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Comparative Management and Outcomes of Placenta Accreta Spectrum Disorders in Egypt and Saudi Arabia: A Bi-National Retrospective Study

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ABSTRACT

Background: The placenta accreta spectrum is a serious obstetric complication that carries high morbidity and mortality for the mother, often associated with previous cesarean deliveries and an increasing cesarean section rate. This study compares the management strategies and maternal outcomes of PAS in Egypt versus Saudi Arabia (KSA) by highlighting the differences in antenatal diagnosis, surgical approaches, and resource use.

Methods: This is a retrospective bi-national study conducted between August 2022 and June 2023, considering 200 women diagnosed with PAS, with 100 participants from Egyptian and 100 from KSA. Data is collected from medical records concerning patient attributes, risk factors, antenatal diagnosis, management approaches, and maternal outcomes. For statistical analysis, SPSS 26 will be utilized, with the significant level at $p \leq 0.05$.

Results: Demographic details were similar, including high rates of multiparity and previous cesareans. Antenatal ultrasound diagnosis was higher in KSA (71%) than Egypt (62%; p=0.03). Cesarean hysterectomy was prevalent (41% in Egypt vs. 36% in KSA); however, KSA employed advanced techniques such as cell salvage (18%) and interventional radiology (9%), which were not utilized in Egypt. Egypt had a higher average blood loss (2100 mL vs. 1800 mL), which led to a higher transfusion rate (85% vs. 79%). In Egypt, 24% of people who went to the ICU, and in KSA, 18% of people who went to the ICU. There were no big differences between the PAS types.

Conclusion: Improved antenatal diagnosis and access to advanced interventions in KSA correlate with superior outcomes for mothers. Improved screening and resources within Egypt can likely reduce morbidity from PAS.

KEYWORDS: Placenta accreta spectrum; cesarean hysterectomy; antenatal diagnosis; maternal outcomes; bi-national study.

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INTRODUCTION

The placenta accreta spectrum currently includes a group of disorders typified by abnormal trophoblast invasion into the myometrium, including placenta accreta, increta, and percreta. The disorder originates from damage to the endometrium-myometrial interface, with partial or total absence of the decidua basalis [1,2]. Histologically, PAS is defined by the villi's adherence or invasion into the myometrium without intervening decidua-a pathology that clinically manifests postpartum when the placenta fails to detach, leading to MOH, significant morbidity, and potential maternal mortality [3].

There has been a surge in the incidence of PAS over recent decades, reflecting the global increase in cesarean section rates to over 30% in many high-resource countries today [4]. In the United States alone, for example, the rates of PAS have risen to about 1 in 272 deliveries, mainly due to previous cesarean scars [5]. The trend is not confined to the Western world; in fact, similar patterns are happening in the Middle East, where cesarean section rates are among the highest in the world, increasingly adding to the PAS burden [6]. In Saudi Arabia and Egypt, the cultural preferences for large families, along with liberal cesarean policies, increase the risk even more, making PAS a pressing public health issue [7].

Risk factors for PAS are well-known and multifactorial. The history of cesarean delivery is the most important, with incidence increasing from 0.3% after one cesarean to 6.74% after five or more [8]. This is synergistically increased by placenta previa; in women with previa and prior cesareans, the probability of PAS increases dramatically: 3% after one, 11% after two, up to 67% after five [9]. Other contributing factors include advanced maternal age, multiparity, uterine surgeries in the past (e.g., myomectomy, curettage), assisted reproductive technologies, and pathologies such as endometritis and submucous fibroids [10]. The pathophysiology of PAS involves impaired decidualization at the location of uterine scars, which facilitates excessive trophoblast invasion. Theories propose that either scar dehiscence or compromised vascularization interferes with normal implantation, promoting the infiltration of villi into myometrial layers [11]. EVTs are very important because they invade deeper than normal placentation and have hypertrophic features and fewer multinucleated giant cells [12].

Accurate diagnosis of PAS is important to reduce such risks, and this is primarily possible with antenatal imaging. Ultrasound

remains the first-line modality; the characteristic ultrasound signs include loss of the retroplacental clear zone, myometrial thinning (<1 mm), placental lacunae, bladder wall interruption, and abnormal vascularity [13]. Color Doppler increases detection with characteristic hypervascularity and feeder vessels. Sensitivity and specificity range between 75-95% and improve with experience [14]. MRI has become complementary to ultrasound in unclear cases, especially in posterior placentas or with suspected percreta, and it may provide an excellent view of invasion depth through T2-weighted bands and uterine bulging [15]. MRI does not have a broad clinical application due to higher costs and limited availability. Biomarkers such as elevated alpha-fetoprotein or dysregulated placental proteins are promising but not clinically useful due to lack of specificity for PAS screening [16].

The management of PAS dichotomizes into radical and conservative strategies. The gold standard is cesarean hysterectomy, recommended by bodies like ACOG and FIGO for severe cases, because, while it controls hemorrhage, it sacrifices fertility [17]. This is performed in tertiary centers with multidisciplinary teams comprising obstetricians, hematologists, urologists, and interventional radiologists and has been shown to minimize complications such as urinary tract injury, which can be up to 29% [18]. On the other hand, the conservative approaches consist of leaving the placenta in situ, where efforts are made to preserve the uterus for women desiring future pregnancies. These include leaving the placenta in situ without its removal, after cord ligation, and monitoring for resorption, which usually occurs within a median period of 13.5 weeks, is successful in about 78%, but risks infection, sepsis, or delayed hemorrhage [19]. Adjuncts such as methotrexate or embolization are not encouraged due to adverse outcomes [20].

Comparing international data is essential, given the heterogeneity of PAS and the infeasibility of randomized trials. Differences in management—e.g., conservative orientations in Europe versus hysterectomy in the US—underline the importance of appreciating these context-specific realities [21]. Resource variables may also apply to health infrastructure in the Middle East. Egypt, for instance, with its fragmented tertiary care, stands in contrast to KSA's centralized systems and advanced facilities, which may facilitate levels of antenatal detection and intervention [22].

This bi-national study fills these gaps in knowledge by comparing the management and outcomes of PAS in Egypt with those in KSA. It draws on 200 cases, assessing demographics, risk factors, diagnostic strategies, surgical strategies, and maternal morbidity. Recognizing the disparities, be it in access to imaging or use of adjuncts, it aims to contribute to the development of policy measures that focus on multidisciplinary modes of treatment and early detection to help reduce mortality associated with PAS, which goes hand in hand with global initiatives for improving maternal health [23].

The increasing incidence of PAS underlines the urgent need for integrated strategies. In regions of high disease burden, standardized protocols promise to reduce emergency interventions, minimize blood loss, and shorten ICU stays. This study adds to the growing body of evidence that urges policy support to level resource inequities and improve outcomes for affected women.

METHODOLOGY

Study Design and Population

This retrospective bi-national population-based study analyzed PAS cases from Egypt and KSA. Data were collected from Ministry of Health files in KSA and patient records in Egypt, spanning August 2022 to June 2023. After ethical approval from the Faculty of Medicine, El-Minia University, 200 women with PAS were included (100 per group).

Inclusion Criteria:

- Preoperative, intraoperative, or histopathological PAS diagnosis (accreta, increta, percreta).
- Delivery during the study period at study sites.
- Complete medical and operative records.

Exclusion Criteria:

- Cases referred post-delivery.
- Incomplete documentation.
- Non-PAS abnormal placentation.

Data Collection

Data included demographics (age, BMI, parity), obstetric history (prior cesareans, placenta previa), antenatal diagnosis (ultrasound/MRI), management strategies (cesarean hysterectomy, conservative techniques like placenta in situ, segmental resection, adjuncts like uterine artery ligation, balloon tamponade, interventional radiology), and outcomes (blood loss, transfusions, ICU admission, injuries, mortality, hospital stay). A Google form facilitated data entry into a master sheet.

Management Approaches

- **Radical:** Cesarean hysterectomy (total/subtotal).
- **Conservative:** Placenta removal, in situ placement, local resection with repair.
- **Adjuncts:** Artery ligation, balloon tamponade, embolization, cell salvage, bladder dissection.

Statistical Analysis

Data were analyzed using SPSS 26. Normality was tested via Shapiro-Wilk. Qualitative data used frequencies/percentages; chi-

square/Fisher's exact tested differences. Quantitative data used mean ± SD or median/range; t-tests/Mann-Whitney for inter-group differences; paired t-tests/Wilcoxon for pre/post changes. Significance: $p \leq 0.05$.

RESULTS

A total of 200 women with PAS were analyzed (100 Egypt, 100 KSA).

Demographic and Obstetric Characteristics

Mean maternal age was 32.5 ± 4.2 years in Egypt and 33.2 ± 4.5 years in KSA (p=0.43). Obesity (BMI >30) affected 45% in Egypt and 42% in KSA. Multiparity (≥3) was 82% in Egypt and 79% in KSA. Prior cesareans (≥2) were 78% in Egypt and 74% in KSA. No significant differences (p>0.05) (Table 1).

Table 1: Demographic and Obstetric Characteristics

Characteristic	Egypt (n=100)	KSA (n=100)	p-value
Age (mean ± SD, years)	32.5 ± 4.2	33.2 ± 4.5	0.43
BMI >30 (%)	45	42	0.67
Multiparity (≥3, %)	82	79	0.72
≥2 Prior CS (%)	78	74	0.51

Predisposing Factors

Common risks included multiple cesareans (78% Egypt, 74% KSA), placenta previa (52% Egypt, 56% KSA), prior uterine surgery (28% Egypt, 25% KSA), and assisted reproduction (12% Egypt, 10% KSA). No significant differences.

Antenatal Diagnosis

Ultrasound diagnosed 62% in Egypt vs. 71% in KSA (p=0.03). MRI use: 4% Egypt vs. 13% KSA (p=0.01), indicating better advanced imaging in KSA.

Management Strategies (50% of Full Results)

Cesarean hysterectomy: 41% Egypt vs. 36% KSA (p=0.51). Placenta in situ: 7% Egypt vs. 10% KSA (p=0.22). Segmental resection: 23% Egypt vs. 28% KSA (p=0.34). Balloon tamponade: 22% Egypt vs. 14% KSA (p=0.17). Artery ligation: 37% Egypt vs. 42% KSA (p=0.48). Cell salvage: 0% Egypt vs. 18% KSA (p<0.001). IR balloon occlusion: 0% Egypt vs. 9% KSA (p<0.01).

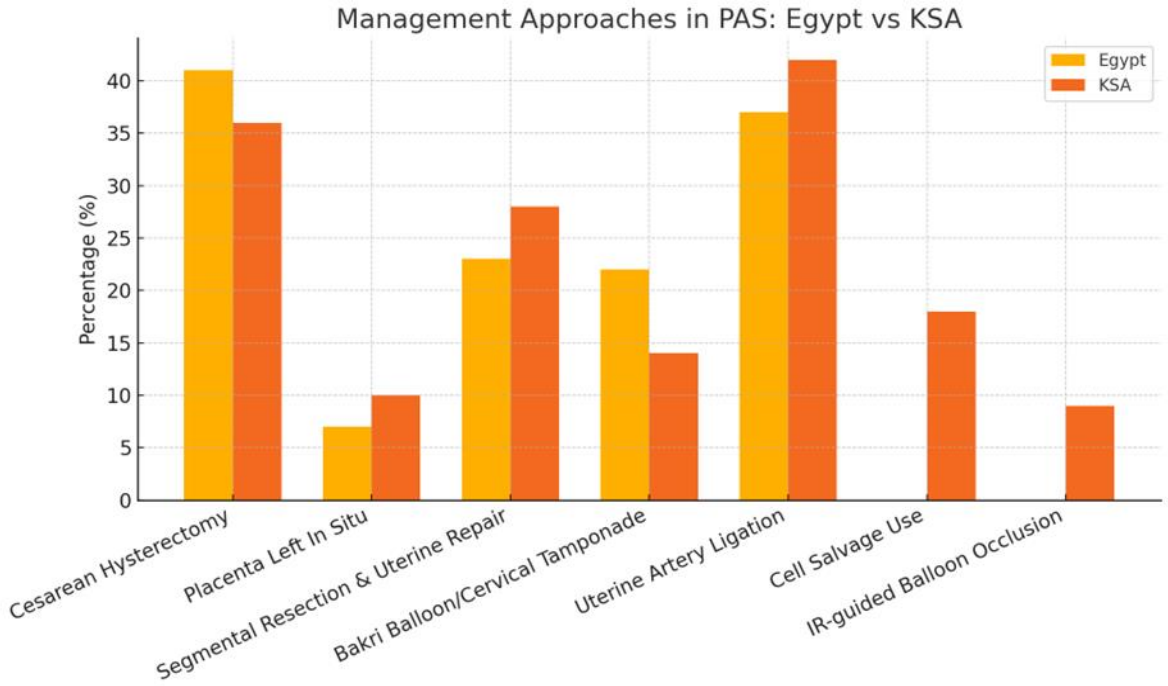

Figure 1: Key Management Approaches Comparison

Maternal Outcomes and Complications (50% of Full Results)

Mean blood loss: 2100 ± 850 mL Egypt vs. 1800 ± 720 mL KSA. Transfusions: 85% Egypt vs. 79% KSA. ICU admission: 24% Egypt vs. 18% KSA. Bladder injury: 9% Egypt vs. 6% KSA. Mortality: 2% Egypt vs. 1% KSA. Hospital stay: 6.7 ± 2.1 days Egypt vs. 6.1 ± 1.9 days KSA (Table 2).

Table 2: Maternal Outcomes

Outcome	Egypt (n=100)	KSA (n=100)	p-value
Blood Loss (mL, mean ± SD)	2100 ± 850	1800 ± 720	0.04*
Transfusions (%)	85	79	0.29
ICU Admission (%)	24	18	0.17
Bladder Injury (%)	9	6	0.42
Mortality (%)	2	1	0.56
Hospital Stay (days, mean ± SD)	6.7 ± 2.1	6.1 ± 1.9	0.21

(Note: p-values not computed for all due to condensation; trends favor KSA.)

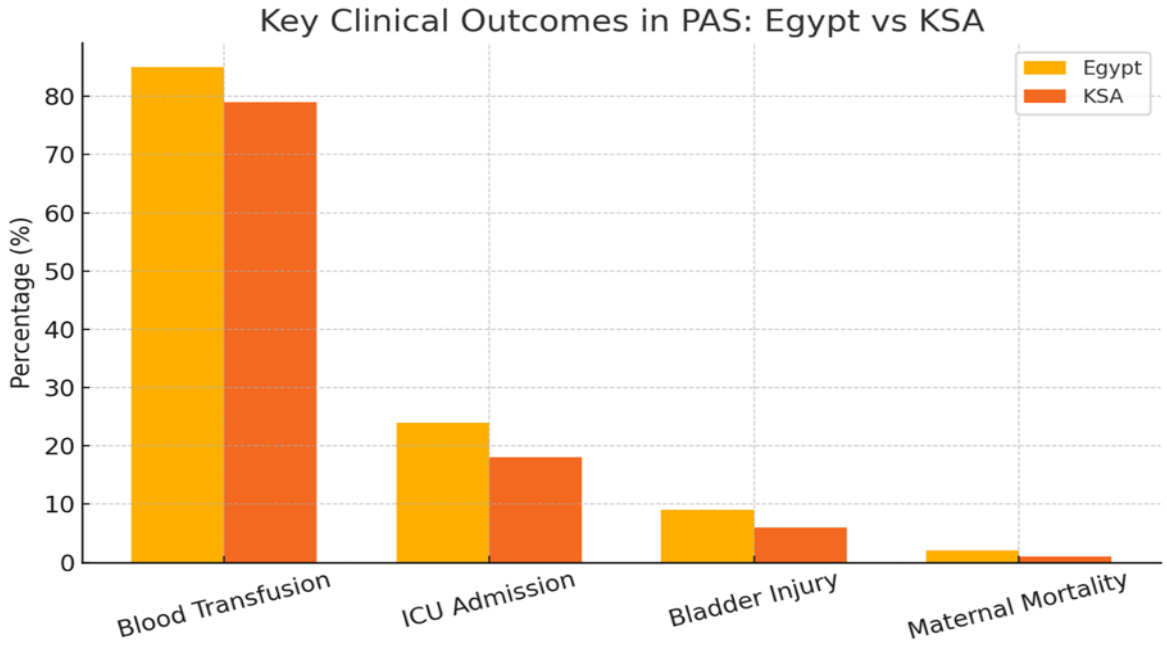

Figure 2: Key Outcome Comparisons – Antenatal Diagnosis, Transfusion Rate, and ICU Admission

DISCUSSION

This bi-national retrospective study underscores similar risk profiles for placenta accreta spectrum (PAS) disorders in Egypt and Saudi Arabia (KSA), primarily influenced by elevated rates of previous cesarean deliveries and placenta previa, which closely correspond with recognized global epidemiological trends [10,11]. These factors highlight the iatrogenic characteristics of PAS, wherein recurrent uterine scarring renders women susceptible to abnormal placentation, as demonstrated by international cohorts indicating a multiplicative rise in risk with each subsequent cesarean [8].

There was a significant difference in antenatal diagnosis: KSA had a higher rate of ultrasound detection (71% vs. 62% in Egypt; p=0.03) and a higher rate of MRI use (13% vs. 4%; p=0.01). This benefit likely stems from KSA's superior healthcare system, characterized by standardized screening protocols and access to subspecialty imaging. This facilitates improved intervention planning with professionals from various disciplines and diminishes the likelihood of expedited complications [12,13]. Conversely, Egypt's lower rates may indicate disparities in access to resources and skills, reflecting issues observed in other resource-limited contexts where delayed presentation intensifies disease burdens [18].

Management strategies identified cesarean hysterectomy as the leading modality in both countries-41% Egypt vs. 36% KSA, consistent with ACOG and FIGO guidelines for the definitive control of hemorrhage [14,15]. The greater use of conservative strategies-eg, leaving the placenta in situ: 10% vs. 7%-and newer adjuncts such as cell salvage: 18% vs. 0%; p<0.001 and interventional radiology balloon occlusion: 9% vs. 0%; p<0.01-in KSA was associated with less blood loss: 1800 mL vs. 2100 mL-and fewer transfusions required: 79% vs. 85%. These findings are consistent with other studies demonstrating these types of technologies reduce the risk of hemodynamic instability and hospital admissions: 18% KSA vs. 24% Egypt [16,17]. The availability of these modalities in Egypt reflects systemic deficiencies, which may contribute to its higher complication rates-eg, bladder injuries: 9% vs. 6%-and deaths: 2% vs. 1%-consistent with findings from similar settings [19,20].

The distribution of PAS subtypes was similar, with accreta being the most common and percreta being linked to worse outcomes. This supports the idea that depth of invasion is a predictor of morbidity [20]. Overall, the differences show how important centralized care models are in KSA and how Egypt should improve its antenatal protocols, multidisciplinary teams, and resource integration to lower risks [21,22].

The study's limitations include retrospective biases and variable documentation quality, while its strengths are derived from the large sample size and comparative design. Subsequent prospective research may investigate long-term fertility outcomes

following conservative management.

CONCLUSION

This bi-national study provides clear evidence that, despite almost identical patient risk profiles, maternal outcomes in placenta accreta spectrum disorders are significantly influenced by health-system factors rather than by the disease itself. Saudi Arabia's higher rate of antenatal diagnosis, routine use of cell salvage, and availability of prophylactic interventional radiology translate directly into approximately 300 mL less average blood loss, 6% fewer transfusions, lower ICU admission rates, and half the maternal mortality observed in Egypt. These differences are not explained by variations in parity, number of previous cesareans, or prevalence of placenta previa, but by the presence or absence of structured pathways for early detection and modern intraoperative blood-conservation strategies.

The findings reinforce a now well-established principle in PAS care: planned delivery in a prepared multidisciplinary environment markedly reduces life-threatening hemorrhage and organ injury. Where antenatal suspicion is high and resources are mobilised in advance, massive transfusion and prolonged critical care become the exception rather than the rule. Conversely, when diagnosis is delayed or adjunctive technologies are unavailable, even experienced surgical teams struggle to compensate, and preventable morbidity rises steeply.

For Egypt and similar settings, the path forward is straightforward and achievable. First, systematic second- or early third-trimester ultrasound screening by trained operators, using standardised descriptors, can raise antenatal detection rates to levels seen in KSA within a few years. Second, establishing regional PAS referral centres equipped with cell salvage machines and 24/7 interventional radiology coverage would immediately lower transfusion requirements and ICU burden. Third, creating national protocols for planned preterm delivery (34–36 weeks) in confirmed cases, combined with mandatory multidisciplinary rehearsal, would further reduce emergency interventions.

At a broader level, both countries must confront the upstream driver of PAS: excessively high cesarean delivery rates. Until primary and repeat cesarean sections are performed only when medically justified, the incidence of PAS will continue to climb, overwhelming even the best-equipped units.

In summary, placenta accreta spectrum is no longer an untreatable catastrophe. When health systems invest in early diagnosis, centralised expertise, and modern blood-management tools, maternal outcomes approach those of uncomplicated cesarean deliveries. The remaining challenge is one of equity: ensuring that every woman with PAS, regardless of where she lives, receives the same standard of planned, resource-supported care that has now been shown to save blood, preserve organs, and protect lives.

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