REVIEW OF PLACENTA PREVIA AND PREGNANCY OUTCOMES AT CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL FROM JANUARY 2017 TO DECEMBER 2018

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master in Medicine in the branch of Obstetrics and Gynaecology Johannesburg 2022.

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ABBREVIATIONS

APH – Antepartum Haemorrhage

CMJAH – Charlotte Maxeke Johannesburg Academic Hospital.

BTL – Bilateral Tubal Ligation

C/S - Caesarean Section

GA- Gestational Age

Hb- Haemoglobin

HCA- High Care Area

ICU- Intensive Care Unit

IQR- Interquartile Range

MRI- Magnetic Resonance Imaging

ml - millilitres

OH- Obstetric Haemorrhage

OS – Cervical Opening

PAS- Placenta Accreta Spectrum

PP – Placenta Previa

PPH – Postpartum Haemorrhage

TAH – Total Abdominal Hysterectomy

TAU- Total Abdominal Ultrasound

T/F – Blood Transfusion

TVS – Transvaginal Ultrasound

UAE- Uterine Artery Embolization

VLBW- Very Low Birth Weight

DECLARATION

I, Dr Thabang Phetole Kgatle declare that this research report is my work. It is being submitted as partial fulfilment for the Degree of Master of Medicine in the branch of Obstetrics and gynaecology, Faculty of Health Sciences at the University of the Witwatersrand, Johannesburg.

It has not been submitted before for any degree or examination at this or any other university.

Signed:

Date: 2021/09/01

DEDICATION

I would like to thank my family and my fiancée who has been supportive throughout this journey together with my parents and brother as they remain my silent supporters.

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ABSTRACT

Aim

This study aims to report on the profile, radiological investigations and findings, maternal and neonatal outcomes amongst patients diagnosed with placenta previa (PP) at Charlotte Maxeke Johannesburg Academic hospital (CMJAH) from January 2017 to December 2018

Methods

A cross-sectional retrospective review of clinical records of patients diagnosed with PP at CMJAH during 2017-2018 was collected and data were analysed using Stata 14.2.

Results

There was a total of 17284 deliveries, 8966 (51.8%) of which were caesarean sections. Eighty four patients who were diagnosed with PP delivered at CMJAH from 01 January 2017 to 31 December 2018 giving a prevalence of PP of 0.49%. Only 71 (84.5%) files were available for analysis. The median maternal age was 33 years (IQR 29-38) and 62 (87.3%) patients were booked with 59 (83.1%) having booked with an Hb < 8g/dl.

More than 30 % of patients were aged < 30 years and > half of the cohort had a previous caesarean section(C/S). The diagnosis of Placenta Previa (PP) and Placenta Accreta Spectrum(PAS) was assessed using transabdominal ultrasound(TAU). Results indicate that TAU had a sensitivity of 87.3% for the diagnosis of PP and, specificity and negative predictive value (NPV) with a sensitivity and positive predictive (PPV) of 93% and 20 % respectively for at diagnosing PAS.

A majority (62.0%) of patients with PP were delivered electively and just below two fifths had an emergency caesarean section. The most common indication for an emergency C/S was antepartum haemorrhage(APH) occurring in 24 out of the 27 (88%) in this group. Only 8% required a total abdominal hysterectomy(TAH) as a lifesaving procedure after primary intervention to achieve haemostasis failed. All four patients who had placenta left in situ ended up with a hysterectomy at some stage either because of sepsis, bleeding or calcified placenta. There were no maternal deaths.

There was 92.9% admission to HCA/ICU when other procedures were done with C/S (OR=24.05, p =0.003). Maternal age > 35 years and pregnancy interval of > 5 years had an ICU/HCA admission rate of 54.2% and 56.1% respectively. The blood transfusion rate was 39.4%, however, only 20% of patients admitted to ICU/HCA received a blood transfusion. The median GA at delivery was 36 weeks (IQR

25-37) with a mean neonatal birth weight of 2360g, a very low birth weight (VLBW) rate of 37.0 % and a neonatal ICU admission rate of 16.9 %.

Conclusion

The diagnosis of PP can be established using TAU. TAU is a good tool for predicting patients without PAS and is essential for low-resource settings. Emergency and inappropriately planned C/S with other procedures were associated with an increased risk of TAH, HCA / ICU admission, preterm delivery and VLBW. There is a high rate of hysterectomy later on if the placenta is left in situ.

INTRODUCTION AND BACKGROUND

Placenta previa (PP) is defined primarily as abnormal implantation of the placenta into the lower segment of the uterus that is located over or near the internal cervical os (1,2). A systematic review (2003), conducted by Fraiz and Ananth covering the period 1966 to 2000, found the prevalence of placenta previa (PP) to be close to 4/1000 pregnancies(2). The incidence of abnormal attachment of the placenta has risen 13-fold since the 1900s(3), mainly due to the rising rate of caesarean section (C/S) worldwide(4). The World Health Organisation (WHO) suggested an optimal rate of C/S of 10%-15 % because C/S above this rate does not improve perinatal outcomes(5).

The pathophysiology of an abnormal attachment of the placenta is unclear, however, there seems to be an association between previous endometrial injury and uterine scarring(1). Other factors that are associated with an increased risk for placenta praevia (PP) among African women include age above 35 years, use of assisted reproductive technology, smoking and multiple gestation. In addition to increasing the risk of the occurrence of placenta praevia (PP), previous curettage of the uterine cavity increases the risk of placenta accreta spectrum (PAS) because of the disruption of the endometrial cavity with the formation of decidua defects and scarring(6). One study from the United State reported that this risk could be as high as 29.1 % in 2004(6).

Prenatal diagnosis offers optimal benefit in that, management can be properly planned and coordinated before the onset of labour to mitigate catastrophic outcomes(3). The diagnosis is, in most cases, made in the second half of pregnancy with either a transvaginal (TVS), transabdominal ultrasound (TAU) or both (7). Diagnosis of PP using a TVS has been postulated to be superior compared to TAU(8). The safety of both approaches has been established (8). There is concern that TAU might miss PP due to poor resolution, especially with posteriorly located placentas, in patients with high body mass index and when the bladder is under or over-filled (9). A study from Cameroon reported found that TAU had a sensitivity and specificity of 82% and 99 % respectively irrespective of the operator (40). This is particularly important for areas where there is a lack of expertise in the use of TVS and where there is no access to TVS. Once a diagnosis of PP has been made it is advisable to repeat the scan at 32 and again at 36

weeks of gestations once a diagnosis of PP or low-lying placenta is made to plan for the delivery(8).

Once PP is diagnosed, sonographers should try and exclude PAS. Ultrasound findings of intraplacental lacunae, placental/venous lakes that are increased in number and size should raise a suspicion of a morbidly adherent placenta(10). Magnetic resonance imaging (MRI) is recommended in cases where there is ultrasound suspicion of a morbidly adherent placenta(11). MRI has greater predictive accuracy in evaluating the depth and topography of placental invasion(12). However, MRI is not always available in some settings leaving healthcare workers with no option, but to rely on ultrasound only. A combination of TAU and TVS with colour Doppler has been found to have a sensitivity and specificity of 95.1% and 95.5% in the diagnosis of PAS(40).

Patients with ultrasound diagnosis of PP in tertiary hospitals are admitted for expectant management unless in cases where there are immediate indications for delivery, such as massive maternal haemorrhage or fetal distress. These patients are given steroids in the form of betamethasone or dexamethasone from 28 weeks until 34 weeks gestation. It is only when there is an urgent need for delivery that the administration of steroids is omitted as recommended by the literature(13). Placenta praevia is associated with antepartum haemorrhage (APH) and increased risk of premature delivery resulting in low birth weight (LBW) as well as low APGAR score following premature C/S delivery for PP(14). The administration of steroids in preterm pregnancies has been shown to decrease the risk of necrotizing enterocolitis of the newborn, intraventricular haemorrhage, respiratory distress syndrome, ventilator support and Neonatal Intensive Care Unit (NICU) admissions(13).

Blood transfusion and intensive care admission post-delivery are common among patients with PP(14). It is estimated that about 0.31% - to 0.6% of pregnancies develop APH once labour has commenced(1). Some studies report that about 5% of C/S hysterectomies are due to PP(1). Placenta previa remains a major risk factor for various maternal complications, e.g. postpartum haemorrhage (PPH), blood transfusion and Total Abdominal Hysterectomy(TAH), adult high care and intensive care (ICU) unit admissions(15).

According to recent guidelines published by the Royal College of Obstetrics and Gynaecology(RCOG) and the Journal of Obstetrics and Gynaecology of Canada (JOGC), elective delivery of PP is recommended from 36 weeks gestation in the presence of risk factors such as bleeding and from 37 weeks if there are none (4). More often, a multidisciplinary team is involved in the planning of delivery which includes: A feto-maternal sub specialist, senior obstetrician, urologist, general surgeon, interventional radiologist, anaesthesiologist, intensivist and a vascular surgeon if complications are anticipated upon delivery(8).

The morbidity and mortality of both pregnant women and their foetuses resulting from PP are considerable and exert an increased demand on health care resources(14). Obstetric haemorrhage (OH) is the commonest cause of maternal morbidity and mortality worldwide and accounts for 25-30% of maternal death in low to middle-income countries(16). Invasion of placenta tissue into the uterine myometrium has been reclassified and adopted by the International Federation of Obstetrics and Gynaecology (FIGO) as Placenta Accreta Spectrum (PAS) (formerly known as accreta, increta / percreta)(17). Surgery for PAS is regarded as challenging but reports from a recent study show a reduction in complications when a patient is delivered at a tertiary centre with a multidisciplinary team involvement (14).

Despite the availability of evidence, the approach to the diagnosis, management and outcome of PP is likely to differ from one setting to another, mainly because of different access to resources. The purpose of this study is to report on the profile, radiological investigations and findings, maternal and neonatal outcomes amongst patients diagnosed with PP at Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) from 01 January 2017 to 31 December 2018. We hope that the findings from this study will be used to inform future practice not only in study settings but also in settings with similar challenges.

METHODS

Study design and setting

This was a cross-sectional study based on a review of the clinical records of patients managed at CMJAH during the study period. This institution is a tertiary referral centre within the Charlotte Maxeke Clinical Cluster which serves two metros (City of Johannesburg and Ekurhuleni) as well as the West Rand district with approximately 54 000 deliveries in the cluster per annum (Personal communication, Prof Chauke). CMJAH is also one of the 3 main teaching hospitals of the University of Witwatersrand.

Inclusion and exclusion criteria

The study included clinical records of patients who were referred from local clinics, other hospitals from the cluster, private hospitals as well as self-referrals who were admitted and delivered at CMJAH during the period 1 January 2017 to 31 December 2018. None of the retrieved clinical files was excluded.

Data collection and analysis

Patients admitted with a diagnosis of PP at CMJAH were entered into the registers in the antenatal ward, the obstetrics emergency unit, and the obstetrics and gynaecology emergency and elective theatres. The names and hospital numbers of these patients were used to retrieve the electronic records which served as the source document for data collected.

Data was collected using a standardized data abstraction form and captured into a Microsoft Excel spreadsheet, then exported into Stata 14.2 for analysis (StataCorp®, USA). Descriptive statistics such as frequencies and percentages for categorical data, medians, and interquartile ranges (IQR) for continuous variables were used to describe the data as well as maternal and fetal outcomes. Frequencies and proportions were used to determine the performance of TAU in diagnosing PP compared to surgery. Diagnostic performance of the TAU in the diagnosis of PAS (sensitivity, specificity, positive predictive value or PPV, negative predictive value or NPV) was calculated using surgical findings as the gold standard. Surgical findings were used

for this purpose as not all patients had a hysterectomy. Both surgical assessment and histology have previously been used to compare the diagnostic performance of ultrasound and MRI in the diagnosis of PAS in other settings(39).

Univariable and multivariable logistic regression was used to determine factors associated with maternal admission to high care or ICU postoperatively and neonatal ICU admission. Variables that had a p-value <0.2 in the univariable analysis were included in the multivariable model.

Ethical considerations

Permission was obtained from the CEO of CMJAH. Ethical Approval (number R14/49) with clearance certificate no. M190456 was obtained from the University of the Witwatersrand Human Research Ethics committee.

RESULTS

There was a total of 17284 deliveries, 8966 (51.8%) of which were caesarean sections. Eighty four patients who were diagnosed with PP delivered at CMJAH from 01 January 2017 to 31 December 2018 giving a prevalence of PP of 0.49%. Of these, patients seventy one (84.5%) were suitable for analysis. For the remaining twelve (15.6%), files could not be retrieved from the filing system in the Patient Records Department.

Demographic and clinical characteristics of admitted women

Of the seventy one for whom data was obtained, the median age of patients diagnosed with PP was 33 years (IQR 29- 38years) and twenty six (36%) were less than 30 years old. Twenty-two (31%) were either married or in a stable relationship upon presentation to CMJAH. Sixty two (87.3%) patients were booked at the antenatal clinic. The median gestational age at the time of booking was 20 weeks however only nine (14.8%) booked before 14 weeks gestation. The median parity was two (IQR 1-2) and thirty eight (53.5%) had a parity of ≥ 2. Thirty patients (42.2%) had pregnancy intervals of > 5 years from the index pregnancy. Only twenty three (32.9%) of patients were HIV positive and nineteen (82.6%) of those women were on ART. Booking Hb < 8g/dl was found in fifty nine (83.1%) of patients meaning a majority of the patient population were anaemic. Fifty-three (74.6%) of the patients in this group had previous C/S while nine (12.7%)and nineteen (26.8%) had a past medical and surgical history (laparotomy for ectopic pregnancy, appendicectomy, ovarian cystectomy, mastectomy and

DD&C) before conception of this pregnancy respectively. Table 1 is a summary of the above data.

Table 1: Demographic and clinical characteristics

Variable	**n (%)**
Age (median, IQR)*	33 (29- 38)
Age < 30 years	26 (36.6)
Gravidity (median, IQR)	3(2-4)
Gravidity >2	61(85.9)
Parity(median, IQR)*	2(1-2)
Parity > 2	38(53.5)
Married or in a stable relationship	22 (31)
Booked at ANC	62 (87.3)
Booking @ >14 weeks	52 (85.2)
Gestational age at booking (median, IQR)*	20 (16- 26)
Most recent pregnancy >5 years	30 (42.2)
History of previous medical conditions	9 (12.7)
History of previous surgery	19 (26.8)
Previous C/S	53 (74.6)
Booking Hb, g/dl (median, IQR)*	11.8 (11- 12.9)
Hb < 8g/dL at booking	59 (83.1)
Rh positive	67 (94.4)
RPR positive	2 (3.1)
HIV positive	23 (32.9)
On ART **	19 (82.6)

*IQR; Interquartile range, **ART: Antiretroviral treatment

Diagnosis of PP and PAS

TAU was used as the first line of diagnosis for PP including assessment for placental invasion or placenta accreta spectrum (PAS) in all patients. All 71 patients had a diagnosis of PP on TAU however only thirteen (18.3%) patients had a suspicion of PAS on TAU based on the loss of ultrasound features such as loss of myometrial and placental interface and increased Doppler uptake indicating possible increased vascularity of invasive placenta into adjacent organs.

These patients were booked for further evaluation using MRI but only one patient (7.7%) out of the thirteen was able to access MRI due to a lack of resources. It was therefore not possible to compare the performance of TAU against MRI as initially intended.

Diagnostic performance of TAU in identifying PP and PAS

In the absence of MRI, surgery was used as the gold standard to assess the performance of TAU in the diagnosis of PP and PAS. Only sixty two out of the seventy one PP diagnosed with TAU could be confirmed at C/S, translating into a sensitivity of 87.3%. Only five (7.0%) out of the thirteen PAS suspected on TAU were confirmed at surgery. This means that TAU had a sensitivity of 20.0%, specificity of 93.0% with a positive predictive value (PPV) of 20.0% and negative predictive value (NVP) of 93.0% for the diagnosis of PAS. It can be concluded from these numbers that TAU is very poor in identifying women with PP who have PAS but performs well in excluding PAS. This information is summarised in Table 2 and Table 3.

Table 2: Radiological and Surgical findings of patients with PP

Method	**Findings**	**n**	**%**
TAU	Features of PAS	5	7.0
	No features of PAS	53	74.6
	Suspicious feature of PAS	13	18.3
C/S	PP present	62	87.3
	PP not present	9	12.7
C/S (in those with PP) **	PAS present	5	8.1
	PAS not present	57	91.9

**Only among 62 patients who had PP

Table 3. Performance of TAU when Surgery (C/S) is used as Gold Standard in diagnosing PAS

		C/S		Totals	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)
TAU		PAS	NO PAS		20.0 (0.51-71.6)	93.0% (83.0-98.1)	20.0 (0.51-71.6)	93.0 (83.0-98.1)
	PAS	1	4	5				
	No PAS	4	53	57				
		5	57	**62**				

Indications for delivery and immediate outcomes of patients with PP

All patients were delivered via C/S The majority of the patients, forty four (62%) out of seventy one were delivered electively and only twenty seven (38 %) had emergency C/S. Among the elective deliveries thirty seven (84.1%) out of the forty four were delivered for PP in the context of previous C/S. Only six (13.6%) and one (2.3%) had previous CS and PAS in addition to the diagnosis of PP. Among the group that had emergency C/S twenty four (88.9%) were delivered because of APH and the remaining three (11.1%) for PP plus fetal distress, PP plus severe pre-eclampsia and PP plus spontaneous rupture of membranes respectively without any other reason that required urgent delivery. Table 4 is a summary of the above.

Table 4: Indications for delivery

Reason for delivery	N (71)	%
Emergency	***27***	***38.0***
PP+APH	24	88.9
PP + Fetal distress	1	3.70
PP + severe pre-eclampsia	1	3.70
PP + spontaneous rupture of membranes	1	3.70

Elective	***44***	***62.0***
PP + previous CS	37	84.1
PP in a patient with previous NVD	6	13.6
PP with PAS	1	2.3

Procedures performed during C/S

All seventy one patients had caesarean sections. Fifty three (74.6%) patients had a C/S without any additional procedure, seven (9, 9%) had a Bakri balloon, four (5.6%) had a B-Lynch brace suture for uterine atony and six (8.4%) had a TAH to control bleeding intraoperatively. Other procedures such as bilateral tubal ligation (BTL), removal of cerclage, uterine embolization (UAE) were performed on two (2.8%) of the patients. Out of the seventy one, four patients (5.6%) had their placentas left behind due to clinical morbid adherence (PAS).

Thirty-three patients (46.4%) required adult HCA and ICU admission and a significant number of those patients were admitted to the obstetric HCA (36.6%) while two (2.8%) were taken to the main adult HCA and five (7.0%) required ICU admission as illustrated in Table 5.

There were no maternal deaths however, five patients (7%) required a relook laparotomy due to declining haemoglobin and ongoing clinical instability after the initial operation while in HCA and ICU. Of the four patients where the placenta was left in situ because it was considered not safe to remove, small bowel resection was performed on one patient. All four patients where the placenta was left in situ ended up with TAH later on, two for sepsis, one for bleeding and the remaining one because the placenta calcified and could not be removed after a year. One other patient required ureteric stents and bladder repair. Bleeding vessels were sutured in two patients (2.8%) after TAH followed by abdominal washouts. The average blood loss during C/S was 959 millilitres. Several blood products were given to twenty eight (39.4 %) patients during and after C/S delivery. Of the twenty eight, namely twenty seven (96.4 %) required red blood cells (RBC), while one (3.6%) did not. Furthermore, twenty three (82.2%) received Fresh Frozen Plasma (FFP), Mega unit of Platelets and Cryoprecipitate (Cryo). These findings are shown in Table 6.

Table 5: Procedure done during operation with HCA and ICU admissions

Procedure done during surgery	**n (%)**
Systemic uterine devascularization	1 (1.4%)
Placenta left behind	4 (5.6)
Accreta	1(25%)
Increta	1(25%)
Percreta	2 (50%)
Re-look laparotomy**	5 (7.0)
Bowel injury	1 (1.4)
Bladder injury	1 (1.4)
TAH	6 (8.4)
Total high or intensive care admissions	33 (46.4)
Obstetrics high care	26 (36.6)
Main high care	2 (2.8)
ICU admission	5 (7.0)

Table 6: Blood Transfusions given

Product received	**n (%)**	**Number of units (median, IQR)**
Median blood loss at C/S (millilitres)	959	
RBC	27 (96.4)	2 (1-4)
FFP	15 (53.6)	2 (2-4)
Platelets (Mega)	5 (17.9)	1 (1- 1)
Cryo	3 (10.7)	4 (4-8)

Factors associated with maternal HCA and ICU Admissions

In a multivariable model adjusting for the marital status, recent pregnancy > 5 years before index pregnancy, having PP at surgery, and having a C/S plus additional procedures, having a C/S plus other procedures were independently associated with post-op admission to HCA or ICU in thirteen patients, indicating a 92.9% admission rate with an adjusted odds ratio [aOR] 20.66 (95% CI 2.20- 194.24), p-value =0.008. There was a trend towards increased odds of admission to HCA/ICU in patients with a single marital status - aOR 3.35 (0.92- 12.20). p=0.067. None of the remaining factors was associated with maternal admission to high care or ICU in univariable or multivariable analyses. These findings a shown in Table 7.

Table 7: Factors associated with maternal HCA and ICU Admissions

Variable	Category	% with High care / ICU admission	OR (95% CI)	p-value	aOR (95% CI)	p-value
Age >35 years	No	20/47 (42.6)	1			
	Yes	13/24 (54.2)	1.59 (0.59-4.29)	0.355		
Married/ stable partner	No	27/49 (55.1)	3.27 (1.10-9.77)	0.034	3.35 (0.92-12.20)	0.067
	Yes	6/22 (27.3)	1		1	
HIV positive	No	20/47 (42.6)	1			
	Yes	12/23 (52.2)	1.47 (0.54-4.01)	0.449		
Most recent pregnancy > 5 years	No	10/30 (33.3)	1		1	
	Yes	23/41 (56.1)	2.56 (0.96-6.80)	0.06	2.05 (0.66-6.36)	0.212
Previous C/S	No	20/47 (42.6)	1			
	Yes	13/24 (54.2)	1.60 (0.59-4.29)	0.355		
PP with features of PAS at surgery	No	29/66 (43.9)	1		1	
	Yes	4/5 (80.0)	5.10 (0.54-48.10)	0.155	2.61 (0.11-62.78)	0.553
CS only	No	13/14 (92.9)	24.05 (2.93-197.47)	0.003	20.66 (2.20-194.24)	0.008
	Yes	20/57 (35.1)	1		1	

OR= odds ratio, aOR = adjusted odds ratio; CI = confidence interval, C/S = caesarean section

Neonatal outcomes and APGAR score

Neonatal outcomes were available for seventy three infants born to seventy one admitted patients, including two sets of twins. Table 8 shows that the median gestational age at admission was 30 weeks and at C/S was 36 weeks (25-37 IQR) with a median birth weight of 2360g (1480-2800 IQR). A very low birth weight rate (VLBW) of <1800g was found among twenty seven (37.0%) deliveries at a median gestation age of 29 weeks. Neonates admitted to the neonatal intensive care unit (NICU) accounted for 16.9 %, namely 12 patients. The median APGAR score at one minute was 8 (IQR 6- 9), improving to nine (IQR 8- 10) and 10 (IQR 9-10) at 5 and 10 minutes respectively. In a multivariable model adjusting for maternal and

neonatal factors – only low birth weight [aOR 14.77 (95% CI 1.72- 127.25)] and maternal admission to ICU or high care [aOR 5.13 (95% CI 1.15- 22.86)] were independently associated with neonates admitted to NICU.

Table 8: Neonatal outcomes and Apgar score

Variable	**n (%)**
Gestational age on admission (median, IQR)	30 (23-39)
Gestational age at delivery of foetus (median, IQR)	36 (25-37)
Birthweight in grams (median, IQR)	2360 (1480- 2800)
Gestational age (in weeks) at delivery of VLBW (median, IQR)	29 (28-31)
Very low birth weight (birthweight <1800g)	27 (37.0)
APGAR 1 (median, IQR)	8 (6-9)
APGAR 5 (median, IQR)	9 (8- 10)
APGAR 10 (median, IQR)	10 (9- 10)
Admission to NICU/HCA	12 (16.9)

DISCUSSION

According to a systematic review published in 2013, the pooled prevalence of PP is currently 5.2 per 1000 births but varies worldwide. Sub-Saharan Africa's prevalence is estimated at 2.7 per 1000(2). The prevalence of PP in this study was 0.49% which is slightly similar to the figures reported in the systematic review but higher than that reported in Sub-Saharan Africa. A possible explanation could be that the hospital is the main tertiary referral centre for all the facilities in the Charlotte Maxeke Cluster. More than one-third of these patients with PP were less than 30 years old. This is smaller compared to a study by Rajesheshwari et al who reported > 70% PP in patients aged 20-29 years(22). This is of particular importance if one considers that PP increases the risk for TAH.

Previous C/S history was found in >50% of the cohort. More than 80% had anaemia with 38% of deliveries being emergencies due to APH, but more than 50% of these patients were delivered as electives for previous C/S. A study by Oppenheimer et al found that the majority (62%) of patients with PP who had a previous C/S were booked for recurrent episodes of

vaginal bleeding with low haemoglobin(18). Our findings are comparable, highlighting the increased risk of morbidity associated with C/S when haemoglobin is not optimised antenatally, particularly in PP. The risk of complicated PP such as PAS increases with the number of C/S which is 25% after one C/S increasing to 40% after two C/S (9).

This study found that TAU was able to correctly diagnose sixty two (87.4%) of patients with PP during C/S. Only five (7.0%) patients had signs of PAS on TAU however surgery could only confirm one case of PAS. This is much lower compared to the study by Chou et al which reported that 20% of women with PP had ultrasound features consistent with PAS (19).TAU also had a high specificity when compared to the gold standard (C/S) for diagnosing PAS in this study. This meant that TAU was a good tool for predicting the likelihood of excluding PAS in the presence of PP with specificity and NPV of 93% (95% CI 83.0-98.1). This performance agrees with a meta-analysis published in 2013 that showed a high accuracy of ultrasound in diagnosing PAS in both retrospective and prospective studies even though our sensitivity was low(20). MRI was sourced when an inconclusive feature of PAS was noted on TAU(41). Features such as increased vascularity of the myometrium and placental interface with rounded edges, thin myometrium, foci of irregularity, inhomogeneity of placenta and no clear plain between bladder and uterus were documented by the residential radiologist. A study by Belfort et al showed how impractical and costly it is to use MRI as a screening tool for PP or PAS and how the findings are subject to selection bias compared to studies done on ultrasound(3).

Pre-operation multidisciplinary (MDT) consults with a urologist, an intensivist and a general surgeon are often carried out when patients have features of PAS or inconclusive features of PAS in the presence of PP. Unfortunately, delays in the completion of preoperative evaluation and poor documentation of MDT assessments resulted in deliveries occurring prematurely. This situation is not uncommon in a third world country institution like CMJAH as scares resources are an ongoing issue. As a result, there was a lack of information on how many patients and how far an MDT was carried out. A study by Alireza et al showed that a focused MDT approach to PAS was associated with better maternal outcomes. In this study, the majority of patients were delivered electively via C/S post conservative care as in-patients which yielded similar outcomes of reduced rate of unplanned delivery complications(21).

Intrauterine tamponade (Bakri balloon) was inserted in 7 (10%) of patients due to placenta bed persistent bleed with no reports of balloon displacement or failure. Other studies have reported a 6-16% displacement and failure of tamponade when drainage from the tube was 500mls after 1-hour post insertion(36). This study had a few patients requiring a balloon insertion and correct protocols of insertion were followed by clinicians when inserting the device. The balloon was decompressed 12-24 hours after the patient was stabilized.

Inadequate response to medical intervention to achieve contractility of the uterus in 6% of patients warranted a B-lynch uterine brace suture. This technique assists with contractility and haemostasis. Results of a study by Chai et al confirmed the effectiveness of a B-lynch suture for patients with uterine atony and PP. The suture exerts a longitudinal compression achieving an evenly distributed tension over the uterus including the lower segment (37). Our study findings showed that this desired effect was not completely achieved in all patients where a B-lynch was inserted.

Failure of a B-lynch and systemic uterine devascularization with rapid intraoperative hemodynamic instability associated with persistent bleeding requiring inotropic support resulted in 8% of patients needing a lifesaving TAH. This phenomenon is very common in patients with PP and PAS, particularly during an emergency C/S. A study by Kong et al agreed with this similar approach of proceeding to a hysterectomy when faced with intractable perioperative bleeding after the failure of conservative interventions(38).

Four (5.6%) patients had placenta left behind with confirmed PAS. These intraoperative interventions are in keeping with internationally adopted guidelines which are applied at CMJAH to prevent further maternal morbidity when attempting to remove the placenta. These surgical measures are also recommended by the American College of Obstetrics and Gynaecology(ACOG) to reduce maternal morbidity at a C/S in a setting of PAS (21). In this study, a relook and other surgical interventions such as one bowel resection, one bladder repair with ureteric stents followed by multiple cycles of haemodialysis due to kidney injury were done for patients with placenta percreta. All four patients had abdominal washouts after a TAH and removal of the placenta. Thus, leaving the placenta in situ should be weighed against the possible risk of secondary intervention. There is no recorded use of any adjuvant methotrexate therapy in this cohort as it is not recommended(8). A study by Lo.Tsz Kin et al noted that leaving the placenta in situ led to delayed bleeding, infection and secondary hysterectomies(12). This was also the case in this study. All four patients later had TAH for

bleeding and sepsis. Only one had TAH for calcified placenta after one year. The patients were stabilized in ICU and then discharged to maternity HCA for observations.

OH is the commonest cause of morbidity and mortality worldwide and is the second most identified cause of maternal morbidity and mortality in South Africa (22). A majority of patients in this study had a pre-delivery Hb < 8g/dl (83.1%). This is similar to, a study by K. Gibbins. et al which demonstrated that anaemia is one of the risk factors for OH as a complication of PP(23). OH perpetuated by anaemia is also associated with an increase in hospital stay and the need for blood transfusion (23). The average blood loss in this cohort was 959 millilitres (ml), which is an improvement compared to the findings of Kassem et al who reported an average blood loss of 2000 ml(14). This improved outcome at CMJAH is due to a senior obstetrician being required to be present during this kind of procedure.

Blood Transfusion products were given to 39.4% of patients in this study which is common in clinical settings of PP. Blood transfusion is often required when there is a significant drop in haemoglobin as a result of bleeding during a C/S for PP(24). Similarly, in this study, just above one third (38.0%) of patients received red blood cell transfusion and 80% of those patients had features of invasion/PAS during C/S and required admission to HCA/ICU for recovery. Once stable, the patient would be transferred to postnatal wards and an average stay of five to seven days was observed before being discharged home.

This study also showed that ICU and HCA post-operative admission was required for 46.4% of the patients. Being in a stable relationship/ being married was not significantly associated with higher odds of admission to HCA or ICU. This is similar to a study by Rasmussen et al which showed that level of education, marital status, and change in a partner were not associated with increased risk in PP associated HCA/ICU admissions(25). In this study, an interval of > 5yrs between index pregnancy at last delivery was significantly associated with PP leading to HCA/ICU admission. (OR 2.56 95%; CI 0.96-6,80; P= 0.06). Our findings are relatively similar to a previous report that an interpregnancy interval of ≥ 4 years was associated with a marginal risk (OR 1.25 95%; CI 1.06-1.48) of PP(25). This indicates the need for thorough counselling on child spacing concerning the risk of PP. This however must be in the context of other risk factors identified.

This study showed that a C/S with additional procedures such as B-lynch, intrauterine balloon tamponade, systemic devascularization and TAH was associated with a high risk (20 times) of being admitted to HCA or ICU admission, suggesting that a difficult C/S done for PP is associated with a higher probability of morbid adherence and more likelihood of bleeding in subsequent pregnancies which meant higher levels of post-op care will be required.

In this study, more than half of the patients admitted to HCA/ICU had a previous C/S before surgery. Majority (92.9%) of patients who had a C/S with additional procedures required main HCA/ICU. As per CMJAH obstetrics department protocol, all patients are further managed and monitored in maternity HCA post C/S for PP in line with adopted recommended international guidelines(8). The management of patients post C/S is then overseen by an obstetrics critical care team at CMJAH reducing the need for ICU care.

Prematurity as a result of PP is also a common problem (15). In our study, the average GA on admission was 30 weeks and all patients received corticosteroids for fetal lung maturity and a median GA at delivery of 36 weeks was achieved. The average birth weight of the neonates was 2360g which was similar to findings by Safaa et al that achieved birth weights of > 2000-2500g. However, just over one third (37%) of deliveries had a VLBW rate at a mean GA of 29 weeks and a neonatal HCA/ICU admission was 16.9%. These findings are comparable to a study by Salah et al where a 17% NICU admission was reported(26). Crane et.al indicated that NICU admissions, preterm delivery, and prolonged neonatal hospital stay were shown to be associated with patients diagnosed with PP(27).

The median APGAR score of neonates delivered in our study was 8/10 at 1 minute and 9/10 at 5 minutes respectively, this is an improvement as a study by Kassem et al found a low APGAR in the 1st minute but an improvement in the 5th minute with only 4.1 % neonates recording APGAR of < 7 at 5 minutes. However, a third of the neonates delivered were resuscitated within 5 mins after birth due to low oxygen saturation and transient respiratory distress. Neonatal morbidity was highest when delivery was done at < 34 weeks(14). One neonatal death was reported in this study resulting in a neonatal mortality rate (NMR) of 13.6 per 1000 live births which are lower than the recent overall NMR of 21 per 1000 in South Africa(28). The reason for better outcomes in our study could be related to early detection and timeous management response upon presentation to the obstetric unit at CMJAH.

Limitations

Loss of clinical files is among the limitations of the study because of its retrospective nature. This is important, especially since the missing files were maternal deaths.

Data collected in our study could not demonstrate the use of TVS due to unavailability. It is not clear why TVS was not used as all ultrasound machines in the hospital have TVS probes. This would have provided us with an opportunity to compare the performance of TVS and TAU in the diagnosis of PP and PAS. Surgery was performed by different registrars together with different consultants and therefore likely to be inter-observer variation in the diagnosis of PAS, especially in the absence of histological confirmation.

CONCLUSION

The incidence of PP is comparable to global figures despite the high rate of C/S in the hospital but higher than figures reported for Sub-Saharan Africa. Transabdominal ultrasound is a useful tool for the diagnosis of PP and for excluding PAS. The diagnosis of PP is associated with high maternal morbidity and admissions to high care and therefore advisable to arrange high care when such surgeries are booked.

Patients aged> 35 years with PP and pregnancy intervals of >5 years should be red flagged as they carry a> 50% chance of complications during C/S for PP. A C/S for PP requiring additional life-saving procedures is linked with increased TAH and HCA / ICU admissions post-operation. Prematurity and LBW are risk factors for NICU admissions. All patients where the placenta is left in situ must have close surveillance because of the increased risk of secondary hysterectomy.

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Appendix A

MMed PROTOCOL

Review of Placenta Previa and pregnancy outcomes at Charlotte Maxeke Hospital

Registrar: Dr TP Kgatle, MBCHB

Supervisor 1: Dr HL Chauke, MBCHB(UCT), BTh (ATS), Dip HIV MAN(SA), FCOG(SA), MMed (O & G), MSc (Clinical Research) (Liverpool), Cert Maternal & Fetal Medicine

1. Table of Contents

ABBREVIATIONS

APH – Antepartum haemorrhage

C/S - Caesarean section

CMJAH – Charlotte Maxeke Hospital.

OS – cervical opening

PP – Placenta Previa

PPH – Postpartum haemorrhage

TAH – Total Abdominal Hysterectomy

T/F – Blood Transfusion

TVS – Transvaginal ultrasound

SYNOPSIS

Placenta previa is an abnormal situation where the placenta of the developing foetus is located in the lower part of the uterus. It obstructs the internal cervical os and presents problems with delivery of the baby if the mother goes into spontaneous labour. Most often, the baby will require delivery via caesarean section for maternal bleeding either antenatally or during labour. There are risk factors associated with placenta previa and the diagnosis of this condition is primarily clinical and requires radiological imaging for conformation, including assessing as well as the extent of placenta morbidity.

Maternal and fetal complications are very common. Knowledge of the complications and outcomes of management can assist in the future management of patients with placenta praevia. There are currently no data that have looked at the management and outcome of patients diagnosed with placenta praevia at Charlotte Maxeke Johannesburg Academic Hospital. The purpose of the study is to address this gap by investigating the management and outcomes of patients diagnosed with placenta previa that was managed in this institution over two years.

LITERATURE REVIEW

1.1 Incidence and prevalence of Placenta previa

The incidence of Placenta previa (PP) is about 0.5% - 1% worldwide(3). The aetiology remains elusive however, one of the contributing factors seems to be the increase in caesarean section deliveries (1,4). The exact prevalence of PP varies from one place to

another. A systematic review (2003), conducted by Fraiz and Ananth within the period 1966 to 2000, found the prevalence to be close to 4/1000 pregnancies (29).
Other studies have found the prevalence of PP to be the highest among Asians and lower in Sub-Saharan Africa(22)(14). The frequency depends on the rate of underlying risk factors as well as the availability of diagnostic resources in a given population(1).

Risk factors associated with Placenta Previa

Although the aetiology of PP is unknown, studies have identified high maternal age, previous uterine scar, grand multiparity, malpresentation and Diabetes Mellitus as common risk factors(1). PP as a result of an increase in maternal age has been theorized to be due to the atherosclerotic and infarction changes that occur within the uterine wall. A study by Lubina Latifa in 2015 also showed a significant increase risk of PP in women with previous miscarriages (30).In particular, previous history of first trimester abortions carries a risk of developing PP (31). Women with 2 or more previous induced abortions had a two-fold increased risk of PP, this was hypothesized by various studies as a result of intrinsic damage to the uterine wall by the use of instruments such as curettage(32).

Furthermore, PP is more common in women with a history of caesarean section compared to those with a normal vaginal delivery (22). Other identified risk factors include smoking, cocaine use and prior abnormal implantation (24). The previous history of induced abortions also suggests a 70% risk of developing PP as a result of being exposed to surgical uterine procedures(6). Previous curettage of the uterine cavity may result in uterine cavity disruption, decidual defects and scarring, resulting in an increased risk of placenta accreta spectrum, which was as high as 29.1 % reported by the United States in 2004(6)(11).
Although little is known regarding the risk of developing PP in twin vs singleton pregnancies, a study in the USA showed that PP occurred more frequently amongst multiple pregnancies than in singletons(33).

Investigations and Imaging

Prenatal diagnosis offers optimal benefit in that, management can be properly planned and coordinated before the onset of labour to mitigate catastrophic outcomes(3).
The diagnosis is, in most cases, made in the second half of pregnancy with either/or a transvaginal/transabdominal (TVS/TAU), which in current practice is easier, safer and more reliable but a disadvantage of TVS could be the possible inaccuracies that occur when conducted during severe vaginal bleeding(7).

Although ultrasound lacks consistent diagnostic criteria, this investigative tool remains the preferred first-line diagnostic imaging modality for the diagnosis of abnormally situated and/or invasive placenta (3). TAU offers poor visualization in situations where the placenta is located posteriorly when the patient has an increase in body habitus and if the bladder is under/over-filled, hindering the accuracy of diagnosis(9).

In recent years, studies have determined the diagnosis and outcome of PP based on localization determined by transvaginal ultrasound (TVS). This method, TVS, allowed the precision of the exact relation between the edge of the placenta and the internal cervical opening (OS)(9). TAU is associated with a 25% of false-positive diagnosis of PP and its diagnostic precision is affected by factors such as the position of the fetal head and maternal obesity. Magnetic Resonance Imaging(MRI) can accurately visualize the placenta, making it superior to TAU but adds no additional benefit over TVS in placenta location(9). TVS is the preferred diagnostic imaging of choice due to its easy accessibility, low cost and efficiency compared to an MRI and is now the gold standard imaging modality of choice in the management of PP(34). MRI can be sourced for diagnostic clarity and evaluation of placenta morbidity when there are suspicious complex TVS findings but it's not readily available in most institutions(11).

Maternal and Neonatal complications and outcomes

Obstetric haemorrhage is the commonest cause of maternal morbidity and mortality worldwide and accounts for 25-30% of maternal death in low to middle-income countries, this is validated by the South African Saving Mothers triannual report 2014-2016(22), which result in catastrophic complications for both mother and foetus. (16)(35).

It is estimated that about 0.31% - to 0.6% of pregnancies develop antepartum haemorrhage (APH) once labour has commenced. (27). Some studies report that about 5% of C/S Hysterectomies are due to PP (5). Placenta Previa remains a major risk factor for various maternal complications, e.g. postpartum haemorrhage (PPH), blood transfusion (T/F) and Total Abdominal Hysterectomy(TAH)(15). The condition is frequently complicated by trophoblastic invasion into the decidua basalis of the uterus resulting in accrete/increta or percreta(7).

Proper management of PP is likely to contribute positively to the reported global reduction in maternal mortality, the gains of which are partly due to the availability of infrastructure and including better clinical acumen assessment and management of pregnancy complications (35).
In addition, PP is a risk factor for preterm delivery and associated complications (5). It is therefore envisaged that this study can add value in terms of the identification of the existing gaps in the management of PP at Charlotte Maxeke Hospital (CMJAH).

Justification of study

Management of PP is of extreme importance in determining the outcome of both mother and baby. Most institutions tailor their management protocols based on the availability of resources and how best to manage the patient based on recommended international and national guidelines. The study will provide possible modify existing protocols on how to best approach a patient with suspected or confirmed PP at CMJAH within the institution's limitations and resource accessibility.

Aim of the Study

To describe the management and outcome of patients who are diagnosed with placenta previa at Charlotte Maxeke Hospital (CMJAH).

Objectives

1. To describe the profile of pregnant women diagnosed with PP.
2. To determine risk factors associated with the diagnosis of PP among the cohort of women who were managed at CMJAH during the study period.
3. To determine how the diagnosis of PP was made and whether the antenatal diagnosis correlated with the surgeon's impression at caesarean section.
4. To describe maternal and neonatal outcomes resulting from the management of PP and related complications.

Methods

1. Study design

A cross-sectional retrospective study.

2. Sample Size

All the files of patients with placenta praevia were delivered during the study period.

An estimated number of 60 patient files will be reviewed from 2017 to 2018.

3. Study population

All patients diagnosed with Placenta Previa that were delivered at CMJAH during the two-year

study period (2017-2018).

Data collection

The antenatal ward, the obstetric emergency unit's admission registers as well as the obstetric and gynaecological elective theatre registers will be used to identify women who were diagnosed with placenta praevia and managed at CMJAH during the study period. The clinical records of the patients will be retrieved from patient records and reviewed. Data

regarding the risk factors, diagnosis, management, and outcomes will be collected into a specifically designed data capture sheet. Such data will include:

- Age
- Gravidity
- Parity
- Booking status
- Gestational age at booking
- Employment and marital status
- Booking bloods
- Previous pregnancies and outcomes
- Modalities used to diagnose PP and findings
- Clinical findings at surgery
- Outcomes of management (e.g. PPH, Blood transfusion, hysterectomy, ICU admission.t)
- Gestational age at delivery and indications
- Neonatal Outcome from Birth to 7 days of life will be a review

- APGAR of neonates and whether the neonates were admitted to high care or ICU

Data analysis

Data was collected using an Excel spreadsheet and transferred into Redcap. Data Analysis will be performed using Stata software (StataCorp. 2015. *Stata Statistical Software: Release 14*. College Station, TX: StataCorp LP). Descriptive statistics will be used for all the variables and presented as frequencies, means, and SD.

Ethics approval

Permission to conduct the study was sought from the CEO of CMJAH and ethical approval from the University of the Witwatersrand's Human Research and Ethics Committee.

Intention to disseminate

The findings from the study will be shared with the department of obstetrics and gynaecology at CMJAH and also presented at research meetings when opportunities arise. Furthermore, the results of the study will be submitted for publication in peer-reviewed journals.

Budget

ITEM	COST
Protocol print out	**R 200**
Data collection sheet	**R 300**
Data analysis by Statistician	**R 2000**
Dissemination	**R 2000**
TOTAL	**R 4 500**

Work Plan:

Task	Jan 2019	Feb-Mar 2019	Apr-May 2019	Jun-Jul 2019	Aug-Sept 2019	Oct 2021
Postgraduate Protocol Review Committee assessment	**x**					
Corrections after Postgraduate Protocol Review Committee		**x**				
Ethics application			**x**			
Institutional permission			**x**			
Data Collection				**x**		
Data analysis and article write-up					**x**	
Submission for examination						**x**

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Appendix B: Data Capture Sheet

DATA CAPTURE SHEET

Participant Number:

File Number:

Age:	
Parity:	
Gravidity:	

Medical History

1.
2.
3.
4.

Surgical History

1.
2.
3.
4.

Marital Status ***(please cross 'X' in the applicable box)***

Single	Stable Relationship	Married	Divorced	Widowed	Unknown

Antenatal record

Booking status ***(please cross 'X' in the applicable box)***	**Booked**		**Unbooked**	
Gestational age @ booking				
Booking Hb				

Previous pregnancies

Year	Gestational age at delivery	Mode of delivery	Complications

Booking bloods

Rh				
RPR				
HIV				
CD4 count				
Viral Load				
Antiretroviral Therapy	YES		NO	

Diagnosis of placenta praevia

(Please cross 'X' the applicable box)

Ultrasound	Transabdominal		Transvaginal	

Signs of invasion	YES		NO	
Increta	YES		NO	
Accreta	YES		NO	
Percreta	YES		NO	

MRI Findings

(Please cross 'X' the applicable box)

Previa without invasion	YES		NO	
Previa with invasion	YES		NO	
Increta	YES		NO	
Accreta	YES		NO	
Percreta	YES		NO	

Findings at Surgery

(Please cross 'X' the applicable box)

Gestational Age At Delivery:				
Indications At Delivery:				
Placenta Previa	YES		NO	
Invasion	YES		NO	
Accreta	YES		NO	
Percreta	YES		NO	

Surgical procedure done

(Please cross 'X' the applicable box)

Caesarean section only	YES		NO	
Caesarean section plus balloon	YES		NO	
Caesarean section plus B-Lynch	YES		NO	
Caesarean section plus Total abdominal hysterectomy (TAH)	YES		NO	
Histology of specimen (after TAH):	YES		NO	
If Other please specify				

Placenta left behind	YES		NO	
Relook Laparotomy	YES		NO	
Type Of Operation Done	YES		NO	

Blood Transfusion	YES		NO	
1. Number Of Units				
2. Type Of Products				

Maternal admissions to a higher level of care

(Please cross 'X' the applicable box)

Obstetrics high care	YES		NO	
Main High care	YES		NO	
ICU	YES		NO	

Reason for admission:
Maternal outcome:

Neonatal Outcome (from Birth to 7 days of life)

(Please cross 'X' the applicable box)

Neonatal weight at birth						
Apgar's (/10)	1st min		5th min		10th min	
Admission to neonatal high care	YES		NO			
Admission to NICU	YES		NO			
Reason for NICU admission:						

Appendix C: Ethics Clearance Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Dr Thabang Kgatle

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M190456

NAME: (Principal Investigator)	Dr Thabang Kgatle
DEPARTMENT:	Charlotte Maxeke Johannesburg Academic Hospital Maternity Theatre Records
PROJECT TITLE:	Review of Placenta Previa Major management and pregnancy outcome at Charlotte Maxeke Hospital
DATE CONSIDERED:	2019/4/26
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Prof H.L Chauke and Dr S. Bhoora
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	05/07/2019

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the Third Floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in April and will therefore be due in the month of April each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix D: Author Guidelines South African Journal of Obstetrics and Gynaecology(SAJOG)

Author Guidelines South African Journal of Obstetrics and Gynaecology(SAJOG)

MANUSCRIPTS Shorter items are more likely to be accepted for publication, owing to space constraints and reader preferences.

Original articles not exceeding 3 000 words, with up to 6 tables or illustrations, are usually observations or research of relevance to Obstetrics and Gynaecology. References should preferably be limited to no more than 15. Please provide a structured abstract not exceeding

250 words, with the following, recommended headings: *Background, Objectives, Methods, Results,* and *Conclusion.*

Scientific letters/short reports, which include case reports, side effects of drugs, and brief or negative research findings should preferably be 1500 words or less, with 1 table or illustration and no more than 6 references. Please provide an accompanying abstract not exceeding 150 words.

Editorials, Opinions, etc. should be about 1000 words and are welcome, but unless invited, will be subjected to the SAJOG peer-review process.

Review articles are rarely accepted unless invited.

Letters to the editor, for publication, should be about 400 words with only one illustration or

table, and must include a correspondence address.

Obituaries should be about 400 words and may be accompanied by a photograph.

MANUSCRIPT PREPARATION Refer to articles in recent issues for the presentation of headings and subheadings. If in doubt, refer to 'uniform requirements' - **www.icmje.org**. Manuscripts must be provided in **UK English**. **Qualification, affiliation, and contact details** of ALL authors must be provided in the manuscript and the online submission process.

Abbreviations should be spelt out when first used and thereafter used consistently, e.g. 'intravenous (IV)' or 'Department of Health (DoH)'.

Scientific measurements must be expressed in SI units except for blood pressure (mmHg) and haemoglobin (g/dl). Litres is denoted with a lowercase 'l' e.g. 'ml' for millilitres). Units

should be preceded by a space (except for %), e.g. '40 kg' and '20 cm' but '50%'. Greater/smaller than signs (> and 40 years of age. The same applies to ± and o, i.e. '35±6' and '19oC'.

Numbers should be written as grouped per thousand units, i.e. 4 000, 22 160...

Quotes should be placed in single quotation marks: i.e. The respondent stated: '...' Round **brackets** (parentheses) should be used, as opposed to square brackets, which are reserved for denoting concentrations or insertions in direct quotes.

General formatting The manuscript must be in Microsoft Word or RTF document format. The text must be single-spaced, in 12-point Times New Roman font, and contain no unnecessary formatting (such as text in boxes, except for Tables).

ILLUSTRATIONS AND TABLES If tables or illustrations submitted have been published elsewhere, the author(s) should provide consent to republication obtained from the copyright holder.

Tables may be embedded in the manuscript file or provided as **'supplementary files**. They must be numbered in Arabic numerals (1,2,3...) and referred to consecutively in the text (e.g. 'Table 1'). Tables should be constructed carefully and simply for intelligible data representation. Unnecessarily complicated tables are strongly discouraged. Tables must be cell-based (i.e. not constructed with text boxes or tabs) and accompanied by concise title and column headings. Footnotes must be indicated with consecutive use of the following symbols: * † ‡ § ¶ || then ** †† ‡‡ etc.

Figures must be numbered in Arabic numerals and referred to in the text e.g. '(Fig. 1)'. Figure legends: Fig. 1. 'Title...' All illustrations/figures/graphs must be of **high resolution/quality**: 300 dpi or more is preferable but images must not be resized to increase resolution. Unformatted and uncompressed images must be attached as '**supplementary files**' upon submission (not embedded in the accompanying manuscript). TIFF and PNG formats are preferable; JPEG and PDF formats are accepted, but authors must be wary of image compression. The original workbook must accompany illustrations and graphs prepared in Microsoft Powerpoint or Excel.

REFERENCES Authors must verify references from the original sources. *Only complete, correctly formatted reference lists will be accepted.* Reference lists must be generated manually and **not** with the use of reference manager software. Citations should be inserted in the text as superscript numbers between square brackets, e.g. These regulations are endorsed by the

[2] [3,4-6] World Health Organization, and others.

All references should be listed at the end of the article in numerical order of appearance in

the **Vancouver style** (not alphabetical order). Approved abbreviations of journal titles must be used; see the List of Journals in Index Medicus. Names and initials of all authors should be given; if there are more than six authors, the first three names should be given followed by et al. First and last page, volume, and issue numbers should be given.

Wherever possible, references must be accompanied by a digital object identifier (DOI) link and PubMed ID (PMID)/PubMed Central ID (PMCID). Authors are encouraged to use the DOI lookup service offered by **CrossRef**.

Journal references Price NC, Jacobs NN, Roberts DA, et al. Importance of asking about glaucoma. Stat Med 1998;289(1):350-355. [http://dx.doi.org/10.1000/hgjr.182] [PMID: 2764753]

Book references: Jeffcoat N. Principles of Gynaecology. 4th ed. London: Butterworth, 1975:96-101. *Chapter/section in a book:* Weinstein L, Swartz MN. Pathogenic Properties of Invading Microorganisms. In: Sodeman WA jun, Sodeman WA, eds. Pathologic Physiology: Mechanisms of Disease. Philadelphia: WB Saunders, 1974:457-472.

Internet references: World Health Organization. The World Health Report 2002 - Reducing Risks, Promoting Healthy Life. Geneva: World Health Organization, 2002. http://www.who.int/whr/2002 (accessed 16 January 2010).

Other references (e.g. reports) should follow the same format: Author(s). Title. Publisher place: publisher name, year; pages. Cited manuscripts that have been accepted but not yet published can be included as references followed by '(in press)'. Unpublished observations and personal communications in the text must not appear in the reference list. The full name of the source person must be provided for personal communications e.g. '...(Prof. Michael Jones, personal communication)'.

PROOFS A PDF proof of an article may be sent to the corresponding author before publication to resolve remaining queries. At that stage, **only** typographical changes are permitted; the corresponding author is required, having conferred with his/her co-authors, to reply within 2 working days for the article to be published in the issue for which it has been scheduled.

CHANGES OF ADDRESS Please notify the Editorial Department of any contact detail changes, including email, to facilitate communication.

CPD POINTS Authors can earn up to 15 CPD CEUs for published articles. Certificates may be requested after publication of the article.

Appendix E: Turnitin report

Document Turnitin.docx

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Appendix F: CEO Approval letter

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL

Enquiries:
Ms. N. Mzila
Office of the Clinical Director
Email: Nolwazi.Mzila@gauteng.gov.za
Tell: (011): 488-4812
18th June 2019

Dear Dr. T. P. Kgatle

STUDY TITLE: Review of Placenta Previa and Pregnancy Outcomes at Charlotte Maxeke Johannesburg Academic Hospital.

Permission to conduct the above mentioned study is provisional approved. Your study can only commence once Ethics approval is obtained. Please forward a copy of your Ethics Clearance Certificate as soon as the study is approved by the Ethics Committee for the CEO's office to give you the final approval to conduct the study.

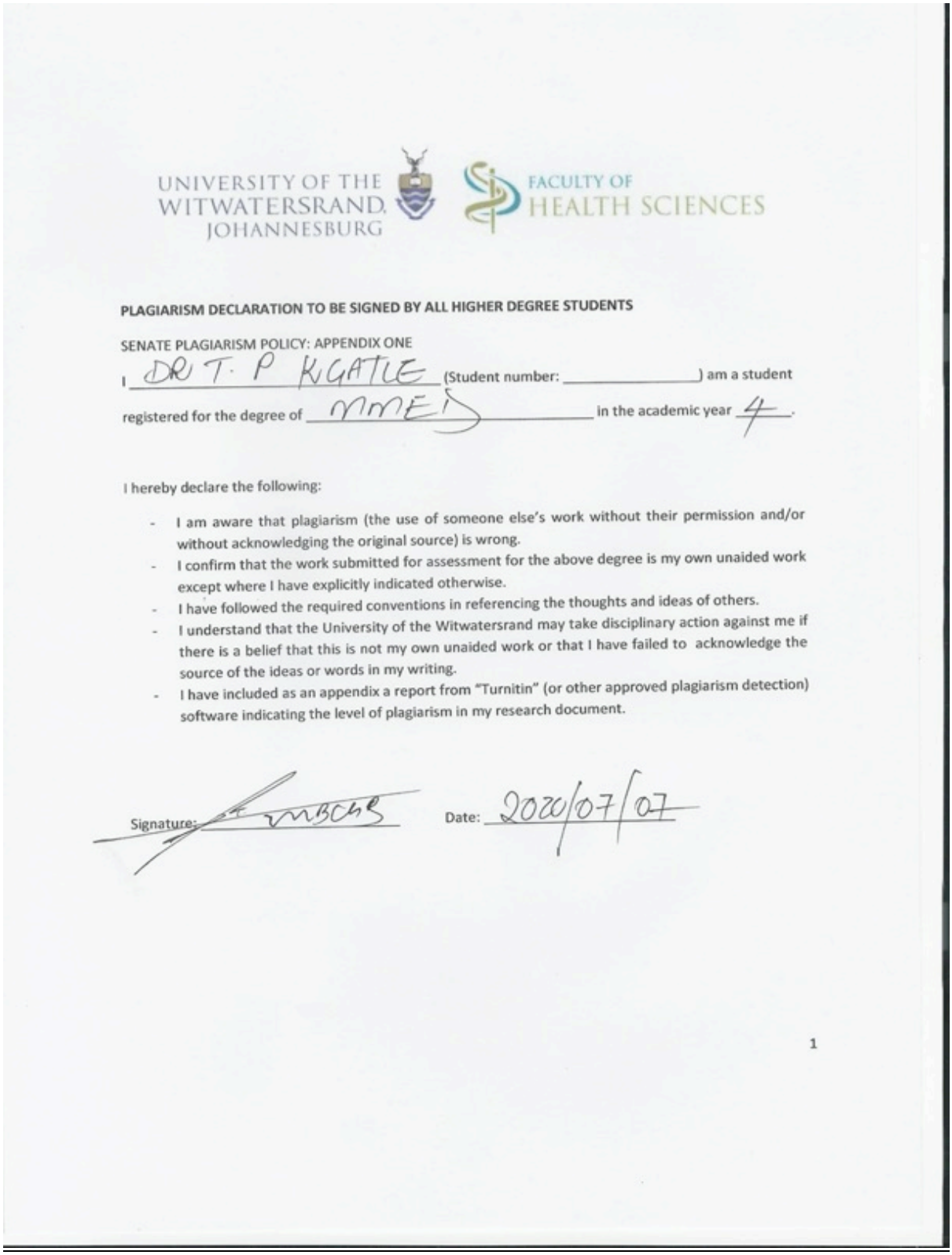
Supported / ~~not supported~~

Dr. M.I. Mofokeng
Clinical Director
DATE: 18/06/2019

Approved / ~~not approved~~

Ms. G. Bogoshi
Chief Executive Officer
DATE: 18/06/2019

Appendix G: Plagiarism declaration



UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

FACULTY OF HEALTH SCIENCES

PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

SENATE PLAGIARISM POLICY: APPENDIX ONE

I DR T. P KGATLE (Student number: _____) am a student registered for the degree of MMED in the academic year 4.

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.
- I have included as an appendix a report from "Turnitin" (or other approved plagiarism detection) software indicating the level of plagiarism in my research document.

Signature: _____ Date: 2020/07/07

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