.5 cm apart and 0.5-1cm below the bifurcation. In the trans-abdominal approach the abdominal wall is opened and the viscera are pushed up as usual. The surgeon should identify the bifurcation of the common iliac artery by two bony landmarks: the sacral promontory and the imaginary line drawn through both anterior superior iliac spines. Then the surgeon should make a longitudinal incision into the posterior parietal peritoneum, the incision could be



in the peritoneum on the posterior surface of the round ligament at the junction of its middle and medial third, this is in case the uterine corpus is present. Then the incision is extended proximally for about 10 cm. In case the uterine corpus is absent, the incision can be made over the external iliac artery and extended proximally to the level of the bifurcation. In another method the incision is made on the peritoneum directly on the bifurcation. Then the incision is extended distally for a few inches. All the previously discussed incisions result in the formation of a medial and lateral peritoneal flap. The ureter is always seen on the medial flap, it can be reflected and protected easily. Anatomically the ureter crosses the common iliac artery from lateral to medial at a point just proximal to the bifurcation. Immediately after opening the peritoneum the loose areolar tissue should be wiped away gently and firmly in the vessel direction, once bifurcation is viewed digital palpation of the bounding pulse can be achieved. The vein is visualized posteriorly. The ureter should be identified and located on the medial peritoneal flap. The bifurcation looks like an inverted Y. The branch is emerging at right angles is the hypogastric (internal iliac artery), it crosses medially and inferiorly. The continuing branch is the external iliac artery, it passes laterally and superiorly over the psoas muscle to the lower extremities as a femoral artery. The two branches must be identified accurately, it must not be mistaken, in case the external iliac artery is ligated the leg will soon be cold, pale with numbness. Loss of that limb can be. After the identification of the internal iliac artery, it should be raised up from the vein by Mixer forceps a right angle forceps. The artery is usually firmly adherent to its underlying vein, caution should be considered, and the point of the instrument should be directed medially to the midline and placed at the edge of the artery and the forceps tips must be spread open with cautions. When the artery is separated from the vein the external branch must be identified and examined, ligature must be passed below the artery and tied gently and firmly. The artery should not be damaged by transection. Then the peritoneum must be closed with interrupted stitches 3-0 plain catgut continuous suture could kink the ureter. Because of the presence of sigmoid flexure on the left side, the procedure may be slightly more complicated and the sigmoid flexure must be mobilized at the white line to get enough exposure.

In extra-peritoneal approach the skin is incised in the inguinal region parallels to the course of external oblique muscle. It passes 6-8 cm in length about 3-5 cm medial to anterior superior iliac spine. The fat and subcutaneous tissues should be dissected away, and then muscle splitting incision is performed to see the peritoneum. The peritoneum is gently reflected medially to view the posterior surface, the ureter is then reflected medially and the vessel laterally ligation is then performed as described above and the closure is the same as that for hernia repair.

In the midline extra-peritoneal approach a midline abdominal incision is made then the anterior sheath of the rectus muscle is exposed and opened below the umbilicus then the peritoneal and pre-peritoneal fat are separated. The peritoneum and its contents are reflected to the right

(or left) leads to exposure of the retroperitoneal structures.

This procedure was reported before 1900 in the United Kingdom and the United States, many surgeons have applied it and they found it beneficial for the control of haemorrhage.<sup>19</sup> Howard Kelly, is the first surgeon who pioneered internal iliac artery ligation in the management of intraoperative bleeding from cervical cancer before the use of this technique in management of postpartum haemorrhage.<sup>19</sup> Complications associated with this procedure include nerve injury, common iliac artery ligation, prolonged operative time and prolonged blood loss. Consequently, this procedure should be confined for stable patients and patients who have significant concern about child-bearing.<sup>20</sup> This procedure could be performed unilaterally or bilaterally, it can be life-saving in patients with massive postpartum haemorrhage.

Even though, surgeons may be hesitant to implement bilateral internal iliac artery ligation for the risk of injury to the pelvic structures, there is no evidence that there is considerable damage of the pelvic viscera. Provided the procedure is performed properly, there is no morbidity or risks to the patient.<sup>20</sup> Ligation of the hypogastric (internal iliac) artery can be performed either via an open approach (intra-peritoneal or extra peritoneal) or via an endovascular approach. Ligation of both right and left internal iliac arteries in urgent cases is time consuming; accordingly, this approach is often reserved more for elective settings. Generally, internal iliac artery ligation is superior to internal iliac artery embolization; if embolization is performed; proximal embolization is preferable to distal embolization, in that it decreases the risk of ischemic complications.

In this retrospective study, we evaluated the efficacy of prophylactic intraoperative bilateral internal iliac artery ligation before the removal of the placenta after extraction of the fetus aiming finally for preservation of fertility in such high-risk patients.<sup>21</sup>

### *The aim of the study*

To evaluate the efficacy of prophylactic bilateral hypogastric arteries ligation on maternal outcome in diagnosed cases of morbidly adherent placenta.

## **MATERIALS AND METHODS**

This retrospective study was carried out on patients who have undergone IIAL or Peripartum hysterectomy for management of Post- Partum haemorrhage in the study period April 2018 To Jan 2019 in a high risk pregnancy unit, Alryan private clinic and Gharian teaching hospital. Information sheet is used to collect data from patient files. Ethical approval was obtained from the local research ethical Committee in Gharian hospital and in Alryan private clinic. Patient consent was acquired from the patients themselves after informing them about the risk of intrapartum and postpartum hemorrhage, the need for blood transfusion, and the possibility of hysterectomy if needed to stop massive blood loss. Pregnant women with placenta praevia, increta, percreta were evaluated. Ultrasound scan was done to all patients in this study in the third trimester of pregnancy to localize the placenta,



combined with color flow Doppler to detect any abnormal adhesions of the placenta. All the patients in this study have been evaluated by history, clinical examination, and routine investigations according to the unit protocol. Sixty-five pregnant women with findings confirmed by these imaging modalities were admitted to the high risk pregnancy unit at 34 weeks of gestation or earlier if vaginal bleeding occurred. All caesarean sections were planned at 37 weeks of gestation unless the clinical situations necessitated earlier termination of pregnancy. A multidisciplinary team including a senior obstetrician and assistant, an urologist, an anesthesiologist, and a pediatrician was involved in the operation. Cross-matched blood prepared for each case of about 4-6 units.

During the caesarean section the uterus and its placenta is exteriorized out of the abdomen after delivery of the fetus, then the anterior division of the internal iliac artery is identified and ligated 4 cm distal to bifurcation of the common iliac bilaterally. Followed by placental delivery, the placenta was removed manually in pieces; any remaining bleeding points from the placental site were then controlled by hemostatic sutures, followed by repair of the uterus and the abdominal wall. Intraoperative blood loss, total number of blood transfusion units, postoperative hemoglobin and hematocrit, cesarean hysterectomy, maternal morbidity, and mortality were measured. Data obtained were analyzed using SPSS for Windows, version 21 (SPSS, Chicago, Illinois, USA). Data were expressed as percentages and mean  $\pm$  SD.

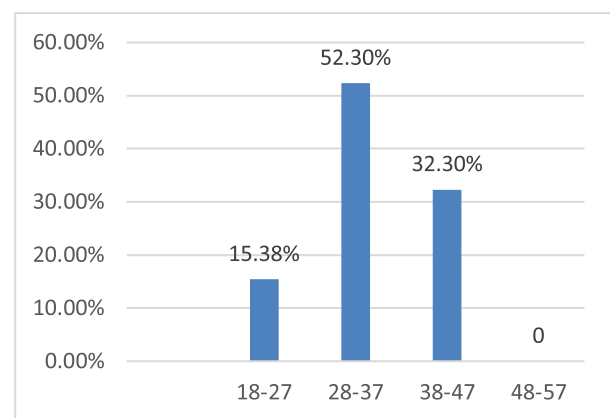
## RESULTS

A total of 65 patients diagnosed by color Doppler with an abnormally adherent placenta praevia were studied; 52 (52/65 = 80.3%) of these patients presented with antepartum hemorrhage and 13 were diagnosed accidentally during routine ultrasound scanning (Table 1). Sixty-two (95%) patients had undergone previous single or multiple CS. Ten patients had a history of first-trimester miscarriage (10/65 = 15.6%) and all were terminated surgically. There was a history of previous placenta praevia in two patients. Pregnancy was terminated in six patients because of antepartum hemorrhage before 36 weeks, whereas 59 patients (90.7%) completed their pregnancy beyond 36 weeks. Bilateral internal iliac artery ligation was performed in all patients with morbid invasive placenta (59/65 = 90.7%), whereas uterine artery ligation was performed in five patients (6/65 = 9.23%) in who placenta praevia was not pathologically adherent. Satisfactory hemostasis was achieved in 54 patients (54/65 = 83%), whereas additional uterine compression suture was performed in one patient (1/22 = 4.5%). Hysterectomy was performed in five patients with placenta praevia increta (6/22 = 27.2%) complicated by intraoperative uncontrollable hemorrhage (Table 2). The mean intraoperative blood loss was  $1255 \pm 589$  mm<sup>3</sup>. Blood transfusion was recorded in 49 patients (49/65 = 75%) during the operation and in two patients (3/65 = 4.6%) on the first day after the operation.  $9.8 \pm 1.3$  and  $31.4 \pm 2.3$  are the results of mean haemoglobin and hematocrit respectively one day postoperatively. During the postoperative period there were no febrile

complications or infection were encountered. Out of six patients who underwent hysterectomy, one patient had accidental bladder and unilateral ureteric injury. Intraoperative consultation with a urologist was advised. Urinary bladder repair and Ureter re-implantation were done, without further complications.

**Table1:** Age of the study group

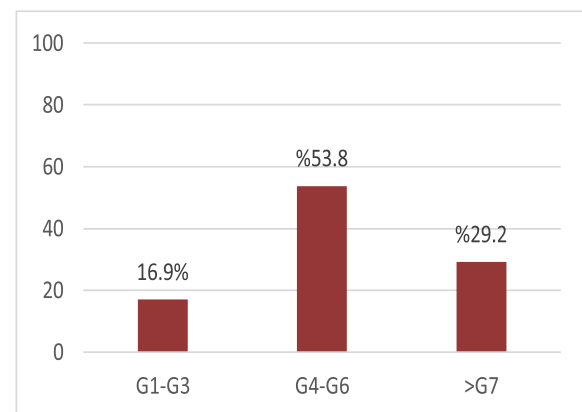
Age group (years)	Number of patients	%
18-27	10	15.38%
28-37	34	52.30%
38-47	21	32.3%
48-57	0	0
Total	65	



**Figure 1:** Age distribution of the study population

**Table 2:** Gravidity of the study group

Gravidity	Number of patients	%
G1-G3	11	16.9%
G4-G6	35	53.8%
G7≤	19	29.2%
Total	65	



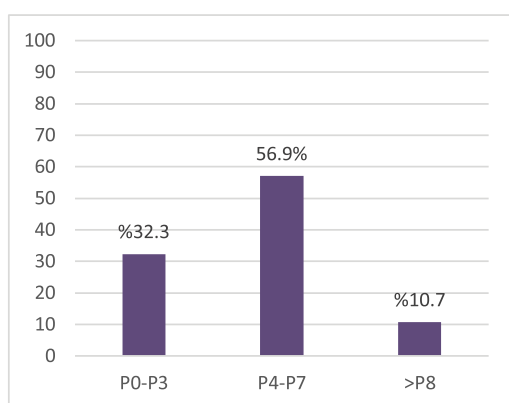
**Figure 2:** Gravidity distribution of the study population





**Table 3:** Parity of the study group

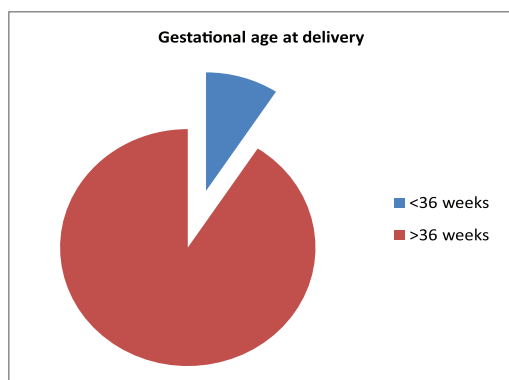
Parity	Number of patients	%
P0-P3	21	32.3%
P4-P7	37	56.9%
P8≤	7	10.7%
Total	65	



**Figure 3:** Parity distribution of the study population

**Table 4:** Gestational age at delivery

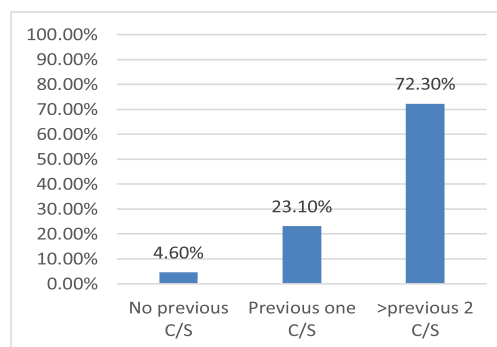
Gestational age	Number of patients	%
<36 weeks	6	9.3%
>36 weeks	59	90.7%
Total	65	



**Figure 4:** Gestational age at delivery

**Table 5:** Previous caesarean section

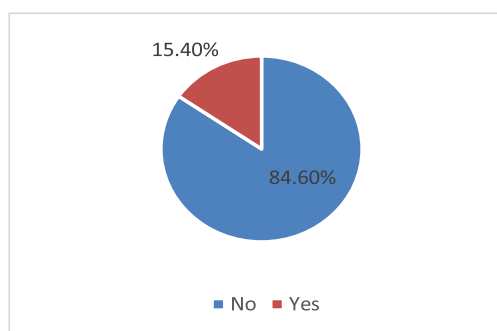
Previous C/S	Number of patients	%
No previous C/S	3	4.60%
Previous one C/S	15	23.10%
≥previous 2 C/S	47	72.30%
Total	65	



**Figure 5:** Previous caesarean section

**Table 6:** Previous miscarriage

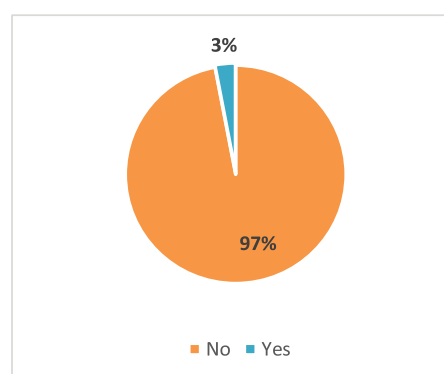
Previous miscarriage	Number of patients	%
No	55	84.60%
Yes	10	15.40%
Total	65	



**Figure 6:** Previous miscarriage

**Table 7:** Previous placenta praevia

Previous PP	Number of patients	%
No	63	97%
Yes	2	3%
Total	65	

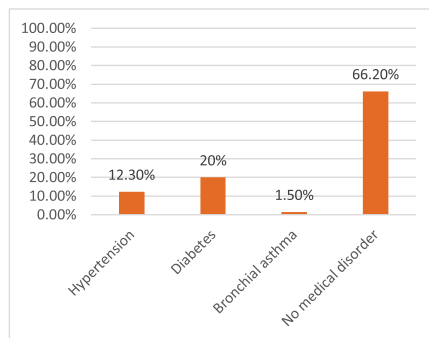


**Figure 7:** Previous placenta praevia

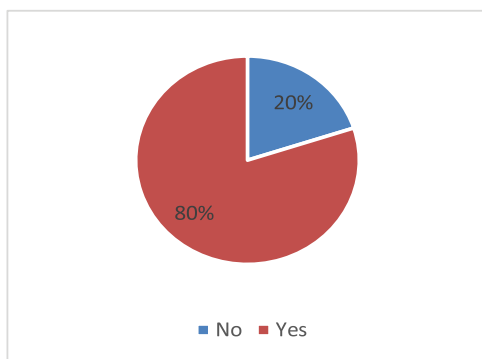


**Table 8:** History of medical disorders

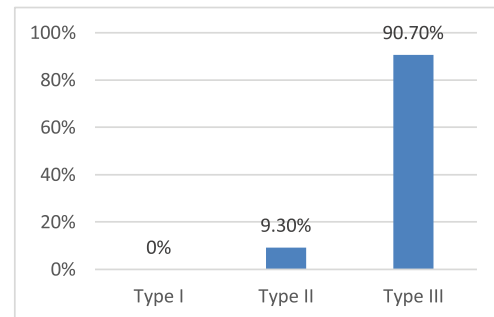
Medical disorder	Number of patients	%
Hypertension	8	12.30%
Diabetes	13	20%
Bronchial asthma	1	1.50%
No medical disorder	43	66.20%
Total	65	

**Figure 8:** History of medical disorders**Table 9:** Antepartum haemorrhage

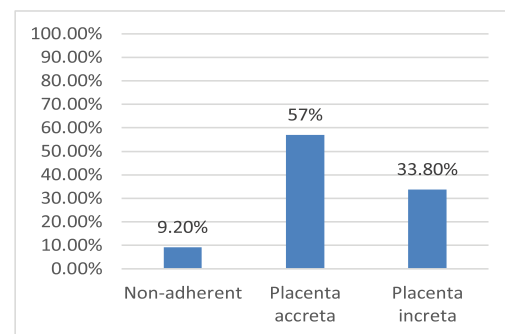
APH	Number of patients	%
No	13	20%
Yes	52	80%
Total	65	

**Figure 9:** Antepartum haemorrhage**Table 10:** Ultrasound diagnosis (degree of placenta praevia)

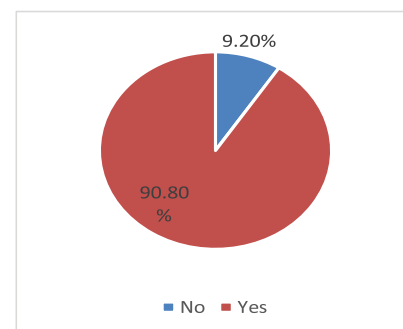
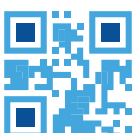
PP Degree	Number of patients	%
Type I	0	0
Type II	6	9.30%
Type III	59	90.70%
Total	65	

**Figure 10:** Ultrasound diagnosis (degree of placenta praevia)**Table 11:** Surgical degree of adherent placenta

	Number of patients	%
Non-adherent	6	9.20%
Placenta accreta	37	57%
Placenta increta	22	33.80%
Total	65	

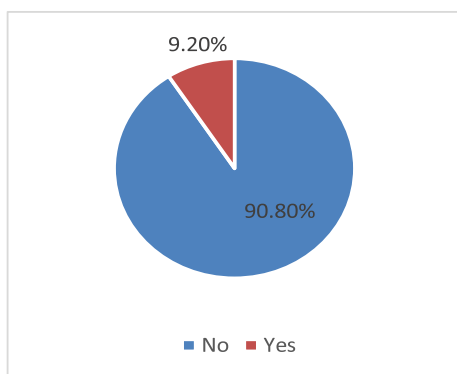
**Figure 11:** Surgical degree of adherent placenta**Table 12:** Internal iliac artery ligation

	Number of patients	%
No	6	9.20%
Yes	59	90.80%
Accreta	37	
Increta	22	
Total	65	

**Figure 12:** Internal iliac artery ligation

**Table 13:** Uterine artery ligation

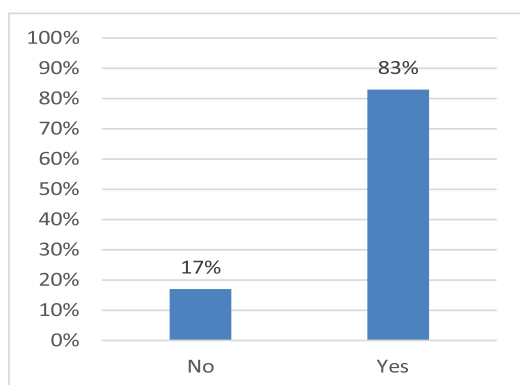
	Number of patients	%
No	59	90.80%
Yes	6	9.20%
Total	65	



**Figure 13:** Uterine artery ligation

**Table 14:** Haemostatic suture and mattress repair

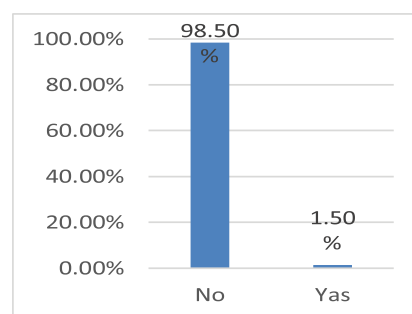
	Number of patients	%
No	11	17%
Yes	54	83%
Accreta	32	
Increta	22	
Total	65	



**Figure 14:** Haemostatic suture and mattress repair

**Table 15:** Compression sutures

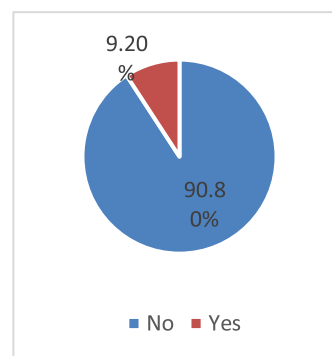
	Number of patients	%
No	64	98.50%
Yes	1	1.50%
Accreta		
Increta		
Total	65	



**Figure 15:** Compression sutures

**Table 16:** Hysterectomy

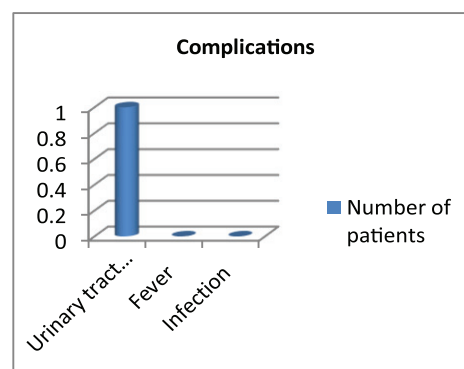
	Number of patients	%
No	59	90.80%
Yes	6	9.20%
Total	65	



**Figure 16:** Hysterectomy

**Table 17:** Complication

	Number of patients	%
Urinary tract injury	1	1.50%
Fever	0	
Infection	0	
Total	65	

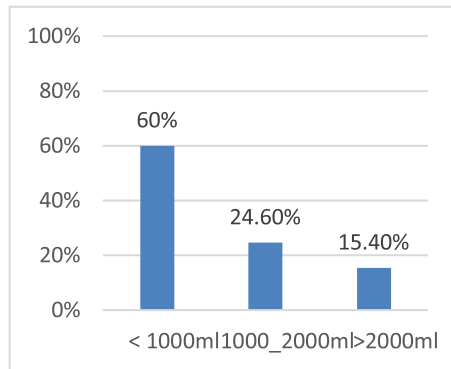


**Figure 17:** Complications

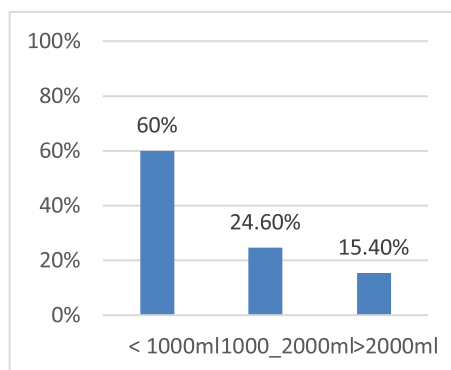


**Table 18:** Blood loss

	Number of patients	%
1000ml>	39	60%
1000-2000ml	16	24.60%
2000ml<	10	15.40%
Total	65	

**Figure 18:** Blood loss**Table 19:** Blood transfusion

	Number of patients	%
No	49	75.40%
Yes	16	24.60%
Total	65	

**Figure 19:** Blood transfusion

## DISCUSSION

The incidence of placental invasion is increasing due to the increased rate of CS. It has increased up to 10-fold within the past 50 years.<sup>22</sup> 84.6% patients with reported placenta accreta had undergone previous one or more CS. About 88% of these patients had accompanied placenta praevia.<sup>23</sup> In this study, the incidence of placenta accreta in women without a history of CS was 3/65 (4.6%), whereas it increased up to 10/65 (15.3%) in women with a history of delivery by one CS, 42/65 (64.6%) in women with a history of previous two or three CS, and 13/65 (20 %) in women with a history of previous four CS. Clark et al.<sup>24</sup> in his research showed that placenta praevia is increased

with increasing operative delivery, in women with a normal delivery was 0.26%, whereas it rises up to 0.65% in women with a history of previous delivery by one CS, reaching 10% following four or more CS. The ACOG committee report on obstetric practice 2002 revealed that the incidence of adherent placenta raised up to 39% in cases who had previous two CS.<sup>24,25</sup>

Obstetric hemorrhage remains a number one explanation for pregnancy-related mortality within the USA. Approximately 29% of maternal deaths are because of bleeding. Placenta accreta is a crucial explanation for obstetric hemorrhage and a number one explanation for peripartum hysterectomy.<sup>26</sup> Hysterectomy has traditionally been the management of choice in placenta accreta, but this represents a drag for patients who desire to preserve the uterus for future fertility thus, other alternative interventions include leaving the placenta after cesarean delivery with surgical uterine devascularization, embolization of the uterine vessels, uterine compression sutures, and/or over sewing of the placental vascular bed.<sup>27</sup> A number of procedures that have been developed to diminish intraoperative bleeding rely upon decreasing pelvic blood flow, mostly of the internal iliac artery for impeding the arterial supply to the uterus while maintaining the blood supply of the other pelvic organs and the lower extremities. This purpose has been achieved with different success rates either by balloon occlusion or by persistent surgical ligation of internal iliac artery and embolization by an interventional radiologist. Isolated cases reporting the efficacy of devascularization of the uterine arteries are published, but the techniques haven't become popular thus far.<sup>28</sup> Surgical internal arteria iliaca ligation is usually went to plan to control otherwise intractable obstetric hemorrhage. Therefore, an enormous amount of blood loss has already occurred before hemorrhage is often controlled by arterial ligation.

In this study, bilateral internal iliac ligation was implemented as prophylactic measure early intraoperative, even before any attempt to remove the adherent placenta, which is the leading cause of massive blood loss that could take place in such condition, a procedure that performed to decrease the pulse pressure below to the position of ligation, therefore, reducing blood loss during caesarean section in placenta accreta.

It seemed to be successful in patients with placenta accreta as none of these patients (n = 40) required hysterectomy or suffered morbidity; however, six patients with placenta increta (6/22, 27.27%) required hysterectomy, with more blood loss, and in one of them, maternal morbidities in the form of bladder and ureteric injury occurred. The mean estimated blood loss was 1255 ± 589 ml, requiring a mean of 1.8 ± 1.3 blood units. Aggarwal et al.<sup>29</sup> reported massive blood loss because the prominent feature altogether women with morbidly adherent placenta, with a mean blood loss of 2710 ml, and a mean of 6 U of whole blood were transfused. Thus, internal arteria iliaca ligation might not only limit blood loss but can also minimize the danger of transfusion reactions, blood borne infections and hysterectomy. In contrast, Berg et al.,<sup>30</sup> reported that





ligation of the interior iliac arteries appears to be effective for bleeding due to uterine atony; it's less effective for placenta accreta. The efficacy of ligation is restricted by rapid recruitment of an in depth collateral system within the pelvis.<sup>31</sup> Tan et al. and Carnevale et al., found that balloon occlusion of the most trunk of the interior iliac arteries reduced intraoperative blood loss and transfusion requirements when comparing the patients retrospectively with an impact group.<sup>32,33</sup> Occlusion balloons have the advantage of being completely reversible immediately after the procedure as compared with surgical ligation of internal iliac arteries. Surgical internal iliac artery ligation requires only an expert obstetrician and just a couple of minutes for bilateral ligation, but preoperative balloon occlusion procedures require a team approach and longer time by the interventional radiologist team, 30 minutes required to gain Balloon access to the internal iliac arteries through a bilateral common femoral artery approach.<sup>34</sup> Preoperative prophylactic internal iliac artery embolization apparently reduces intraoperative blood loss and transfusion requirements in patients with placenta accreta compared with historical controls. In a review article of by Alanis and colleagues showed that arterial embolization is effective in the treatment of placenta increta in women who request to preserve fertility. In 72 women, a 76.9% were successful and an 11% complication rate was demonstrated.<sup>35</sup> A major advantage of surgical internal iliac artery ligation over intraoperative balloon occlusion and embolization is prevention of exposure of both the patient and therefore the fetus to radiation and saving time. Also, complications of balloon occlusion with embolization occur in about 7% of patients. These complications include the angiography complications (such as allergic reactions, renal damage due to the dye, heart attacks, and bleeding), pelvic infection or pelvic abscess, and ischemic phenomena such as bladder gangrene and a post-embolization syndrome, a self-limited condition of fever, elevated white blood cells, and pain from tissue necrosis or vascular thrombosis.<sup>36</sup>

## CONCLUSION

Abnormal placentation such as placenta accreta or increta is a potentially life-threatening hemorrhagic condition that carries a high rate of maternal morbidity and mortality. Prophylactic bilateral internal iliac artery ligations before extraction of placenta accrete seemed to be an effective and safe technique to decrease intrapartum and postpartum complications, and to avoid emergent peripartum hysterectomy.

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