REPUBLIC OF CAMEROON
PEACE-WORK-FATHERLAND

MINISTRY OF HIGHER EDUCATION

THE UNIVERSITY OF YAOUNDE I

FACULTY OF MEDICINE AND BIOMEDICAL SCIENCES

REPUBLIQUE DU CAMEROUN
PAIX-TRAVAIL-PATRIE

MINISTERE DE L'ENSEIGNEMENT SUPERIEUR

UNIVERSITE DE YAOUNDE I

FACULTE DE MEDECINE ET DES SCIENCES BIOMEDICALES

DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY

IMMEDIATE NEONATAL OUTCOME FOLLOWING MULTIFETAL PREGNANCIES IN TWO HOSPITALS IN YAOUNDE

Thesis written and defended publicly in partial fulfilment of the requirements for the award of the *Medicinae Doctor* (MD) degree by:

BATEBE-AGBOR REGINA NKIEH

17M086

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PROF. MBU Robinson ENOW

Professor of
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Academic year 2023-2024

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Date of public defense:

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DEDICATION

To my lovely parents,

Mr Batebe-Agbor Boniface

and

Mrs Fotabong Magdaline Epse Batebe

ACKNOWLEDGEMENTS

I am most grateful to God Almighty for all that He has done for me in the last 7 years, this work wouldn't have been possible without His grace. I also wish to express my heartfelt gratitude to everyone who has supported me throughout this work. Special thanks to:

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- And to all whose names were not mentioned above, your contributions did not go unnoticed.

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231.	BENGONDO MESSANGA Charles (HD)	P	Stomatology
232.	NOKAM TAGUEMNE M.E.	SL	Dental Medicine
233.	EDOUMA BOHIMBO Jacques Gérard	SL	Stomatology and Surgery

234.	MBEDE NGA MVONDO Rose	SL	Dental Medicine
235.	MENGONG ép. MONEBOULOU Hortense	SL	Paediatric Dentistry
236.	LOWE NANTCHOUANG Jacqueline Michèle épouse ABISSEGUE	SL	Paediatrics Dentistry
237.	Jules Julien NDJOH	SL	Dental Surgery
238.	GAMGNE GUIADEM Catherine M	L	Dental Surgery
239.	BITHA BEYIDI Thècle Rose Claire	L	Maxillo-Facial Surgery
240.	NIBEYE Yannick Carine Brice	L	Bacteriology
241.	KWEDI Karl Guy Grégoire	L	Dental Surgery
242.	NKOLO TOLO Francis Daniel	L	Dental Surgery
DEPARTMENT OF PHARMACOGNOSY AND PHARMACEUTICAL CHEMISTRY			
243.	NTSAMA ESSOMBA Claudine (HD)	P	Pharmacognosy/pharmaceutical chemistry
244.	NGAMENI Bathélémy	P	Phytochemistry/ Organic chemistry
245.	NGOUPAYO Joseph	P	Phytochemistry/Pharmacognosy
246.	GUEDJE Nicole Marie	AP	Ethnopharmacology/Plant Biology
247.	BAYAGA Hervé Narcisse	L	Pharmacy
DEPARTMENT OF PHARMACOTOXICOLOGY AND PHARMACOKINETICS			
248.	ZINGUE Stéphane (HD)	AP	Pharmacy
249.	FOKUNANG Charles	P	Molecular Biology
250.	MPONDO MPONDO Emmanuel	P	Pharmacy
251.	TEMBE Estella ép. FOKUNANG	AP	Clinical Pharmacology
252.	TABI OMGBA	SL	Pharmacy
253.	NENE AHIDJO ép. NJITUNG TEM	L	Neuropharmacology
DEPARTMENT OF GALENIC PHARMACY AND PHARMACEUTICAL LEGISLATION			
254.	NNANGA NGA Emmanuel (HD)	P	Galenical Pharmacy
255.	MBOLE Jeanne Mauricette épse MVONDO	SL	Quality control and management of health products and food

256.	SOPPO LOBE Charlotte Vanessa	SL	Quality control of Drugs
257.	MINYEM NGOMBI Aude Périne ép. AFUH	L	Pharmaceutical Regulation
258.	NYANGONO NDONGO Martin	L	Pharmacy
259.	ABA'A Marthe Dereine	L	Drug Analysis

KEY:

HD= Head of Department

P= Professor

AP= Associate Professor

SL= Senior Lecturer

L= Lecturer

THE PHYSICIAN'S OATH

Declaration of Geneva adopted by the Geneva Assembly of the World Medical Association in Geneva, Switzerland, September 1948 and amended by the 22nd World Medical Assembly, Sydney, Australia (August 1968)

I will solemnly pledge myself to consecrate my life to the service of humanity
I will give my teachers the respect and gratitude which is their due
I will practice my profession with conscience and dignity
The health of my patients will be my first consideration
I will respect secrets confided in me, even after the patient has died
I will maintain by all the means in my power the honour and noble traditions of the medical profession

My colleagues will be my brothers

I will not permit considerations of religion, nationality, race, party politics or social standing to intervene between my duty and my patient

I will maintain the utmost respect for human life from the time of conception, even under threat

I will not use my medical knowledge contrary to the laws of humanity

SUMMARY

Background: Multifetal pregnancies are considered high risk because they have an increased incidence of perinatal mortality and morbidity worldwide. This is quite common in our setting occurring in about 2.8% of pregnancies. These pregnancies can imply an increased risk for women and children because of higher rates of obstetrical complications. It is therefore important to understand the relationship between these pregnancies and their outcomes.

Objective: The main objective was to evaluate immediate neonatal outcome following multifetal pregnancies.

Methods: We conducted a retrospective cohort study at the Yaoundé Gynaecology, Obstetrics and Paediatrics Hospital and the Yaoundé Central Hospital. All files of pregnant women who delivered in the selected hospitals from January 2018 to December 2022 were included. The exposed group consisted of files of pregnant women with multifetal pregancies who were admitted in labor and delivered in these hospitals. The unexposed group were files of women with singleton pregnancies who were admitted in labor and delivered just after the cases of the multifetal pregnancy.

Results: We had a total of 150 exposed and 150 unexposed cases. The highest number of multifetal pregnancies occurred among women aged between 30-35 years (26.7%) with a mean maternal age of 27.9 ± 6.2 years. The highest level of education among women in the exposed group was high school (40.0% vs. 28.0%) in contrast to women in the unexposed group who were mostly university graduates (46.7% vs. 30.7%) **(p < 0.05).** Grand multigravidity and grand multiparity were associated with multifetal pregnancies **(p<0.001).** Women in the exposed group had a 1.7-fold higher risk of caesarean delivery than women in the unexposed group **(p = 0.002).** After multivariate analysis using the binary logistic regression method, neonates in the exposed group were significantly less likely to fall within the birth weight range of 2500-4000 **(aRR: 0.27, 95% CI 0.16-0.47; adjusted p < 0.001).**

Conclusion: Multifetal pregnancies were associated with adverse neonatal outcomes such as low birth weight.

Keywords: Multifetal, neonatal, outcome, pregnancy.

RESUME

Contexte: Les grossesses multifœtales sont considérées comme étant à haut risque car elles présentent une incidence accrue de mortalité et de morbidité périnatale dans le monde entier. Dans notre pays, ce type de grossesse est assez courant, puisqu'il concerne environ 2,8 % des grossesses. Ces grossesses peuvent impliquer un risque accru pour les femmes et les enfants en raison des taux plus élevés de complications obstétricales. Il est donc important de comprendre la relation entre ces grossesses et leurs devenir.

Objectif : L'objectif principal était d'évaluer l'issue néonatale immédiate après les grossesses multifœtales.

Méthodes: Nous avons mené une étude de cohorte rétrospective à l'hôpital de gynéco-obstétrique et pédiatrique de Yaoundé et à l'hôpital centrale de Yaoundé. Tous les dossiers des femmes enceintes ayant accouché dans les hôpitaux sélectionnés de janvier 2018 à décembre 2022 ont été inclus. Le groupe exposé était constitué des dossiers de femmes enceintes présentant des grossesses multifœtales qui ont été admises en travail et ont accouché dans ces hôpitaux. Le groupe non exposé était constitué de dossiers de femmes avec des grossesses monofœtales qui ont été admises en travail et ont accouché juste après les cas de grossesse multifœtale.

Résultats: Nous avons eu un total de 150 cas exposés et 150 cas non exposés. Le plus grand nombre de grossesses multifœtales a été enregistré chez les femmes âgées de 30 à 35 ans (26,7 %), avec un âge maternel moyen de 27,9 ± 6,2 ans. Le niveau d'éducation le plus élevé parmi les femmes du groupe exposé était le lycée (40,0 % contre 28,0 %), contrairement aux femmes du groupe non exposé qui étaient pour la plupart à l'université (46,7 % contre 30,7 %) ($p < 0,05$). La grande multigravité et la grande multiparité ont été associées à des grossesses multifœtales ($p<0,001$). Les femmes du groupe exposé présentaient un risque d'accouchement par césarienne 1,7 fois plus élevé que les femmes du groupe non exposé ($p = 0,002$). Après une analyse multivariée utilisant la méthode de régression logistique binaire, les nouveau-nés du groupe exposé étaient significativement moins susceptibles de se situer dans la fourchette de poids de naissance de 2500-4000 (RR : 0,27, 95% CI 0,16-0,47 ; p ajusté < 0,001).

Conclusion: Les grossesses multifœtales sont associées au faible poids de naissance.

Mots-clés : Multifœtale, néonatale, issue, grossesse.

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LIST OF ABBREVIATIONS

ANC: Antenatal Consultations

ART: Assisted Reproductive Technologies

ACOG: American College of Obstetrics and Gynaecology

β-hCG: beta-human Chorionic Gonadotropin

FSH: Follicle Stimulating Hormone

IVF: In Vitro Fertilization

PPROM: Preterm Premature Rupture of Membranes

TRAP: Twin Reversed Arterial Perfusion

WHO: World Health Organization

YCH: Yaoundé Central Hospital

YGOPH: Yaoundé Gynaecology, Obstetrics and Paediatrics Hospital

CHAPTER 1: INTRODUCTION

1 INTRODUCTION

1.1 BACKGROUND

The simultaneous development of two or more fetuses in the uterus is referred to as multifetal pregnancy or multiple gestation [1]. It presents unique challenges, both maternal and fetal, due to increased risk of pregnancy-related deaths [2]. Multifetal pregnancies are regarded as high risk pregnancies in the whole world with a twin birth rate of 31.2 per 1000 live births and a triplet or higher order birth rate of 78.9 per 100,000 live births according to the United States' National Centre for Health Statistics[3].

Studies have shown that, the highest incidence of multiple pregnancies has been found in low and middle-income countries particularly in Sub-Saharan Africa with an average twinning rate of 20 per 1000 births compared to 10 per 1000 deliveries in Europe and 5-6 per 1000 deliveries in Asia[4].

Globally, there is extensive evidence that multifetal births are associated with a substantially higher risk of perinatal mortality and morbidity with a mortality rate being six times higher compared to that with singleton births [1,5,6]. The complications include prematurity, low birth weight, intrauterine growth restriction and fetal demise [7] . These pregnancies are responsible for 17% of all preterm births (before 37 weeks of gestation), 23% of early preterm births (before 32 weeks of gestation), and 24% of low birth weight infants(a weight at birth of a neonate less than 2,500 grams but greater than 1500 grams) [8,9].

In Cameroon, studies have been done to determine the prevalence and outcomes of multifetal pregnancies, one of which revealed a prevalence of 2.8% in Bamenda, in 2022 [1]. This study evaluated the neonates at birth and found adverse fetal outcomes such as prematurity, low birth weight and birth asphyxia, however little is known about the outcomes in the early neonatal period following multiple gestations in the public hospitals in Yaounde.

Due to the increased risks associated with multifetal pregnancies, it is necessary to assess the early neonatal outcomes in our setting in order to propose preventive measures in a bid to improve these outcomes.

1.2 RATIONALE

The occurrence of multifetal pregnancies has significantly increased over the past years, most likely due to advancements in assisted reproductive technologies such as in vitro fertilization and induction of ovulation [5,10]. As stated in the introduction the highest incidence of multifetal pregnancies has been found in low and middle-income countries particularly in Sub-

Saharan Africa [4]. This implies an increased risk for women and children because of higher rates of obstetrical complications and lower access to adequate management skills in these countries [11].

A better understanding of the relationship between multifetal pregnancies and the immediate neonatal outcome in our setting is imperative due to the distinct anatomical and physiological characteristics of multifetal gestations as well as the difficulties faced by healthcare workers in managing these pregnancies.

We therefore proposed to carry out this study to evaluate the immediate neonatal outcome following multifetal pregnancies in two hospitals in Yaoundé.

1.3 RESEARCH QUESTION

What is the immediate neonatal outcome following multifetal pregnancies at the Yaoundé Gynaecology, Obstetrics and Paediatrics Hospital and in the Yaoundé Central Hospital?

1.4 RESEARCH HYPOTHESIS

Multifetal pregnancies are most likely to be associated with a poorer neonatal outcome compared to singleton pregnancies.

1.5 OBJECTIVES

1.5.1 Main Objective

The main objective was to evaluate the immediate neonatal outcome following multiple gestations in 2 hospitals in Yaoundé.

1.5.2 Specific Objectives

Our specific objectives were to:

1. Describe the sociodemographic and obstetrical profiles of women with multifetal pregnancies who gave birth during the study period.
2. Describe the clinical profiles of neonates born following multifetal pregnancies.
3. Determine the immediate neonatal outcome associated with multifetal pregnancies.
4. Compare the immediate neonatal outcome of multifetal pregnancies with those of singleton pregnancies.

1.6 DEFINITION OF OPERATIONAL TERMS

- Antenatal care (ANC): It can be defined as the care provided by skilled health-care professionals to pregnant women and adolescent girls in order to ensure the best health conditions for both mother and baby during pregnancy [12].
- Assisted reproductive technology: These are techniques that involve manipulation of oocytes outside the body and other medical procedures used primarily to address infertility. [13].
- In vitro Fertilization (IVF): It is medical procedure whereby an oocyte is fertilized by sperm in a petri dish or elsewhere outside the body [13].
- Singleton birth: It refers to the birth of only one child during a single delivery with a gestation of 20 weeks or more [14].
- Preterm birth: It is defined by WHO as all live births before 37 completed weeks of gestation [15].

LITERATURE REVIEW

2 LITERATURE REVIEW

2.1 INTRODUCTION

The incidence of multifetal pregnancies has increased dramatically, and this is mainly due to assisted reproductive techniques such as in vitro fertilization and ovulation induction drugs [16,17].

Multifetal pregnancies may result from two or more fertilization events, from a single fertilization followed by a splitting of the zygote, or both.

Multifetal gestations remain problematic for both the mother and her foetuses as it accounts for about 15% of all infant deaths[18].

A good understanding of the early neonatal outcomes following multiple gestations is warranted by health care providers in order to propose preventive measures for better outcomes.

2.1.1 Definition

According to the American College of Obstetricians and Gynaecologists, a multifetal pregnancy is defined as a pregnancy with more than one fetus [19].

2.1.2 Epidemiology

Births from multifetal pregnancies account for 4-5% of all births [20]. In the United States there was a reported twin birth rate of 31.2 per 1000 live births [1,3]. Higher rates are found in low and middle-income countries particularly in Sub-Saharan Africa with an average twinning rate of 20 per 1000 births.

In Cameroon, studies have been done to evaluate the prevalence of multiple pregnancies, one of which revealed a prevalence 2.8% in Bamenda, in 2022.

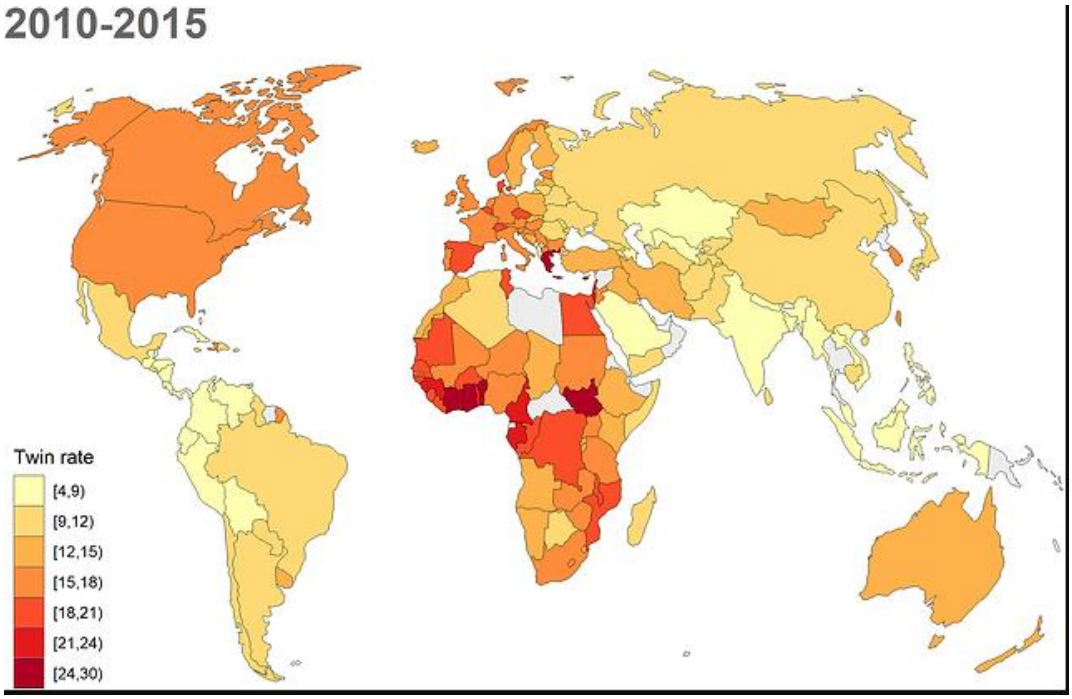

Figure 1: Twinning rates per country in 2015.

Moving from the yellow to brown areas, the twinning rate increases in the countries. We note the highest incidence in Ivory Coast, Ghana and South Sudan [21].

2.2 RECALL

2.2.1 Anatomy

2.2.1.1 The uterus

The nongravid uterus is situated in the pelvis between the bladder anteriorly and the rectum posteriorly. The uterus is pear shaped and consists of two major but unequal parts. The lower portion of this peritoneum forms the anterior boundary of the rectouterine cul-de-sac, or pouch of Douglas. Only the upper portion of the anterior wall of the uterus is so covered. The peritoneum in this area reflects forward onto the bladder dome to create the vesicouterine pouch. The lower portion of the anterior uterine wall is united to the posterior wall of the bladder by a well-defined loose connective tissue layer—the vesicouterine space. There is an upper triangular portion—the body or corpus, and a lower, cylindrical portion—the cervix, which projects into the vagina. The isthmus is the union site of these two. It is of special obstetrical significance because it forms the lower uterine segment during pregnancy [18]. The nulligravid uterus measures 7 to 8 cm in length and 4-5cm in width but these values are higher in multiparous women. The uterus averages 30-40g and typically weighs more in

parous women. In nulligravidae, the fundus and cervix are approximately equal in length, but in multiparas, the cervix is only a little more than a third of the total length [22].

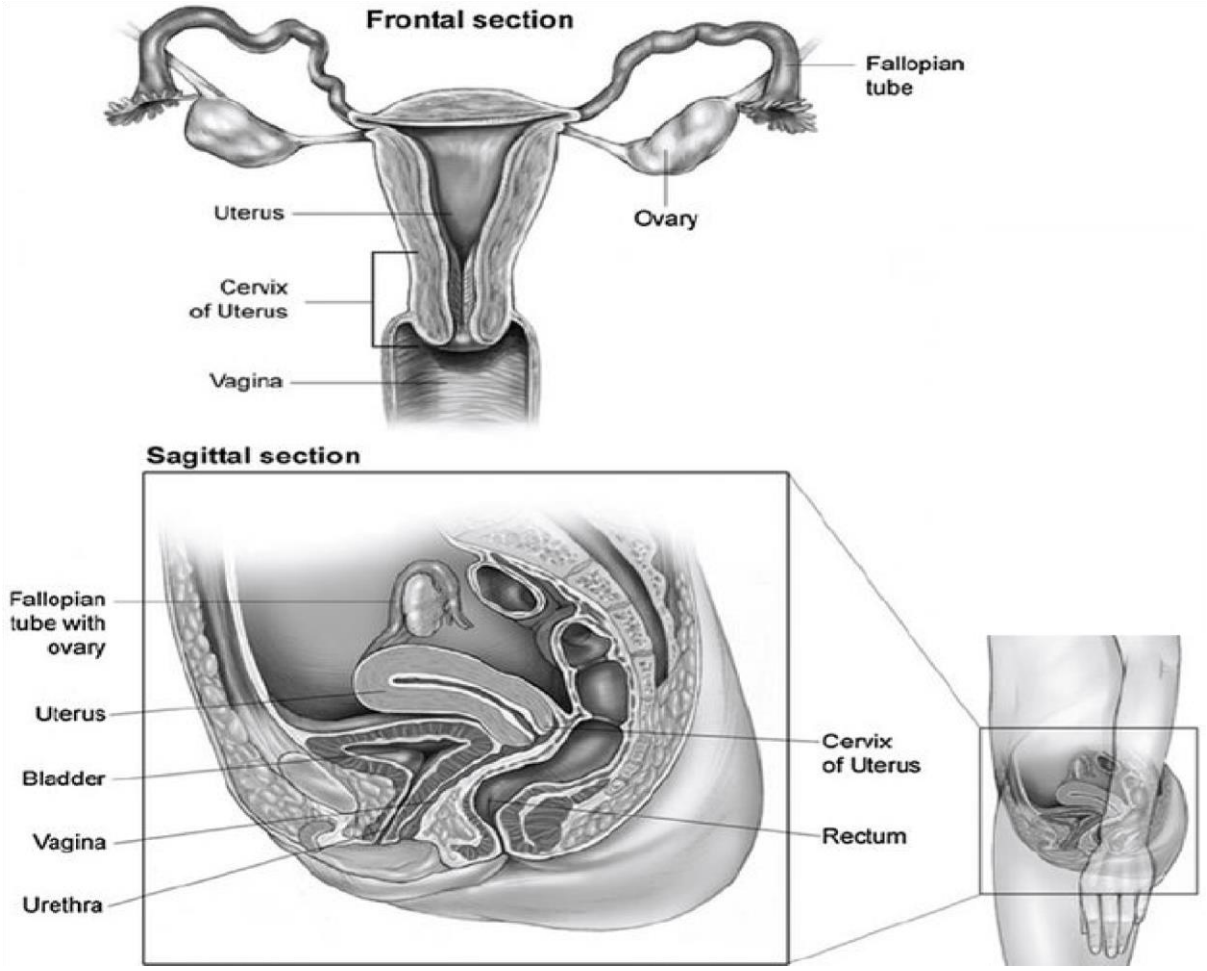

Figure 2: Anatomy and location of the uterus [18].

Pregnancy stimulates remarkable uterine growth owing to muscle hypertrophy. The uterine fundus, a previously flattened convexity between tubal insertions, now becomes dome shaped. Moreover, the round ligaments appear to insert at the junction of the middle and upper thirds of the organ. The fallopian tubes elongate, but the ovaries appear unchanged.

The wall of the uterus is very thick and consists of 3 layers: serous, muscular, and mucous. The serous layer (perimetrium) is simply the peritoneal covering. It is thin and firmly adherent over the fundus and most of the body, and then thickens posteriorly and becomes separated from the muscle by the parametrium. The muscular layer (myometrium) is extremely thick at about 1.5–

2.5 cm and continuous with that of the tubes and vagina. It also extends into the ovarian and round ligaments, into the cardinal ligaments at the cervix, and minimally into the uterosacral ligaments. Two principal layers of the muscular coat can be distinguished: (1) the outer layer, which is weaker and composed of longitudinal fibers; and (2) a stronger inner layer, the fibers of which are interlaced and run in various directions, having intermingled within them large venous plexuses. The muscle layer hypertrophies with the internal os to form a sphincter. The mucous layer (endometrium) is soft and spongy, composed of tissue resembling embryonic connective tissue. The surface consists of a single layer of ciliated columnar epithelium. The tissue is rather delicate and friable and contains many tubular glands that open into the cavity of the uterus [22].

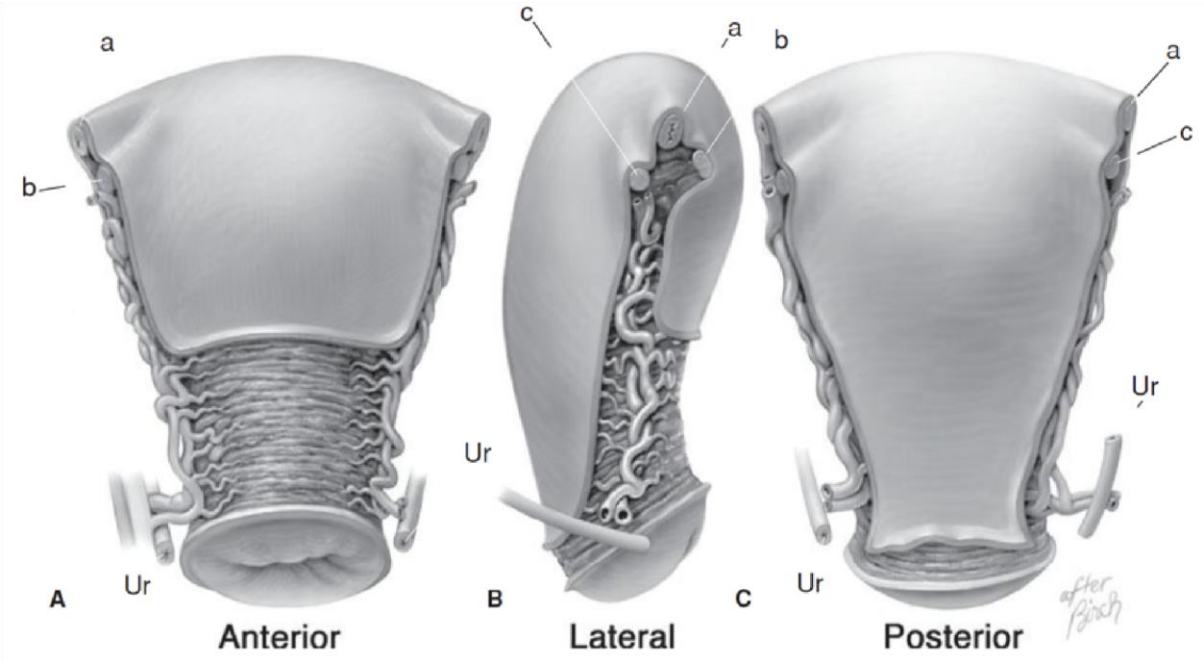

Figure 3: Overview of the uterus.

A=anterior, B=right lateral, C=posterior views. a=fallopian tube, b=round ligament, c=uteroovarian ligament, Ur=ureter [18].

2.2.2 Reproductive Physiology

2.2.2.1 Physiology of the menstrual cycle

The menstrual cycle is a coordinated cyclical change that occurs under hormonal influences resulting in anatomic and physiological changes to the ovary and uterus. It occurs as a result of the joint action of the hypothalamus, pituitary gland , ovaries and the endometrium [23].

These changes enable normal pregnancy or shedding during menstruation. The average age of menarche and menopause is 12yrs old and 51 years respectively [24].

The menstrual cycle can be divided into 03 different phases;

- **The follicular phase**: the release of GnRh from the hypothalamus triggers the release of follicle stimulating hormone from the anterior pituitary gland. FSH promotes ovarian follicles to grow to develop causing the dominant follicle containing oocyte to grow. Follicular granulosa cells produce estrogen which in turn promotes endometrial proliferation. The rise in the levels of estrogen results in a negative feedback mechanism on the hypothalamus-pituitary axis through follicular inhibin and stops further FSH production.

- **The ovulatory phase:** Increasing follicular estrogen causes an alteration in the pituitary GnRH pulsatility resulting in production of LH and later ovulation.

- **The luteal phase:** It starts from the end of ovulation to the first day of the menstrual flow [25]. The follicle degenerates after release of oocyte to become the corpus luteum which produces estrogen and progesterone (from the theca cells) these hormones act on the endometrium to induce secretory changes such a thickening of the endometrial lining and increase vascularity. After 14 days, the corpus luteum undergoes involution to produce the corpus albicans. If implantation occurs, beta HCG allows the continued production of progesterone by preservation of the corpus luteum. In the absence of pregnancy, the corpus luteum degenerates leading to a rapid fall in progesterone and estrogen, initiating menstruation.

❖ **Menstruation**

The rapid drop in progesterone levels result in shedding of the unused endometrium. This process is enabled by the release of inflammatory mediators such as prostaglandins, interleukin, TNF leading to vasospasm in the spiral arteries, hypoxia and endometrial devitalization leading to the loss of the endometrial layer and bleeding. At the end of menstruation, all steroid hormones would return to basal levels, restarting the negative feedback mechanism and GnRH FSH production will begin the new cycle.

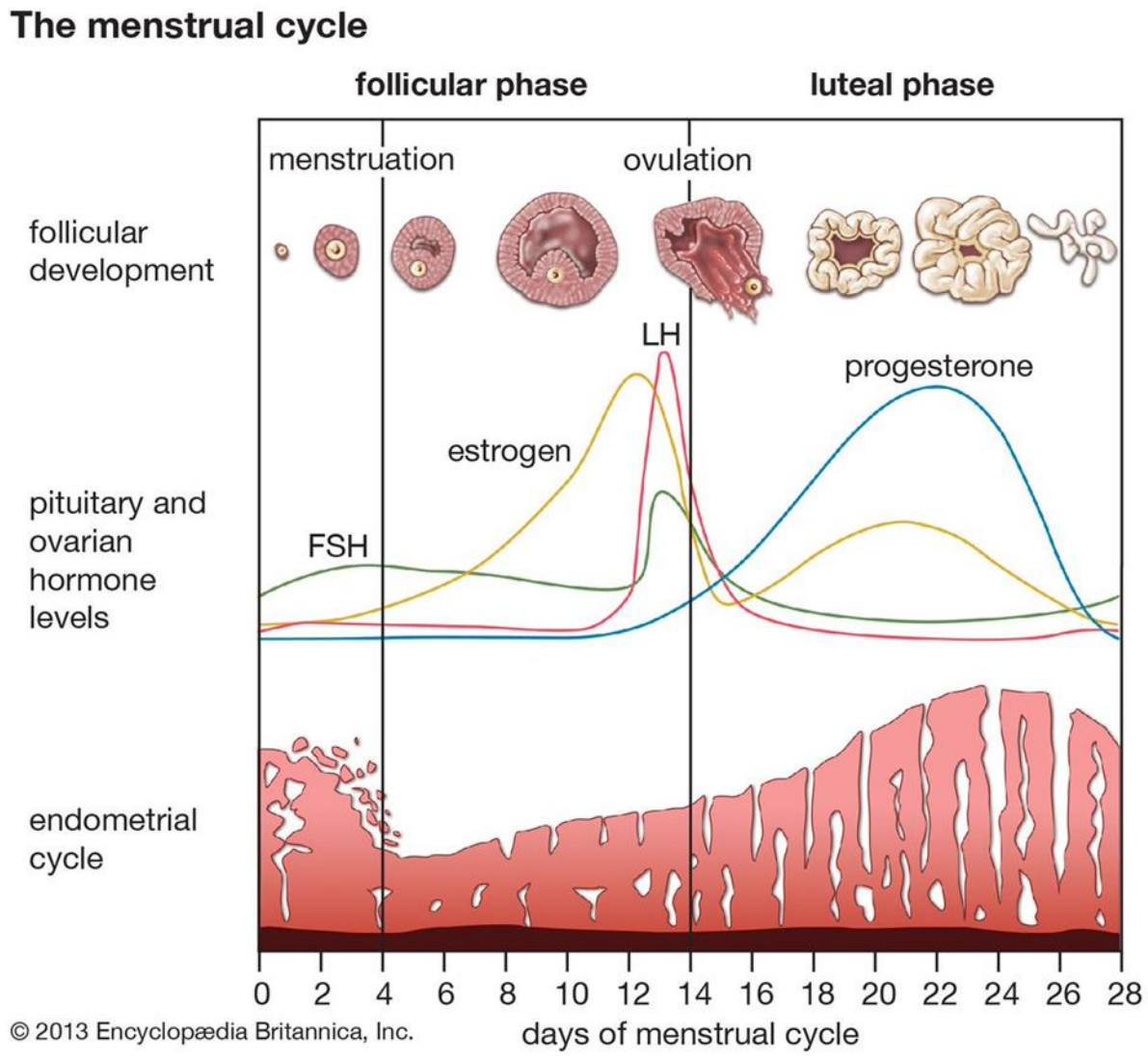

Figure 4: The menstrual cycle [26].

2.2.2.2 Fertilization

This is the fusion of male and female gamete, usually occurring at the ampulla of the fallopian tube resulting in the formation of the ovum which later travels to the uterus for implantation.

If the oocyte is not fertilized here, it slowly passes to the uterus, where it becomes degenerated and is absorbed [27].

During ovulation, the secondary oocyte is released from the ovary into the Fallopian tube. Transport through the tube is accomplished by the directional movement of cilia and tubal peristalsis.

For fertilization to occur successfully the spermatozoa need to be present in the Fallopian tube at the time of arrival of the oocyte, this usually takes place 2 days preceding or on the day of ovulation.

The process of fertilization involves at the molecular level, the passage of spermatozoa between follicular cells, through the zona pellucida into the oocyte cytoplasm. The fusion 02 nuclei and intermingling of maternal and paternal chromosomes leads to the formation of the zygote.

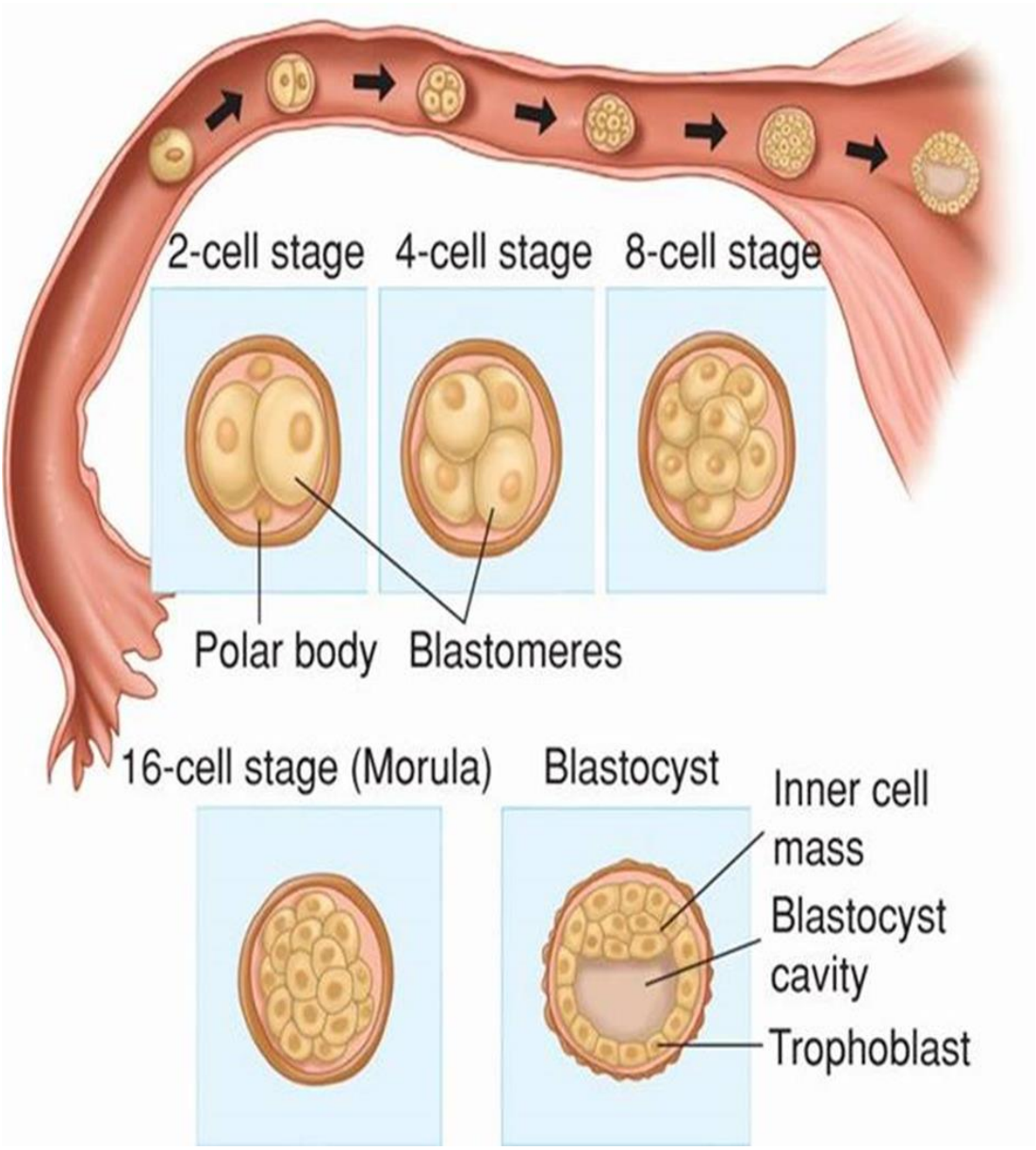

Figure 5: Zygote cleavage and blastocyst formation.

The morula period begins at the 12- to 16-cell stage and ends when the blastocyst forms, which occurs when there are 50 to 60 blastomeres present. The polar bodies, shown in the 2-cell stage, are small nonfunctional cells that degenerate [18].

2.2.2.3 Normal pregnancy

Pregnancy or gestation, is the physiologic process of a developing fetus within the maternal body. For obstetric purposes, the gestational age or menstrual age is the time elapsed since the first day of the last normal menstrual period (LNMP), which actually precedes the time of oocyte fertilization. The gestational age is expressed in completed

weeks. The start of the gestation (based on the LNMP) is usually 2 weeks before ovulation, assuming a 28-day regular menstrual cycle. The developmental or fetal age is the age of the conception calculated from the time of implantation, which is 4 to 6 days after ovulation is completed. The menstrual gestational age of pregnancy is calculated at 280 days or 40 completed weeks. The estimated due date (EDD) may be estimated by adding 7 days to the first day of the last menstrual period and subtracting 3 months plus 1 year (Naegele's rule) [22].

Diagnosis of pregnancy is made on the basis of amenorrhea and a positive pregnancy test, added to these, are a multitude of signs and symptoms which further suggest the onset of pregnancy. Some of these signs and symptoms are;

- Amenorrhea; cessation of menses caused by hormones produced by the corpus luteum.
- Nausea and vomiting; these begin as early as the 2nd week of gestation and usually resolves between the 13th and 16th week of gestation. Hyperemesis gravidarum is an extreme form of nausea and vomiting and is characterized by dehydration, weight loss (up to 5%), and ketonuria. This can sometimes lead to the loss of pregnancy.
- Breast changes like breast pain (mastodynia), breast engorgement and secretion of colostrum.
- Fetal movement; the initial perception of fetal movements occurs around the 18-20th week of gestation in primiparous women and as early as 14 weeks'gestation in multiparous women. This sign will be one of the most important in our study.
- Other changes include abdominal enlargement, Braxton Hick's contractions, linea nigra, and striae gravidarum.

Diagnostic methods include;

1. Pregnancy test; Sensitive, early pregnancy tests measure changes in the level of human chorionic gonadotropin (hCG). The β submit of hCG is produced by the syncytiotrophoblast 8 days after fertilization and may be detected in the maternal serum 8-11 days after conception or as early as 21-22 days after the LNMP. β-hCG levels peak at 10-12 weeks' gestation and decrease afterward. Generally, serum and urine levels return to normal (<5mIU/mL), 21–24 days after delivery or after a fetal loss [22].

2. Imaging studies; Ultrasound is one of the most useful technical aids in diagnosing and monitoring pregnancy. Cardiac activity is discernible at 5-6 weeks via transvaginal ultrasound. At the end of the embryonic period (10 weeks by LNMP), the embryo has a human appearance. The gestational age can be determined by the crown rump length between 6 and 13 weeks' gestation, with a margin of error of approximately 8% or 3–5 days [22].
3. Fetal Heart Tones; They are detectable by handheld Doppler (after 10 weeks' gestation) or by fetoscope (after 18–20 weeks' gestation). The normal heart rate is 110–160 beats per minute [22].
4. Uterine size/fetal palpation; Uterine size can be used to diagnose pregnancy secondary to uterine enlargement. Later in pregnancy, the fetus can be palpated through the maternal abdominal wall (after 22 weeks), and the position can be determined by Leopold's manoeuvres [22].

2.2.2.4 Antenatal Care

According to the WHO, antenatal care (ANC) can be defined as the care provided by skilled healthcare professionals to pregnant women and adolescent girls in order to ensure the best health conditions for both mother and baby during pregnancy. The components of ANC include: risk identification; prevention and management of pregnancy-related or concurrent diseases; and health education and health promotion. ANC reduces maternal and perinatal morbidity and mortality both directly, through detection and treatment of pregnancy-related complications, and indirectly, through the identification of women and girls at increased risk of developing complications during labour and delivery, thus ensuring referral to an appropriate level of care REFERENCE WHO .

The figure below shows how often ANC visits should be done and what should be done at each visit;

First Visit	11–13 Weeks	16–20 Weeks	26–28 Weeks
1. History and physical (H&P) 2. Labs: ▪ Hct/Hgb ▪ Rh factor ▪ Blood type ▪ Antibody screen ▪ Pap smear ▪ *Gonorrhea* and *Chlamydia* cultures ▪ Urine analysis (protein, glucose, ketones) ▪ Urine culture ▪ Infection screen: Rubella, syphilis, hepatitis B, human immunodeficiency virus (HIV), tuberculosis (TB) ▪ Cystic fibrosis screen ▪ Urine drug screen ▪ Hemoglobin electrophoresis	1. H&P 2. Fetal exam: ▪ Fetal heart tones 3. Urine dip: Protein, glucose, leukocytes 4. First-trimester screen	1. H&P 2. Fetal exam: ▪ Fetal heart ▪ Fundal height 3. Urine dip: Protein, glucose, leukocytes 4. Fetal ultrasound: Anatomy, dating 5. Quad screen 6. Genetic amniocentesis (if indicated)	1. H&P 2. Fetal exam: ▪ Fetal heart ▪ Fundal height 3. Labs: ▪ Complete blood count ▪ Ab screen ▪ *Gonorrhea* and *Chlamydia* cultures (optional) ▪ Diabetes screen ▪ Urine dip: Protein, glucose, leukocytes ▪ Syphilis screen (optional) 4. Give anti D immunoglobulin if indicated (28 weeks)

Week 32	Week 36	Week 38	Week 39	Week 40
1. H&P 2. Fetal exam: ▪ Fetal heart ▪ Fundal height 3. Urine dip: protein, glucose, leukocytes	1. H&P 2. Fetal exam: ▪ Fetal heart ▪ Fundal height ▪ Fetal presentation 3. Urine dip: Protein, glucose, leukocytes 4. Group B strep culture 5. HIV—required in some states	1. H&P 2. Fetal exam: ▪ Fetal heart ▪ Fundal height ▪ Fetal presentation 3. Urine dip: Protein, glucose, leukocytes 4. Cervical exam (frequency is controversial)	1. H&P 2. Fetal exam: ▪ Fetal heart ▪ Fundal height ▪ Fetal presentation 3. Urine dip: Protein, glucose, leukocytes	1. H&P 2. Fetal exam: ▪ Fetal heart ▪ Fundal height ▪ Fetal presentation 3. Urine dip: Protein, glucose, leukocytes

Figure 6: Content and frequency of antenatal consultations [28].

2.3 AT-RISK PREGNANCY

At-risk pregnancy can be referred to as one in which the mother, fetus or newborn is or may possibly be at increased risk of morbidity or mortality before, during or after delivery. The presence of the following can increase risk during pregnancy:

- Hyperemesis gravidarum
- Hemorrhagic disorders
- Hypertensive disorders in pregnancy

- Multifetal pregnancies
- Infections
- Gestational diabetes
- Fetal growth disorders
- Intrauterine fetal deaths
- Premature rupture of membranes
- Preterm labor
- Etc

In this study, we will focus on multifetal pregnancies.

2.3.1 Multifetal pregnancy

2.3.1.1 Mechanisms of multifetal pregnancies

Multifetal pregnancies are often described by zygosity, amnionicity, and chorionicity, which are the number of zygotes, amnions, and chorions, respectively. Twin fetuses most often result from fertilization of two separate ova, which yields dizygotic or fraternal twins. Less often, twins arise from a single fertilized ovum that then divides to create monozygotic or identical twins [18].

2.3.1.1.1 Monozygotic

The rate of monozygotic twinning is 1 in 250 pregnancies, and 30% of all twins are monozygotic. Monozygotic twins are the result of cleavage of a fertilized single ovum by a single sperm. The process remains uninfluenced by race, age, and parity, but is affected by infertility treatment interventions thought to occur due to injury to the zona pellucida that influences splitting. Timing of division of the embryo dictates placentation.

- **Dichorionic Diamniotic** : If the zygote divides within 72 hours of fertilization prior to the morula phase and trophoblast differentiation, a dichorionic diamniotic twin pregnancy occurs with separate or fused placentas, 2 chorions, and 2 amnions. This accounts for one-third of monozygotic twinning. Dichorionic gestations have the lowest rate of overall complications [22].
- **Monochorionic Diamniotic**: Monochorionic diamniotic pregnancy results from division on day 4-8, after differentiation of the trophoblast has occurred but prior to the formation of the amnion. A single placenta is found with a common chorion and 2 amnions. This accounts for two-thirds of monozygotic twinning. Monochorionic pregnancies have an increased risk of adverse outcomes including fetal structural

malformations, intrauterine growth restriction, and spontaneous premature birth. They are also associated with an increased risk of twin-twin transfusion syndrome.

- **Monochorionic Monoamniotic**: Monoamniotic twins are among the rarest form of twins with an incidence of 1 in 10,000 pregnancies. This occurs with division after differentiation of the amnion on day 8-13 after fertilization. There is a single placenta, 1 chorion, and I amnion. Congenital anomaly rates are as high as 25%, and fetal weights are most often discordant. Perinatal mortality rates as high as 80% have been recorded, primarily due to cord entanglement due to the absence of a dividing membrane between the fetuses.
- **Conjoined Twins**: Conjoined twins may occur due to incomplete splitting of an embryo or late splitting on day 13 or beyond; incidence is 1 in 50,000-100,000 births. Conjoined twins are described by site of union: thoracopagus (chest), omphalopagus (abdominal wall), craniopagus (head), and pyopagus (sacrum) [22].

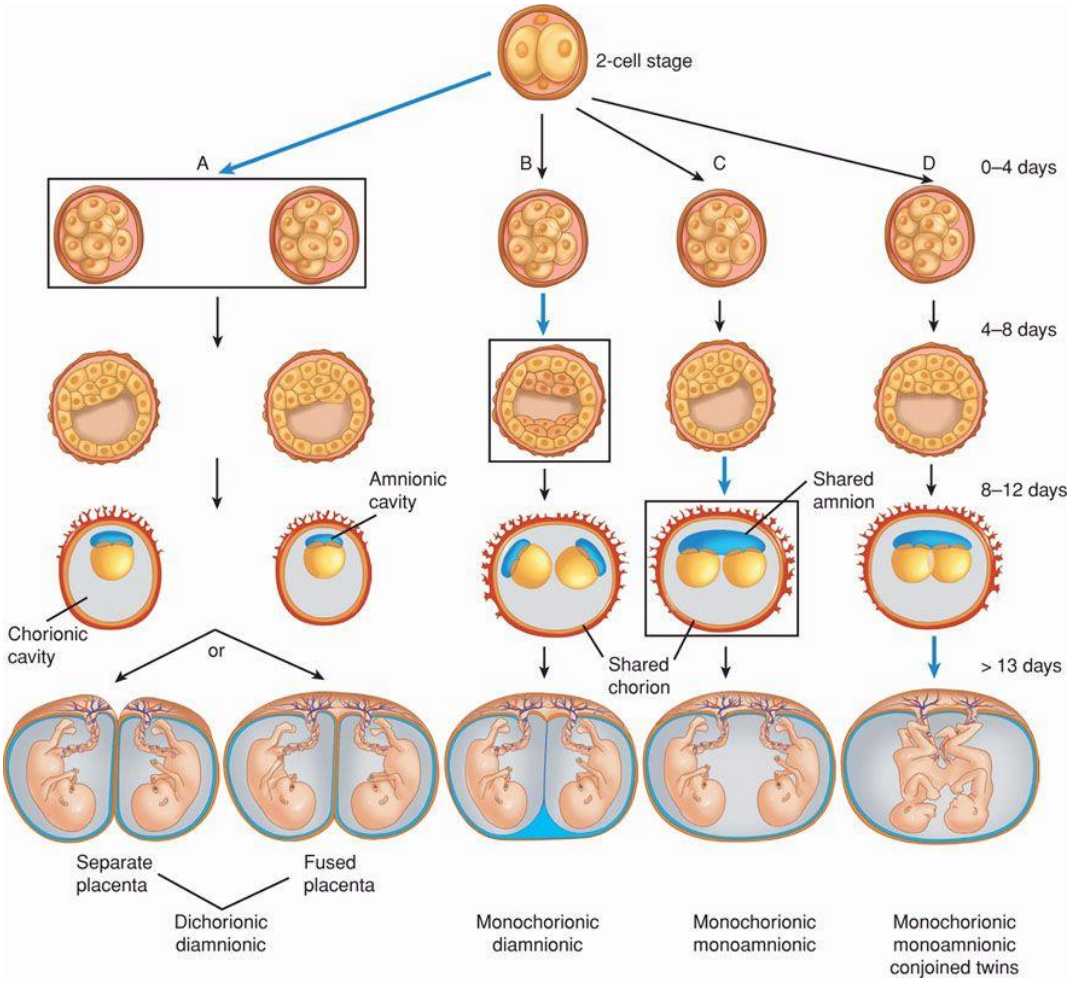

Figure 7: Mechanism of monozygotic twinning.

Black boxing and blue arrows in columns A, B, and C indicate timing of division. **A.** At 0 to 4 days postfertilization, an early conceptus may divide into two. Division at this early stage creates two chorions and two amnions (dichorionic, diamnionic). Placentas may be separate or fused. **B.** Division between 4 and 8 days leads to formation of a blastocyst with two separate embryoblasts (inner cell masses). Each embryoblast will form its own amnion within a shared chorion (monochorionic, diamnionic). **C.** Between 8 and 12 days, the amnion and amnionic cavity form above the germinal disc. Embryonic division leads to two embryos with a shared amnion and shared chorion (monochorionic, monoamnionic). **D.** Differing theories explain conjoined twin development. One describes an incomplete splitting of one embryo into two. The other describes fusion of a portion of one embryo from a monozygotic pair onto the other [18].

2.3.1.1.2 Dizygotic

Although rates vary globally, in the United States, dizygotic twinning occurs in 1 in 80 births. A traditional formula approximates triplets to occur in 1 in 6400 births and quadruplets to occur in 1 in 512,000 births. Overall, 70% of all twins are dizygotic. Dizygotic twins occur when 2 separate ova are fertilized by 2 separate sperm.

- **Dichorionic Diamniotic:** As each pregnancy will have its own placenta, every dizygotic pair will be dichorionic and diamniotic. Incidence is affected by age, race, heredity, nutrition, parity, and fertility therapies. Superfecundation refers to fertilization of 2 ova during separate episodes of coitus, not necessarily from sperm of the same individual [22].

2.3.1.1.3 Superfecundation and superfetation

Superfecundation is fertilization of two ova within the same menstrual cycle but not at the same coitus nor necessarily by sperm from the same male. The latter leads to heteropaternity. This is an extremely rare phenomenon with a reported frequency of 2.4% heteropaternal superfecundation among dizygotic twins whose parents were involved in paternity disputes [29].

In superfetation, an interval as long as or longer than a menstrual cycle intervenes between fertilizations. Superfetation is not known to occur spontaneously and is likely due to ART. It is a rare event that involves getting pregnant a second time while already pregnant [30]. Pseudo-superfetation often results from markedly unequal growth of twins with the same gestational age.

2.3.1.2 Risk Factors

1. **Dizygotic**:
    - Race and ethnicity greatly influence twinning rates. Multiple gestations occur most commonly among African-Americans and least frequently among Asians, with an intermediate occurrence among whites. One theory relates to varying levels of follicle-stimulating hormone (FSH) across peoples. Maternal heredity of twinning increased rates up to 1 in 60 births.
    - Maternal age is an independent risk in twinning. Women greater than 30 have a greater chance of multiple conception [31]. Multifetal gestations naturally occur in 16.3 of 1000 births in women < 20 years old, but 71 of 1000 births in women> 40 years old. The peak age is 37 years, when FSH levels reach maximum levels. Greater parity is an independent risk factor for twinning.
    - Increased gonadotropin levels, namely FSH, are related to an increase in twinning. This occurs as a rebound effect of increased release of pituitary gonadotropin after the discontinuation of long-term oral-hormonal contraceptives in the first spontaneous cycle.
    - Ovulation induction increases the chances of multifetal gestations due to the recruitment of multiple follicles. The estrogen analogue clomiphene citrate increases the incidence of dizygotic gestations to 5-10%. The ART of in vitro fertilization (IVF) was responsible for a massive increase in multifetal gestation rates directly related to the number of embryos transferred during each cycle. Rates have decreased with a concurrent decrease in the number of transferred embryos. In 2010, 26% of ART gestations were twin pregnancies, and 1.3% were of a higher order.
2. **Monozygotic**:
    - Monozygotic twinning rates are not influenced by factors such as race, age and parity. This type of twinning is affected by ART (Assisted Reproductive Tecnologies) including IVF (In Vitro Fertilization) and intra-cytoplasmic sperm injection due to disruption of the pellucida.

2.3.1.3 Diagnosis of multifetal pregnancies

2.3.1.3.1 Clinical Evaluation

Women carrying multiple gestations may be initially asymptomatic or may have normal signs and symptoms of pregnancy (eg, breast tenderness, fatigue, nausea, vomiting)[32]. Multiple gestations may be suspected in the setting of hyperemesis gravidarum or in a patient who has undergone assisted reproductive technology. A complete history, including a family history, should be taken in every woman suspected to have multiples. Early diagnosis can help with management of the associated risks posed by twins. Accurate fundal height measurement can be an initial tool. With multiples, uterine size is typically larger during the second trimester than that expected for a singleton.

Palpation of fetal parts to diagnose twins before the third trimester is difficult. Even then, obesity or hydramnios can hinder assessment. Palpating two fetal heads strongly supports the diagnosis. Moreover, a hand-held Doppler ultrasonic unit may isolate two fetal heartbeats if their rates are clearly distinct from each other and from the mother. Overall, however, clinical criteria alone to diagnose multifetal gestations is unreliable. In the Routine Antenatal Diagnostic Imaging with Ultrasound (RADIUS) trial, for 37 percent of women who did not have a screening ultrasound examination, their twin pregnancy was not diagnosed until 26 weeks' gestation. In 13 percent of unscanned women, their multifetal gestation was identified only during their admission for delivery [18]

2.3.1.3.2 Imaging Studies

Sonographic examination should detect practically all sets of twins. Further, it should aim to determine fetal number, estimated gestational age, chorionicity, and amnionicity. Importantly, the risk for many twin-specific complications varies in relation to these

Table I : Incidence of some complications related to twin characteristics [18].

Type of twinning	Rates of Twin-Specific complications in percent				
	Twins	Fetal-growth Restriction	Preterm Delivery	Placental Vascular Anastomosis	Perinatal Mortality
Dizygotic	80	25	40	0	10-12
Monozygotic	20	40	50	-	15-18
Diamniotic/dichorionic	6-7	30	40	0	18-20
Diamniotic/monochorionic	13-14	50	60	100	30-40
Monoamniotic/monochorionic	<1	40	60-70	80-90	58-60
Conjoined	0.002-0.008	-	70-80	100	70-90

With sonography, separate gestational sacs, if present, can be identified early in twin pregnancy

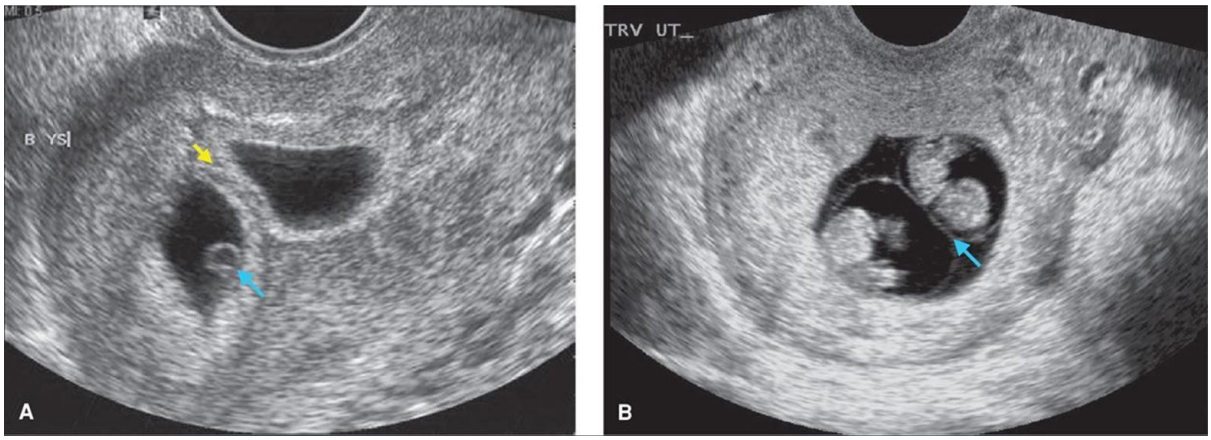

Figure 8: Sonograms of first-trimester twins.

A. Dichorionic diamnionic twin pregnancy at 6 weeks' gestation. Note the thick dividing chorion (yellow arrow). One of the yolk sacs is indicated (blue arrow). B. Monochorionic diamnionic twin pregnancy at 8 weeks' gestation. Note the thin amnion encircling each embryo, resulting in a thin dividing membrane (blue arrow) [18].

Subsequently, each fetal head should be seen in two perpendicular planes to avoid mistaking a fetal trunk for a second fetal head. Ideally, two fetal heads or two abdomens are seen in the same image plane to avoid scanning the same fetus twice and interpreting it as twins. Higher-order multifetal gestations are more challenging to evaluate. Even in the first trimester, identifying the actual number of fetuses and their position can be diffcult.

Ultrasonography is a vital tool in diagnosis of multiple gestation and chorionicity. Transvaginal approach allows detection as early as 5 weeks. Identification of chorionicity is essential to patient counselling for the remainder of the pregnancy. Counting the number of gestational sacs, yolk sacs, and fetal poles, and measuring the thickness of a dividing membrane are the first steps. Later in pregnancy, precise determination of chorionicity poses more difficulty. Interrogation involves identification of the number of placentas relative to the number of fetuses and attempted visualization of the dividing membrane for 2 versus 4 layers of the fused amnion-chorion and for the thickness of the membrane;

2.3.1.3.2.1 Dichorionic diamniotic

A membrane > 2 mm is generally indicative of dichorionicity. In the latter part of the first trimester, the base of the intertwine membrane should be inspected. It appears as the "twin peak" or "lambda" sign, which is a triangular projection of tissue extending beyond the chorionic placental surface and is indicative of a dichorionic gestation. Two placentas are most commonly noted; however, they may be fused, which may make it difficult to identify 2 separate entities

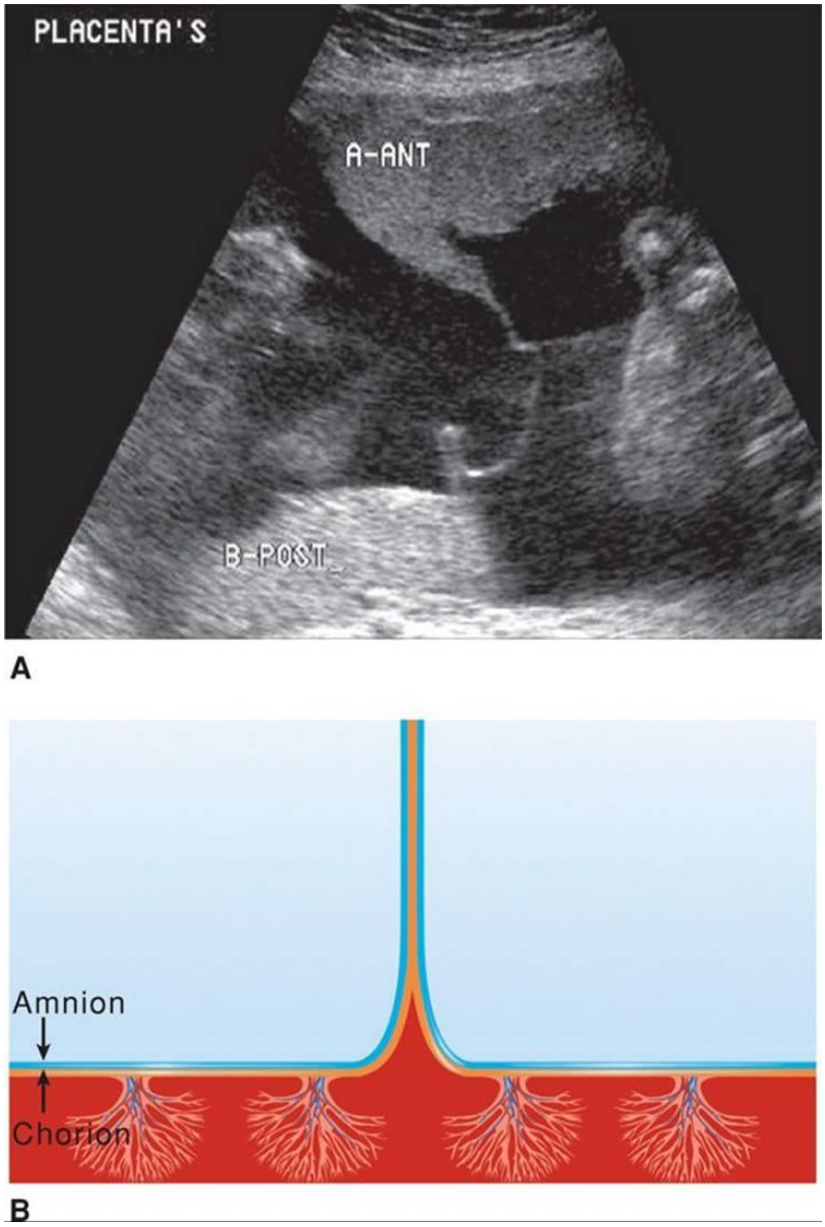

Figure 9:Twin-peak or lambda sign

A. Sonographic image of the “twin-peak” sign, also termed the “lambda sign” in a 24-week gestation. At the top of this sonogram, tissue from the anterior placenta is seen extending

downward between the amnion layers. This sign confirms dichorionic twinning. B. The “twin-peak” sign is seen at the bottom of this schematic diagram. The triangular portion of placenta insinuates between the amniochorion layers [18].

2.3.1.3.2.2 Monochorionic diamniotic

In contrast to dichorionic pregnancies, monochorionic pregnancies will have a right angle "T" sign at the base of the intertwine membrane, without any extension of placenta into the membrane (Figure 17-2). An intertwine membrane will be noted separating the fetuses; however, it will be noted to be very thin and hair-like, measuring < 2 mm. After the first trimester, monochorionic diamniotic pregnancies can be mistaken for monoamniotic pregnancies. A "stuck twin" appearance can occur in monochorionic diamniotic pregnancies where oligohydramnios of 1 twin causes the fetus to be held against the uterine wall. In this situation, it is often difficult to identify the dividing membrane, as it is mutually abutting the stuck twin, and it may give the illusion of a monoamniotic pregnancy. One way to differentiate between a "stuck twin" and a monoamniotic pregnancy is to perform ultrasound with the patient in different positions: supine, on her left side, and on her right side. If there indeed is a "stuck twin," that fetus will remain adherent to the same position on the uterine wall regardless of the maternal position, whereas with monoamniotic pregnancies, both fetuses will shift in accordance with gravity.

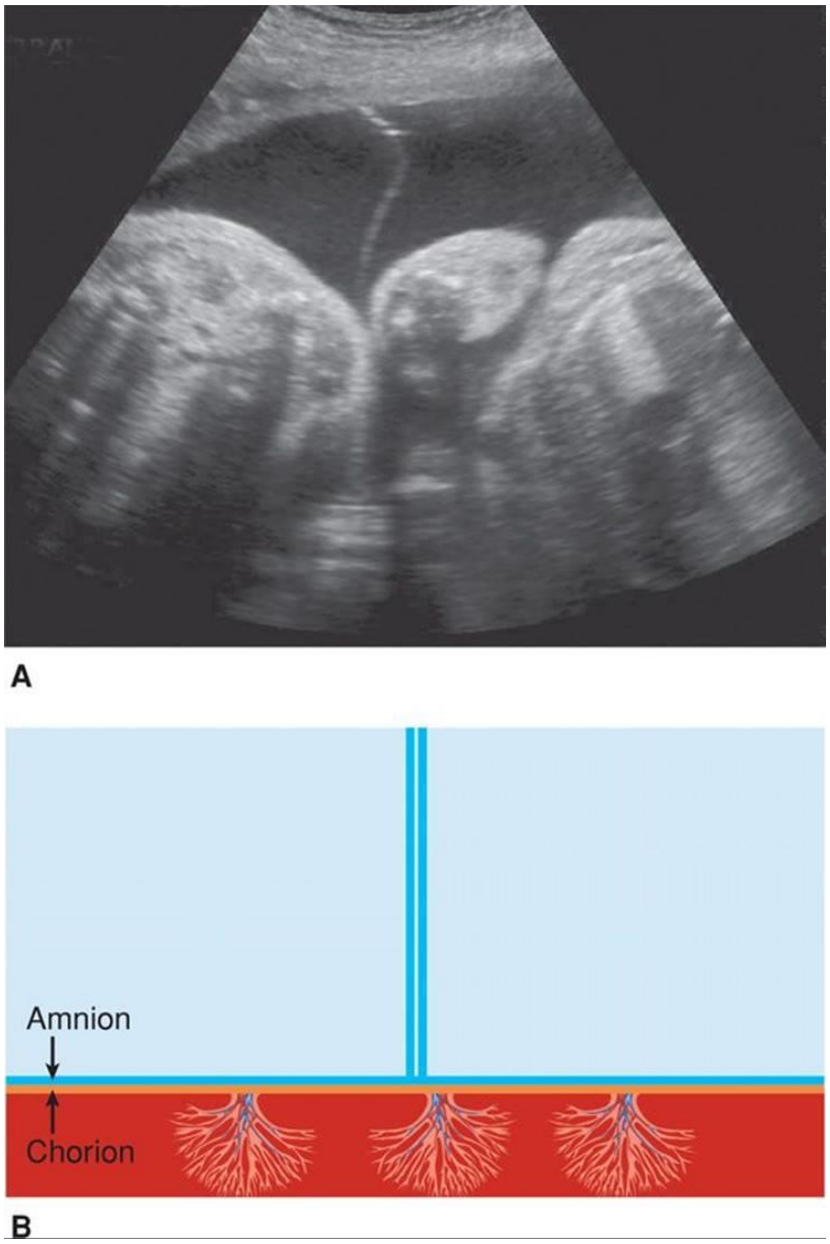

Figure 10: “T” sign in monochorionic diamnionic gestation.

A. Sonographic image of the “T” sign in a monochorionic diamnionic gestation at 30 weeks. At the top of this sonogram, the two apposed amnion layers are seen as the thin line extending downward. B. Schematic diagram of the “T” sign. Twins are separated only by a membrane created by the juxtaposed amnion of each twin. A “T” is formed at the point at which amnions meet the placenta [18].

2.3.1.3.2.3 Monochorionic monoamniotic

In a monoamniotic gestation, there will be no identifiable membrane between fetuses. A single placenta will be identified with multiple origin sites of umbilical cord. It is common to detect

tangling of the cords between the fetuses, often including knotting of the cords, as early as the first trimester.

2.3.1.3.2.4 Conjoined

When 2 separate fetuses are noted in a gestational sac, with a single placenta, and without an intertwine membrane, but with a connection at a particular body site, conjoined twins may be diagnosed. The most common points at which conjoined twins are united include the head, lower abdomen, and sacrum.

2.3.1.3.3 Laboratory Findings

Although no biochemical test reliably identifies multifetal gestation, levels of human chorionic gonadotropin in maternal plasma are higher than those found in singletons. Elevated maternal serum a fetoprotein levels are also commonly seen. Maternal hypochromic microcytic anemia is near universal due to fetal demands for iron that are beyond maternal ability to compensate. There are no known discernible laboratory differences between monozygotic and dizygotic gestations.

2.3.1.3.3.1 Screening in multiple gestations

In twin pregnancies not complicated by neural tube defects, the median maternal serum a fetoprotein level will be 2.5-fold that of the median level for a singleton gestation at 14-20 weeks. A value greater than 4.5 times the median is considered abnormal for twins. A targeted ultrasound should be performed with consideration for amniotic fluid collection for a fetoprotein and acetylcholinesterase measurement.

Routine aneuploidy screening should be offered regardless of maternal age. The mathematical likelihood of trisomy is higher due to presence of multiple fetuses. The age-related risk of Down syndrome is similar for a 33-year-old woman carrying twins and a 35-year-old woman with a singleton pregnancy. Second-trimester serum screening is less sensitive in multifetal gestation due to an average measure in the mother's serum, with a 63% detection rate for trisomy 21 in twins. Nuchal translucency screening with first-trimester serum analytes can detect 75-85% of trisomy 21 cases and 66.7% of trisomy 18 cases in twin pregnancies with minimal added benefit of second-trimester serum analyte screening. Nuchal translucency measurements are similar for a given gestational age regardless of fetal count.

At present, data remain limited on the use of cell-free DNA aneuploidy screening in multifetal pregnancies. Failure rates of the test are higher and detection rates are lower than in singletons.

Results are especially nonreliable with a vanishing twin or empty sac. Therefore, non-invasive prenatal testing is not routinely recommended in multifetal gestations.

Both amniocentesis and chorionic villus sampling may be safely performed in multifetal pregnancies for definitive diagnostic testing within the limits of today's genetic technologies. Both procedures are associated with a 1% risk of pregnancy loss when used in twin gestations. Detailed ultra-sonographic mapping of both fetal and placental location is essential. To avoid sampling error during amniocentesis, indigo carmine may be injected into the sampled sac prior to needle removal. When the subsequent sac is sampled, fluid should be clear. However, there is a 1% risk of sampling error in women who undergo chorionic villus sampling.

2.3.1.3.4 Other diagnostic aids

2.3.1.3.4.1 Placental examination

Careful visual examination of the placenta and membranes alter delivery can establish zygosity and chorionicity in many cases. First, the placenta is gently delivered to preserve the attachment of the amnion and chorion. With one common amnionic sac or with juxtaposed amnions not separated by chorion, the fetuses are monozygotic (see Fig. 48-1). If adjacent amnions are separated by chorion, the fetuses could be either dizygotic or monozygotic, but dizygosity is more common (Fig. 48-5). If the neonates are of the same sex, blood typing of cord blood samples may be helpful. Different genders or blood types reflects dizygosity, although the same gender or blood type in each fetus does not confirm monozygosity. Postnatal zygosity genetic testing is available, and the benefits and ethics have been debated.

Figure 11: Dichorionic diamnionic twin placenta.

The membrane partition that separated twin fetuses is elevated and consists of chorion (c) between two amnions (a) [18].

2.3.1.4 Differential Diagnosis

The following conditions may be considered when a uterus appears large for gestation:

- Multifetal gestation
- Inaccurate dating
- Hydramnios
- Hydatiform mole with or without concurrent fetal gestation
- Abdominal tumors (leiomyoma, adnexal mass)

2.3.1.5 Maternal physiological adaptations

The physiological burdens of pregnancy and likelihood of serious maternal complications are typically greater with multifetal gestations than with singleton ones. In the first trimester and with its higher serum β-hCG levels, multifetal gestations often cause nausea and vomiting. In women carrying more than one fetus, blood volume expansion is greater and averages 50 to 60 percent compared with 40 to 50 percent in those with a singleton. This augmented hypervolemia offsets blood loss with vaginal delivery of twins, which is twice that with a single fetus. Although red cell mass also accrues, it does so proportionately less in twin pregnancies.

Combined with greater iron and folate requirements, this predisposes to anaemia. Women carrying twins also have a typical pattern of blood pressure change. One study assessed serial blood pressures in more than 13,000 singleton and twin pregnancies. As early as 8 weeks' gestation, the diastolic blood pressure in women with twins was lower than that with singleton pregnancies. It generally rose by a greater degree at term. An earlier study demonstrated that this later rise was at least 15 mm Hg in 95 percent of women with twins compared with only 54 percent of women with a singleton. Hypervolemia along with decreased vascular resistance has an impressive effect on cardiac function. In one study of 119 women with twins, cardiac output rose another 20 percent above that in women with a singleton. Similarly, a study of serial maternal echocardiography examinations found a greater elevation in cardiac output in 20 women with uncomplicated twin pregnancies. Both studies found that the augmented cardiac output was predominantly due to greater stroke volume rather than higher heart rate. Vascular resistance was significantly lower in twin gestations throughout pregnancy compared with singleton ones. In a study of 30 uncomplicated twin pregnancies, this same group of investigators identified progressive diastolic dysfunction from the first to third trimester. The dysfunction subsequently normalized after delivery. Uterine growth in a multifetal gestation is substantively greater than in a singleton one. The uterus and its nonfetal contents may achieve a volume of 10 L or more and weigh in excess of 20 pounds. Especially with monozygotic twins, excessive amounts of amniotic fluid may rapidly accumulate. In these circumstances, maternal abdominal viscera and lungs can be appreciably compressed and displaced by the expanding uterus. As a result, the size and weight of the large uterus may preclude more than a sedentary existence for these women. Rarely, maternal renal function can become seriously. Rarely, maternal renal function can become seriously impaired, most likely as the consequence of obstructive uropathy. Hydramnios is a common associate, and therapeutic amniocentesis may provide relief for the mother, may improve obstructive uropathy, and possibly may lower rates of preterm labor or rupture of membranes. Unfortunately, hydramnios often develops remote from term and rapidly reaccumulates.

2.3.1.6 Complications

Multiple gestations are high risk pregnancies which may have many complications. These complications increase with each additional fetus in a multiple pregnancy and include many medical issues that will be discussed below. In addition to these, the incidence of severe nausea and vomiting, cesarean section, or forceps delivery is higher.

2.3.1.6.1 Maternal Complications

All potential maternal complications of pregnancy are more common in multifetal gestation as the maternal systems undergo greater stress with higher maternal-fetal nutritional requirements. Women are more likely to be anemic; have urinary tract infections, velamentous cord insertion, vasa previa, or placenta previa; experience vaginal hemorrhage before, during, and after delivery; undergo cesarean section; and experience postpartum depression. They experience greater rates of hyperemesis gravidarum due to elevated ß-human chorionic gonadotropin. Women are more likely to be diagnosed with gestational diabetes mellitus due to a greater presence of pregnancy-associated hormones such human placental lactogen.

Hypertensive disorders of pregnancy are more common and occur in proportion to the total number of foetuses present [33]. This leads to greater incidence of placental abruption and iatrogenic preterm delivery. Singletons have a 6.5% total rate of hypertensive pregnancies. Preeclampsia occurs more frequently in women with multiples. It is one of the most frequent complications in these pregnancies [34]. Women with twin gestations have a 2.6-fold greater relative risk of developing preeclampsia, which also tends to occur earlier in gestation. Higher order multiples have a propensity toward atypical presentations of preeclampsia. Of note, fetal reduction reduces the risks of hypertensive complications down toward the relative number of living fetuses. Twin pregnancy is also known to be a risk factor for pulmonary embolism due to increased demand from both foetuses [35].

2.3.1.6.2 Fetal Complications

The average gestational age at delivery is 36-37 weeks in twins, 33 weeks in triplets, and 31 weeks in quadruplets.

2.3.1.6.2.1 Prematurity

Perinatal morbidity and mortality rates are significantly higher in multifetal gestation mainly due to preterm delivery and consequences of neonatal prematurity. The gestatioinal age decreases with an increase in the number of foetuses[8]. Preterm premature rupture of membranes (PPROM) occurs more frequently in multifetal gestations: 25% in twin pregnancies, 50% in triplet pregnancies, and 75% in quadruplet pregnancies. Twins have a 6-fold increased rate of preterm delivery, a 5-fold higher rate of stillbirth, and 7-fold increased rate of neonatal death. Intracranial injury including intraventricular hemorrhage,

periventricular leukomalacia, and cerebral palsy is more common in infants born from a multifetal gestation at matched gestational ages in singleton pregnancies [7].

2.3.1.6.2.2 Fetal and New-born Complications

Preterm delivery place increases the risk for severe complications or early death. A baby's lungs, brain, circulatory system, intestinal system, and eyes may be not completely developed. Of the premature babies who die, 50% succumb to respiratory distress syndrome, caused by immaturity of the lungs. Brain damage is responsible for almost 10% of premature new born deaths. Birth defects and stillbirths account for about 30% of the deaths in twins and multiple pregnancies. Neonatal intensive care unit admission is required for one-fourth of twin and three-fourths of triplet deliveries [7].There is a 10-fold increase in the risk of perinatal mortality following multiple gestations than singleton gestations [36].

2.3.1.6.2.3 Twin-twin transfusion syndrome

Twin-twin transfusion syndrome (TTTS) is a complication of mono-chorionic diamniotic gestation. It affects 15% of such pregnancies and occurs most commonly due to arteriovenous anastomoses, which lead to unequal fetal-placental sharing and transfusion between twins. The donor twin is typically affected by hypovolemia and anemia, which may lead to hydrops and oligohydramnios. The recipient twin will have evidence of polyhydramnios, hypervolemia, multiorgan enlargement, and frequently heart failure that may lead to death. Ultrasonography should be used every 2 weeks starting at 16 weeks in monochorionic gestations to screen for the development of TTTS. Laser therapy is available for advanced-stage TTTS (Table 17-1) with improved neurodevelopmental outcomes.

Table II: Quitero staging for twin-twin transfusion syndrome [22].

Stage 1	Monochorionic diamniotic gestation with oilgohydramnios and polyhydramnios
Stage 2	Donor twin with absent bladder
Stage 3	Abnormal Doppler findings
Stage 4	Hydrops fetalis
Stage 5	Death of 1 or both twins

2.3.1.6.2.4 Abnormal fetal growth

Discordant fetal growth occurs when there is a 20% or more difference in the estimated fetal weight as determined by ultrasound between fetuses. When discordance in size occurs but both fetuses remain appropriate for gestational age, they are not at increased risk for morbidity or mortality. In cases of selective growth restriction of a single fetus or of multiple fetuses, however, there is a significantly increased risk of neonatal morbidity and mortality when compared to gestational age-matched singleton controls.

2.3.1.6.2.5 Fetal demise

The spontaneous reduction of a fetus, known as "vanishing twin," may occur in 20-60% of spontaneous twin pregnancies. Rates are higher with increasing maternal age, greater number of gestational sacs, and earlier detection of multifetal gestation via ultrasound. A vanishing twin may affect not only maternal serum analyte results, but also chorionic villus sampling karyotype results.

In the second and third trimesters, the fetal loss rate reaches 5% and 15% in twin and triplet gestations, respectively. The loss of 1 foetus poses a greater risk of demise of the remaining gestations.

- **Dichorionic Diamniotic**: Demise of a single twin in a dichorionic pregnancy is less common than in monochorionic pregnancies. In the event of a twin demise, the surviving co-twin is at minimal risk of subsequent morbidity due to housing in a separate sac and separate placentation. Delivery is not recommended in the event of demise of a co-twin; however, it may be considered in the early term period.
- **Monochorionic Diamniotic**: Monochorionic diamniotic gestations are at increased risk compared to dichorionic gestations. The risk of neurologic morbidity is greatest in the surviving twin of a monochorionic gestation, reaching nearly 20%. Unfortunately, there appears to be no benefit to immediate delivery of the surviving twin once demise has occurred in a co-twin during the late second or third trimester. In the event of co-twin demise, delivery is not routinely recommended prior to 34 weeks due to compounded risks of prematurity.

2.3.1.6.3 Unusual Presentations

2.3.1.6.3.1 Conjoined twins

A rare event, conjoined twins occur as a result of incomplete separation of co-twins during early development. Although most commonly, 30% of conjoined twins are fused at the chest

to lower abdomen regions, or thoraco-omphalopagus, body site fusion may occur at any location. There is a 3:1 female gender preference in conjoined twin pregnancies. Although 50% of conjoined twin pregnancies will culminate with intrauterine fetal demise, a majority of those who survive to birth have anomalies that are not compatible with life. Rare cases of conjoined twins surviving into child and adulthood exist and procedures to separate conjoined twins may be attempted at specialized centres when organs are duplicated and organized to support survival of 2 individuals.

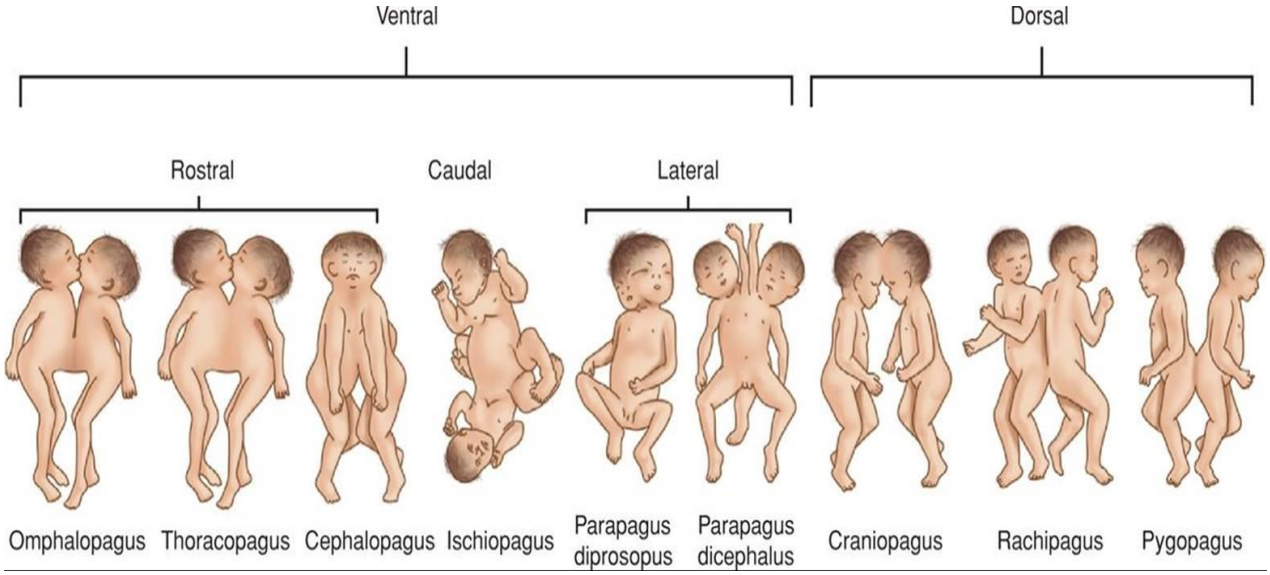

Figure 12: Types of conjoined twins [18].

2.3.1.6.3.2 Twin reversed arterial perfusion (TRAP) sequence

TRAP sequence, also known as acardiac twin pregnancy, occurs in 1% of monochorionic gestations. In this condition, 1 fetus lacks normal heart and head development and is perfused by placental anastomoses from the donor twin. This may occur as part of the TRAP sequence, in which a normal donor twin feeds the recipient twin. The donor, or pump twin, develops high-output cardiac failure resulting in demise in 50% of such cases.

2.3.1.7 Management

2.3.1.7.1 Antepartum Interventions

2.3.1.7.1.1 Fetal reduction

Fetal reduction is a procedure that may be considered in multifetal gestations with clearly separate chorionicity (ie, trichorionic triamniotic pregnancies).

Multifetal pregnancy reduction decreases the risks inherent to multifetal gestations such as hypertensive disorders and spontaneous preterm delivery. A Cochrane review found that

women who reduced a triplet pregnancy to twins observed lower rates of loss, preterm birth, low-birth-wag infants, operative delivery, neonatal death, and maternal complications during the antepartum period. The fetus to be reduced is selected based on fetal health when predetermined by definitive invasive prenatal diagnosis, technical issues such as positioning and accessibility, and chorionicity.

Monochorionic gestations complicate reduction procedures due to potential morbid consequences to the surviving twin. It is recommended that both fetuses of a monochorionic pair be reduced when applicable.

Selective reduction is a specific term that refers to fetal reduction of an abnormal fetus in a multifetal gestation the risks are greater than in multiferal reduction largely duet later gestational age of diagnosis. It can be performed under ultrasound guidance with intracardiac potassium chlonide injection.

2.3.1.7.1.2 Preterm birth prediction and prevention

Serial cervical length assessment. fetal fibronectin screening, and uterine home monitoring have all been considered as methods to reducing spontaneous preterm birth in twins. No interventions have been proven to be effective for screening asymptomatic women with multifetal gestation and are not recommended. Although the positive predictive value of fetal fibronectin testing and a short cervical length is poor, they may be used for the acute management of symptomatic women. Prophylactic cerclage has shown no benefit and has even been shown to be harmful when placed in women with twin gestations and a short cervix; thus, it should be avoided.

Progesterone treatment is not recommended for use with intent to reduce spontaneous preterm birth in asymptomatic women with multifetal gestation. It has even resulted in higher rates of early loss in higher order gestations Although data to recommend progesterone in women with a twin gestation and a short cervical length < 25 mm are insufficient, the use of either 17-hydroxyprogesterone caproate or vaginal progesterone capsules has not been shows to prolong pregnancy.

There is no role for prophylactic tocolysis in mutile gestations. Calcium channel blockers (nifedipine) or nonsteroidal anti-inflammatory drugs (indomethacin) may be used for short-term pregnancy prolongation during corticosteroid administration and to allow transfer to a tertiary care centre. Maternal complication of pulmonary edema is more profound in multifetal pregnancy with use of tocolytics.

Primarily, extracted from benefits seen in singleton pregnancies, it is recommended to administer antenatal corticosteroids (dexamethasone or betamethasone) to women with multifetal gestations between 23 and 34 weeks at risk of delivery within 1 week. A single repeat course may be considered if a woman remains at risk of preterm delivery least 1 week from the completion of the prior course and before 34 weeks of gestation. No data exist to support any added benefit of an additional corticosteroid course in the setting of PPROM.

Administration of magnesium sulphate prior to preterm delivery at < 32 weeks has been shown to decrease the severity and risk of cerebral palsy in surviving infants regardless of fetal number.

2.3.1.7.1.3 Fetal well-being

- **Dichorionic Diamniotic**: Ultrasonography is essential to monitor fetal growth throughout gestation. Scans should be performed every 4-6 weeks in otherwise uncomplicated pregnancies. More frequent monitoring is required for pregnancies complicated by growth restriction.
- **Monochorionic Diamniotic:** Monochorionic placentation requires more frequent ultrasonography in order to monitor closely for development of TTTS. Ultrasound should be performed every 2 weeks to monitor for changes in amniotic fluid index in both sacs and to monitor fetal growth.

Antepartum testing via external electronic fetal monitoring is not routinely recommended in uncomplicated, normally grown pregnancies. This is rare, however, and most women will undergo weekly testing in the late third trimester for gestations complicated by growth restriction or discordance between fetuses. Bed rest is not recommended due to lack of benefit and risk of thrombosis and deconditioning, even during a prolonged admission.

2.3.1.7.2 Intrapartum Interventions

2.3.1.7.2.1 Indicated Timing of Delivery

- **Dichorionic Diamniotic:** Timing of delivery is balanced between risks of prematurity and rising perinatal mortality rates after 38 weeks in dichorionic twin gestations. Therefore, dichorionic diamniotic twin gestations should be delivered at 38 weeks.
- **Monochorionic Diamniotic:** Monochorionic diamniotic gestations should be delivered between 34 and 38 weeks with timing dependent on the given gestation's associated complications or maternal morbidities. For example, a gestation

complicated by TTTS may be considered for delivery at 34 weeks, while a gestation that has 2 normally grown fetuses could be maintained until 38 weeks.

- **Monochorionic Monoamniotic**: Management of monochorionic monoamniotic gestations remains controversial. Most commonly, patients are admitted at 24-28 weeks for daily fetal surveillance , serial growth assessments and delivery between 32-34 weeks via cesarean section.

2.3.1.7.2.2 Mode of delivery

Multifetal gestation is not itself an indication for cesarean delivery. A history of a previous low transverse cesarean delivery is not a contraindication for a twin vaginal delivery. However, fetal malpresentation is 10 times more common in multiple gestations. Fifty percent of twins will both be cephalic at time of birth. In 33% of cases, twin A will present cephalic and twin B will present breech. Both fetuses will be breech in 10% of cases, and just < 10% will be dually transverse [7].

Delivery should be performed in the operating suite due to potential need for emergent cesarean delivery of twin B. Regional anesthesia is recommended, and pediatricians should be in attendance at the birth. Vaginal delivery may be attempted when both twins are cephalic and when twin A is cephalic but twin B is not. Both external cephalic version and internal podalic version of twin B may be considered by experienced providers. There is no definitive recommended time interval between infant deliveries, as long as the in-utero twin shows reassuring testing with fetal monitoring.

When twin A is breech and twin B is cephalic, they are at risk of becoming "locked twins." Their heads become impacted against one another and impacted in the pelvis. This is an obstetrical emergency and may require cesarean delivery of both twins.

2.3.1.8 Prognosis

Maternal and fetal complications are more frequent in multifetal gestations. Although infants of multifetal pregnancies have an increased risk of neurologic sequelae, the most important prognostic factor for developmental outcome is gestational age at delivery. Although women are at increased risk of hypertensive crisis, uterine atony, hemorrhage, and hysterectomy, the maternal mortality rate for women with a multifetal gestation is only slightly above that for singleton gestations in the United States.

2.4 REVIEW OF STUDIES

2.4.1 In the World

Title and Place of study	Authors and year of study	Setting	Results
Maternal and neonatal outcomes in multiple pregnancy: A multicentre study in the Beijing population, China.	Na Sua, Wei-Wei Zhub, Yu-Mei Weia, Chen Wanga, Hui Fenga, Li Lina,Hui-Xia Yang 2015.	Data concerning maternal and neonatal adverse outcomes in multiple and singleton pregnancies were collected from 15 hospitals in Beijing by a systemic cluster sampling survey conducted from 20 June to 30 November 2013. The SPSS software(version 20.0) was used for data analysis. Thec2test was used for statistical analyses	The rate of caesarean deliveries was much higher in women with multiple pregnancies (85.8%) than that in women with singleton pregnancies (42.6%, $\chi^2 = 190.8$, $P < 0.001$). The incidences of anemia ($\chi^2 = 40.023$, $P < 0.001$), preterm labor ($\chi^2 = 1021.172$, $P < 0.001$), gestational diabetes mellitus ($\chi^2 = 9.311$, $P < 0.01$), hypertensive disorders ($\chi^2 = 122.708$, $P < 0.001$) and post-partum hemorrhage ($\chi^2 = 48.550$, $P < 0.001$) was significantly increased with multiple pregnancy. In addition, multiple pregnancy was associated with a significantly higher rate of small-for-gestational-age infants ($\chi^2 =$

			92.602, $P < 0.001$), low birth weight ($\chi^2 = 1141.713$, $P < 0.001$), and neonatal intensive care unit (NICU) admission ($\chi^2 = 340.129$, $P < 0.001$).
Perinatal outcomes in twin pregnancies complicated by maternal morbidity: evidence from the WHO Multicountry Survey on Maternal and Newborn Health	Danielly S. Santana1, Carla Silveira1, Maria L. Costa1, Renato T. Souza1, Fernanda G. Surita1, João P. Souza2, Syeda Batool Mazhar3, Kapila Jayaratne, Zahida Qureshi, Maria H. Sousa, Joshua P. Vogel, José G. Cecatti, 2018.	Secondary analysis of the WHO Multicountry Survey on Maternal and Newborn Health (WHOMCS), a cross-sectional study implemented in 29 countries. Data from 8568 twin deliveries were compared with 308,127 singleton deliveries. The occurrence of adverse perinatal outcomes and maternal complications were assessed. Factors independently associated with adverse perinatal outcomes were reported with adjusted PR	

		(Prevalence Ratio) and 95%CI.	
Maternal and Perinatal Outcome in Multifetal Pregnancy: A Study at a Teaching Hospital, Pokhara, Nepal	Mahendra Raj Pandey, Bikash Jang Kshetri, Deepak Dhakal, 2012 to 2014.	The prospective observational study was done at labor room and maternity ward of Manipal Teaching Hospital, Pokhara, Nepal from January 2012 till December 2014. The diagnosis of multiple pregnancy was established by transabdominal ultrasonographic imaging performed by trained radiologist and the last ultrasonographic examination before delivery was taken in the cohort.	The total number of deliveries between January 2012 to December 2014 were 7666. The number of twin pairs and triplets delivered during the same period was 144. This made an overall incidence of multiple pregnancies as 1.9 per 1000 births. Majority 126(87.5%) were unbooked cases. The mean maternal age at presentation was 26 years for both twins and triplets . Most of them were multipara 70(51%). Only 3 cases conceived by ovulation induction. The main maternal adverse outcomes were preterm delivery (62.58%), anemia (8.6%), pregnancy induced hypertension (5%), and antepartum hemorrhage (2.2%), respectively. Postpartum hemorrhage occurred in 12 cases whereas eclampsia,

			postpartum cardiomyopathy, vulval hematoma, and puerperal pyrexia occurred in 2 cases each, the cause of puerperal pyrexia was urinary tract infection. The average birth weight of first twin was 2100 grams and of second twin was 2040 grams. The average birth weight of the 1st, 2nd, and 3rd triplets was 1300 grams, 1630 grams, and 1460 grams, respectively etc.
Complications of multiple pregnancies. Overwiew Stara zagora, Bulgaria.	S. Lazarov, L. Lazarov, N. Lazarov. 2016	Department of Obstetrics and Gynecology, Medical Faculty, Trakia University, Stara Zagora, Bulgaria	Preterm labor and birth represent the greatest risk to a multiple pregnancy. Sixty percent of multiples are born prematurely (<37 weeks) compared to about 10% of singleton pregnancies. Placental function is more likely to be abnormal in a multiple pregnancy. Another placental problem is twintwin transfusion, a life-threatening condition in identical twins. Preeclampsia, also

			known as toxemia, occurs 2 to 5 times more often in multiple pregnancies. Fifteen percent to 20% of women with twin pregnancies will experience preeclampsia, and an even higher percentage is preeclamptic in triplet or high-order pregnancies. Preterm labor and birth pose the greatest risk to a multiple pregnancy. Sixty percent of multiples are born prematurely (<37 weeks) compared to about 10% of singleton pregnancies. Fetal and Newborn complications such as preterm delivery, respiratory distress syndrome, brain damage are responsible for almost 10% of premature newborn deaths. Birth defects and stillbirths account for about 30% of the deaths in twins and multiple pregnancies. Low birth weight of less than 5.5 pounds (lb.)

			[2,500 grams] occurs in over half of twins..

2.4.2 In Africa

Title and place of study	Authors and year of study	Setting	Results
Perinatal Outcomes of Multiple Births in Southwest Nigeria	Bolajoko O. Olusanya, 2007.	This cross-sectional study was conducted at the Island Maternity Hospital (IMH) in Lagos, southwest Nigeria, from May 2005 to December 2007.	Of the 4,573 deliveries, there were 4,416 (96.6%) singletons and 157 (3.4%) multiples, comprising 296 twins and six triplets together (6.4% of all live 4,718 infants). After adjusting for maternal age, ethnicity, occupation, parity, and antenatal care, multiple gestations were associated with increased risks of hypertensive disorders and caesarean delivery. Similarly, after adjusting for potential maternal confounders, multiple births were associated with low five-minute Apgar score (OR: 1.47, 95% CI 1.13-1.93), neonatal sepsis (OR: 2.16, 95% CI 1.28-3.65), severe hyperbilirubinaemia (OR: 1.60, 95% CI 1.00-2.56), and admission to a special-care baby unit (OR: 1.56, 95% CI 1.12-2.17) underpinned by

			preterm delivery before 34 weeks (OR: 1.91, 95% CI 1.14-3.19), birthweight of less than 2,500 g (OR: 6.45, 95% CI 4.80-8.66), and intrauterine growth restriction (OR: 9.04, 95% CI 6.62-12.34). Overall, the results suggest that, in resourcepoor settings, infants of multiple gestations are associated with a significantly-elevated risk of adverse perinatal outcomes. Since these perinatal outcomes are related to the increased risk of later neurodevelopmental disabilities, multiple-birth infants merit close developmental surveillance for timely intervention.
Perinatal Outcomes of Multiple-Gestation Pregnancies in Kenya, Zambia, Pakistan, India, Guatemala, and Argentina: A Global Network Study	Irene Marete, Constance Tenge et al. 2014.	The Global Network for Women and Children's Health Research Maternal Newborn Health registry study is a prospective multicenter study conducted in Kenya, Zambia Pakistan, Guatemala,	A total of 69,706 women were enrolled. Multiple gestations accounted for 0.9% of all births (twins 0.9%, triplets 0.01%). Kenya and Pakistan had the highest rates of multiple gestation deliveries with 14.6/1000 and 10.7/1000 live births respectively. The mothers with a

		Argentina and India (8). The registry includes 106 geographically defined study clusters across the sites	multiple gestation were more likely to deliver in a health care facility compared to singleton pregnancy mothers (70% and 66% respectively, p<0.001), to be attended by skilled health personnel (71% and 67%, p<0.001) and to be delivered by Cesarean section (18% vs. 9%, p<0.001). Multiple gestation fetuses had a relative risk (RR) for stillbirth of 2.65 (2.06, 3.41) and for perinatal mortality rate (PMR) a RR of 3.98 (3.40, 4.65) relative to singletons (both p<0.0001). Neither delivery in a health facility nor the Cesarean section rate was associated with decreased PMR. Among multiple gestation deliveries, physician attended delivery relative to delivery by other health providers was associated with a decreased risk of perinatal mortality.
Early neonatal mortality in twin pregnancy: Findings from 60	Saverio Bellizi, Howard Sobel et al. 2018.	We conducted a secondary analysis of individual level data from 60 nationally-	Early neonatal mortality among twins was significantly higher when compared to singleton neonates

low- and middle-income countries		representative Demographic and Health Surveys including 521 867 singleton and 14 312 twin births. We investigated the occurrence of deaths within the first week of life in twins compared to singletons and the effect of place and attendance at birth; also, the role of caesarean sections against vaginal births was examined, globally and after countries stratification per caesarean sections rates. A multi-level logistic regression was used accounting for homogeneity within country, and homogeneity within twin pairs.	(adjusted odds ratio (aOR) 7.6; 95% confidence interval (CI) = 7.0-8.3) in these 60 countries. Early neonatal mortality was also higher among twins than singletons when adjusting for birth weight in a subgroup analysis of those countries with data on birth weight (n = 20; less than 20% of missing values) (aOR = 2.8; 95% CI = 2.2-3.5). For countries with high rates (>15%) of caesarean sections (CS), twins delivered vaginally in health facility had a statistically significant (aOR = 4.8; 95% CI = 2.4-9.4) increased risk of early neonatal mortality compared to twins delivered through caesarean sections. Home twin births without SBA was associated with increased mortality compared with delivering at home with SBA (aOR = 1.3; 95% CI = 1.0-1.8) and with vaginal birth in health facility (aOR = 1.7; 95% CI = 1.4-2.0).

2.4.3 In Cameroon

Title and place of study	Authors and place of study	Setting	Results
Outcomes of Twin Delivery at the Bamenda Health District, North West Region Cameroon	William Ako Takang1,2, Dobgima Walters Pisoh2, Tcheumbe Josiane Nyeumenou1, Enow Robinson Mbu1, Mary Bi Shu Atanga, 2018.	This was a hospital-based, cross-sectional analytic study done at the Bamenda Health District in three selected hospitals (Bamenda Regional Hospital, CMA Nkwen, and IHC Azire) from the 1 st of January to the 10th of May 2018. 55 women with twin pregnancies and 55 women with singleton pregnancies at gestational ages of 28 completed weeks and above who came for delivery and who consented to the study were included.	Women with twin gestations were mostly aged between 25 and 34 years with a mean maternal age of 28.6 ± 5.8 years, more than half (60%) of them were multiparous with family histories of twin, and business was their main occupation (58.2%). The prevalence of twin gestations at the Bamenda Health District was 2.8%. As compared to singleton deliveries, twin deliveries were associated with adverse fetal outcomes such as prematurity (born before 37 completed weeks) which was about 6 times higher among twins than singleton babies (OR: 5.6, 95% CI: 2.2 - 14.3, p < 0.001), birth asphyxia (Apgar score < 7 at 5th min) that was 15 times higher in twin than singleton births (OR: 15.3, 95% CI: 2 -

			116.6, p < 0.001) and low birth weight (birth weight < 2500 grams) that was 15.6 times increased in twin than singleton births (OR: 15.6, 95% CI: 3.6 - 67.8, p < 0.001). There were 5.5 times increased cesarean sections among women with twin pregnancies compared to women with singleton pregnancies (OR: 5.5, 95% CI: 2.2 13.9, p < 0.001). There was no association between twin delivery and postpartum haemorrhage (p > 0.05). Conclusion: Twin deliveries were associated with adverse fetal outcomes (prematurity, birth asphyxia, and low birth weight) in the three health facilities where we carried out the study. Cesarean section was higher among women with twin gestations compared to women with singleton gestations.

Pregnancies Outcome after Assisted Reproductive Technology: A Multicenter Case Control Study in a Low Income Setting Douala, Cameroon	Tchene Nguefack Charlotte, bourdanne Tekouake Didier et al. 2021	It was a case-control study carried out in four health facilities in Douala-Cameroon, over a period of five years.	Some independent factors associated with ART were: age over 45 years [aOR: 7.55; 95% CI (1.55 - 36.76); p: 0.01], twin pregnancies [aOR: 16.55; 95% CI (7.91 - 34.60); p < 0.01], Cervical cerclage [aOR: 3.04; 95% CI (1.23 - 7.50); p: 0.01], miscarriages [aOR: 11.73; 95% CI (5.07 - 27.10); p: 0.01], elective cesarean section [aOR: 4.63; 95% CI (2.27 - 9.45); p: 0.01] and low birth weight [aOR: 3.32; 95% CI (1.90 - 5.82); p < 0.01]. Women who conceived by ART were older with higher rates of multiple pregnancy and complications. We recommend transfer of a single embryo.
Triple Gestations in Two University Teaching Hospitals in Yaounde, Cameroon	E Nkwabong, F Lhagadang, R Mbu, PN Nana, L Kouam, PC Ngassa. 2011	This retrospective study, carried out in 2 university hospitals in Yaounde (Cameroon) over a 6-year period, was done to evaluate the complications that	A total of 43 cases were analyzed. The most common complications that occurred during pregnancy were preterm delivery and pre-eclampsia. Twenty seven women (62.8%)

		occurred during triple pregnancies as well as the mode of delivery of triplets.	delivered vaginally and 16 (37.2%) were delivered by caesarean section with the most common indications being mal presentation and cord prolapse of the 1st triplet. In patients who have proper antepartum monitoring, it is possible to pre-select cases for trial of vaginal delivery because vaginal delivery is possible and carries no significant risk for the foetuses.

CHAPTER 3: METHODOLOGY

3 METHODOLOGY

3.1 TYPE OF STUDY

We carried out a retrospective cohort study.

3.2 SITE OF STUDY

Our study was carried out in two reference hospitals in Yaoundé. These hospitals are the Yaoundé Gynaecology, Obstetrics and Paediatrics Hospital and the Yaoundé Central Hospital.

The Yaoundé Gynaecology, Obstetrics and Paediatrics Hospital

It is a reference health facility created in 2002 and specializes in mother and child health care. Its gynaecology/obstetrics department has a capacity of 34 inpatient beds, 3 delivery tables and 4 operating theatres with two laparoscopy columns. The service carries out an average of 3015 deliveries per annum with a staff of 14 specialists in Obstetrics and Gynaecology.

The Yaoundé Central Hospital

This reference hospital located in the heart of Yaoundé has one of the biggest and most specialized maternity unit with over 72 in-patient beds, 6 delivery tables, 2 service operating theatres and a large highly trained staff. It records about 219 deliveries per month.

All the afore mentioned hospitals have been chosen for this study because of their great patient turnover, adequate follow up and anticipated clear records.

3.3 DURATION OF STUDY

The study was carried out over a duration of seven months (November 2023 to May 2024).

3.4 STUDY POPULATION

Our study population consisted of files of pregnant women who delivered in the selected hospitals from January 2018 to December 2022.

3.4.1 Inclusion criteria

Exposed group:

- Files of pregnant women with multifetal gestations who were admitted in labor and delivered in these hospitals.
- Complete patient records.

Unexposed group:

- Files of women with singleton pregnancies who were admitted in labor and delivered just after the cases of multifetal pregnancy matched for maternal age (+/-), gestational age(+/-) and parity (+/-).

3.4.2 Exclusion criteria

- Files of women with incomplete information.

3.4.3 Non-inclusion criteria

- Files of women with comorbidities such as gestational diabetes and hypertension who delivered during the same period.

3.5 SAMPLING

3.5.1 Sampling method

Recruitment was consecutive until our sample size was attained.

3.5.2 Sample size estimation

Based on our study design, the sample size was calculated as shown below:

$$n = \left[\frac{2 * \left(Z_\alpha + Z_\beta\right)^2 * p * (1-p)}{(p_0 - p_1)^2}\right]$$

P_0= The proportion of women in the unexposed group who will develop the complication considered.

P_1= The proportion of women in the exposed (risk) group who will develop the same complication.

$P = (P_0 + P_1) / 2$

$\alpha = 0.05$

$Z_\alpha = 1.96$

$\beta = 0.1$

$Z_\beta = 1.28$

Therefore **n= a minimum of 79 participants**

With ratio 1 exposed: 1 unexposed.

3.6 PROCEDURE

3.6.1 Administrative formalities

Firstly, we wrote and presented a research protocol that was approved by the supervisors, after which we obtained research authorization from the management of the hospitals and ethical clearance from the Institutional Review Board of the Faculty of Medicine of the University of Yaoundé I.

3.6.2 Recruitment and data collection

Delivery records were used to identify women with multifetal and singleton gestations who delivered in the selected hospitals during the period ranging from 2018 to 2022 inclusive. We then proceeded to the archives to collect the files for studies. For every exposed case or multifetal delivery, the next singleton delivered matched for age and parity was considered as the unexposed case. Data were extracted from their files according to working variables unto the worksheet for appropriate data management and analysis.

3.6.2.1 Study Variables

For the exposed and unexposed cases, information of interest was collected with the help of a data collection worksheet. This worksheet was designed, internally validated by supervisors, tested and then adapted for the study. The following were searched for;

1. Sociodemographic and obstetrical data: This included age, region of origin, marital status, profession, level of education, religion, gravidity and parity.
2. Clinical variables: We obtained information on the sex of neonate(s), gestational age, ANC, ultrasound data, mode of delivery, history of multiple gestations, APGAR score, birth weight, foetal length, foetal head circumference, fetal mid-upper arm circumference.
3. Complications: This included fetal death, prematurity, neonatal asphyxia, neonatal sepsis, other immediate neonatal morbidities encountered.

3.7 STUDY RESOURCES

3.7.1 Materials for data collection

- Pre-established consent forms
- Pre-established questionnaires
- Rim of A4 papers
- Patients' medical records
- Pens, pencils, …

3.7.2 Human resources

- Main investigator:

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  7th Year - General Medicine, FMBS UYI

  +237 6 78 72 81 68

  reginabatebe@gmail.com

- Supervisors
- Statistician

3.8 DATA ANALYSIS

Data from completed and validated data collection sheet were entered into and analysed using the IBM SPSS (International Business Machine Statistical Package for Social Sciences). Pearson's chi square test will be used for comparison between categorical data and Student's T-test for numerical data. The exposed and the unexposed group characteristics were compared using relative risk. This study was done within a confidence interval of 95% and a value of P< 0.05 was considered significant.

3.8.1 Material for data management

- Computer
- Scientific calculator
- Microsoft software package
- USB flash drive
- Smart phone

3.9 ETHICAL CONSIDERATIONS

Before embarking on data collection, ethical clearance was requested and obtained from the ethical committee of the Faculty of Medicine and Biomedical Sciences. We equally obtained administrative authorizations from the management of the Yaoundé, Gynaecology Obstetrics and Paediatrics Hospital and Yaoundé Central Hospital to carry out the study.

Confidentiality was ensured by assigning randomly generated codes to every participant and these codes used at every stage of documentation.

All the data collected was used only for the research.

CHAPTER 4: RESULTS

4.1 DIAGRAMMATIC REPRESENTATION OF RECRUITMENT PROCESS

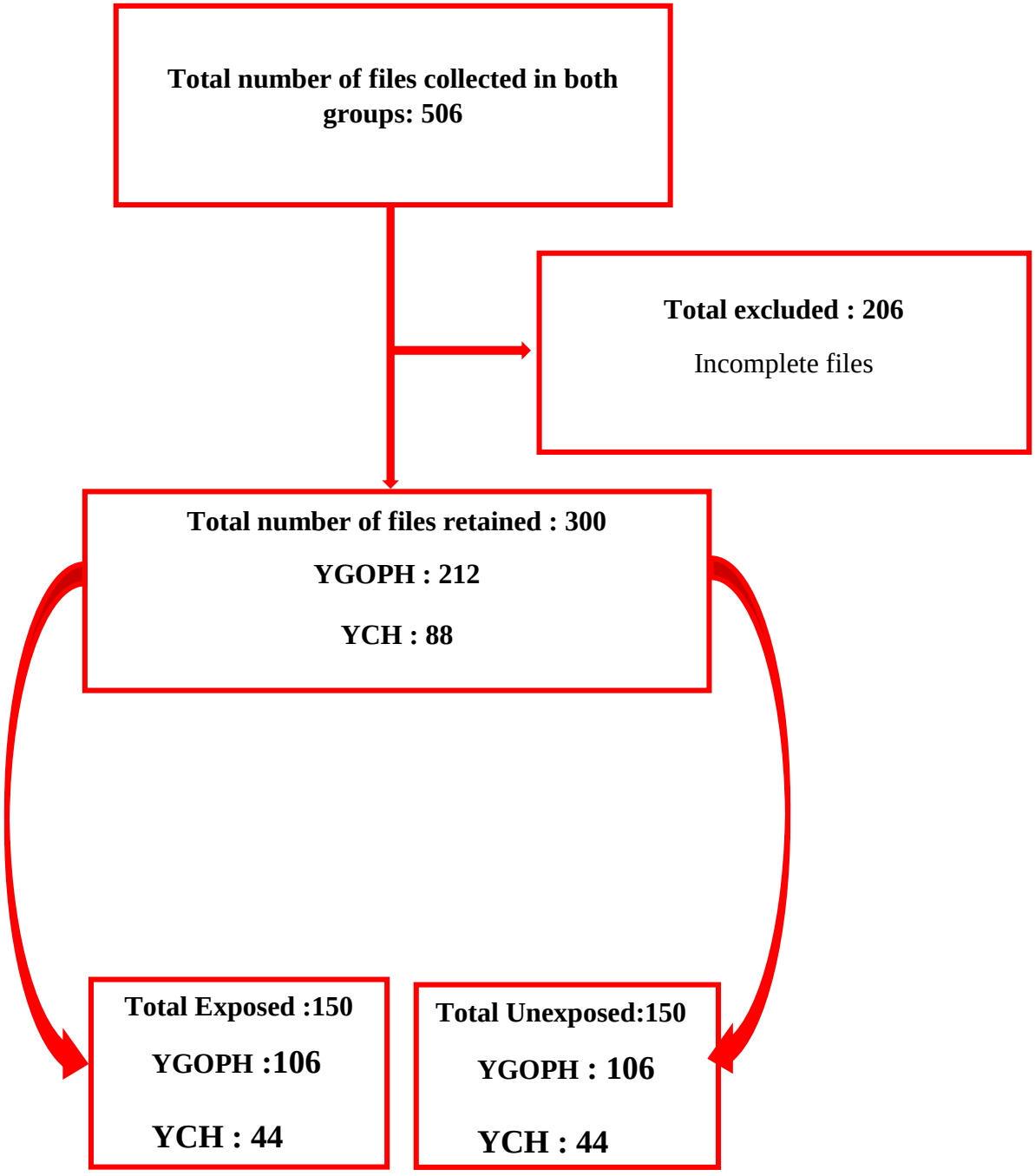


Figure 13: Recruitment flow chart.

For this study, we went through all patient records in the Obstetrics and Gynecology services of the YGOPH and the YCH from Jan 1st 2019 to Dec 31st 2022. Out of the 506 files evaluated, 206 were found to be incomplete. A total of 300 files were retained in our study. We had 150 files in the exposed group and 150 in the unexposed group giving a ratio of 1:1.

4.2 TYPES OF MULTIFETAL PREGNANCIES

Table III: Types of multifetal pregnancies

Types	Frequency N=150	Percentage (%)
Twins	**134**	**89.3**
Triplets	**16**	**10.7**
Quadruplets	**0**	**0.0**
Quintuplets	**0**	**0.0**

The number of twins and triplets were 134 and 16 respectively, giving a total of 316 neonates from the exposed group. There were no quadruplets nor quintuplets in the study.

4.3 SOCIODEMOGRAPHIC PROFILE OF THE STUDY POPULATION

The tables (III and IV) below describe the sociodemographic profiles of our study population.

Table IV: Population distribution by age and marital status

Variables	Exposed group N=150; n(%)	Unexposed group N=150; n(%)	RR (CI at 95%)	p-value
Age groups (in years)				
[15-19]	13 (8.7)	17 (11.3)	0.74 (0.34-1.58)	0.282
[20-24]	37 (24.7)	36 (24.0)	1.03 (0.61-1.75)	0.500
[25-29]	34 (22.7)	49 (32.7)	**0.64** (0.32-1.01)	**0.035**
[30-34]	40 (26.7)	30 (20.0)	1.45 (0.84-2.49)	0.110
[35-39]	21 (14.0)	16 (10.7)	1.36 (0.68-2.72)	0.241
≥ 40	5 (3.3)	2 (1.3)	2.55 (0.48-13.36)	0.224
Marital status				
Married	73 (48.7)	58 (38.7)	1.50 (0.95-2.37)	0.051
Single	77 (51.3)	92 (61.3)	0.66 (0.42-1.05)	0.051

Women within the age group 25-29 were the most protected in the two groups **(RR 0.64, 95% CI 0.32-1.01, p<0.035).** The highest number of multifetal pregnancies occurred among women aged between 30-34 (26.7%).

Table V: Population distribution by others sociodemographic characteristics

Variables	Exposed group N=150; n(%)	Unexposed group N=150; n(%)	RR (CI at 95%)	p-value
Level of education				
Primary	5 (3.3)	6 (4.0)	0.82 (0.24-2.77)	0.500
Secondary	39 (26.0)	32 (21.3)	1.29 (0.75-2.21)	0.208
High school	60 (40.0)	42 (28.0)	**1.71 (1.05-2.78)**	**0.019**
University	46 (30.7)	70 (46.7)	**0.50 (0.31-0.81)**	**0.003**
Occupation				
Informal sector	67 (44.7)	54 (36.0)	1.43 (0.90-2.28)	0.079
Student	30 (20.0)	36 (24.0)	0.79 (0.45-1.37)	0.243
Civil servant	18 (12.0)	21 (14.0)	0.83 (0.42-1.64)	0.366
Private sector	20 (13.3)	18 (12.0)	1.12 (0.57-2.23)	0.431
Unemployed	15 (10.0)	21 (14.0)	0.68 (0.33-1.38)	0.187
Region of origin				
Grand-North	10 (6.7)	15 (10.0)	0.64 (0.27-1.48)	0.202
Centre	61 (40.7)	50 (33.3)	1.37 (0.85-2.19)	0.116
Littoral	4 (2.7)	8 (5.3)	0.48 (0.14-1.65)	0.189
North-West	4 (2.7)	2 (1.3)	2.02 (0.36-11.24)	0.342
South-West	2 (1.3)	2 (1.3)	1.00 (0.13-7.19)	0.689
West	64 (42.7)	67 (44.7)	0.92 (0.58-1.45)	0.408
East	3 (2.0)	1 (0.7)	3.04 (0.31-29.56)	0.311
South	0 (0.0)	2 (1.3)	/	0.249
Foreigner	2 (1.3)	3 (2.0)	0.66 (0.10-4.02)	0.500
Religion				
Christian	135 (90.0)	132 (88.0)	1.22 (0.59-2.53)	0.356
Muslim	15 (10.0)	16 (10.7)	0.93 (0.44-1.95)	0.500
Others	0 (0.0)	2 (1.3)	/	0.249

The highest level of education among women in the exposed group was high school (40.0% vs. 28.0%) in contrast to women in the unexposed group who were mostly university graduates(46.7% vs. 30.7%) **(p < 0.05).** Women in the informal sector were the most represented in both groups, i.e. 44.7% vs. 36.0% but this was not statistically significant (p = 0.079). There were no differences with respect to region of origin and religion.

4.4 OBSTETRICAL PROFILE AND COMORBIDITIES OF OUR STUDY POPULATION

The tables (V and VI) below describe the obstetrical profile and comorbidities of our study population

Table VI: Population distribution according to personal and family obstetrical characteristics

Variables	Exposed group N=150; n(%)	Unexposed group N=150; n(%)	RR (CI at 95%)	P
Gravidity				
Pimigravidarum	34 (22.7)	50 (33.3)	**0.58 (0.35-0.97)**	**0.027**
Paucigravidarum	49 (32.7)	63 (42.0)	0.67 (0.41-1.07)	0.060
Multigravidarum	38 (25.3)	29 (19.3)	1.41 (0.81-2.44)	0.134
Grand multigravidarum	29 (19.3)	8 (5.3)	**4.25 (1.87-9.65)**	**< 0.001**
Parity				
Primiparous	41 (27.3)	66 (44.0)	**0.47 (0.29-0.77)**	**0.002**
Pauciparous	57 (38.0)	61 (40.7)	0.89 (0.56-1.42)	0.361
Multiparous	32 (21.3)	19 (12.7)	1.87 (1.01-3.47)	0.032
Grand multiparous	20 (13.3)	4 (2.7)	**5.61 (1.87-16.85)**	**< 0.001**
History of multifetal pregnancy				
Yes	5 (3.3)	1 (0.7)	5.13 (0.59-44.51)	0.107
No	145 (96.7)	149 (99.3)	1	
Family history of multifetal pregnancy				
Yes	3 (2.0)	0 (0.0)	/	0.124
No	147 (98.0)	0 (0.0)	/	0.124

Grand multigravidity and grand multiparity were associated with multifetal pregnancies. Women who were grand multigravida had 4.25 times the risk of having multifetal pregnancies **(RR 4.25, 95% CI 1.87-9.65, p< 0.001).** In the same order, women who were grand multiparous had 5.16 times the risk of having multifetal pregnancies **(RR 5.61, 95% CI 1.87-16.85, p<0.001)**

Table VII: Population distribution according to comorbidities and lifestyle

Variables	Exposed group N=150; n(%)	Unexposed group N=150; n(%)	RR (CI at 95%)	P
Comorbidities				
None	140 (93.3)	135 (90.3)	1.55 (0.67(3.58)	0.202
HIV infection	3 (2.0)	11 (7.3)	**0.25 (0.07-0.94)**	**0.026**
Hepatitis B	3 (2.0)	2 (1.3)	1.51 (0.24-9.17)	0.500
Hypertension	2 (1.3)	0 (0.0)	/	0.249
Diabetes	1 (0.7)	0 (0.0)	/	0.500
Hepatitis C	0 (0.0)	1 (0.7)	/	0.500
Lifestyle				
Alcohol consumption	11 (7.3)	7 (4.7)	1.61 (0.60-4.29)	0.233
Tobacco consumption	1 (0.7)	1 (0.7)	1.00 (0.06-16.13)	0.751

Comorbidities were dominated by HIV infection in all study groups, i.e. 2.0% in the exposed group and 7.3% in the unexposed group **(p=0.026**). Alcohol consumption was frequent in 7.3% of womwn among the exposed group and in 4.7% of women among the unexposed group but the difference was not statistically significant (p=0.233).

4.5 ANC CHARACTERISTICS OF OUR STUDY POPULATION

Table VIII: Population distribution according to ANC characteristics

Variables	Exposed group N=150; n(%)	Unexposed group N=150; n(%)	RR (CI at 95%)	p-value
Number of ANC				
0	1 (0.7)	1 (0.7)	1.00 (0.06-16.13)	0.751
1-3	89 (59.3)	78 (52.0)	1.34 (0.85-2.12)	0.123
4	18 (12.0)	25 (16.7)	0.68 (0.35-1.31)	0.161
5-7	36 (24.0)	39 (26.0)	0.89 (0.53-1.51)	0.395
≥ 8	6 (4.0)	7 (4.7)	0.85 (0.27-2.59)	0.500
Qualification of ANC provider				
No follow-up pregnancy	1 (0.7)	1 (0.7)	1.00 (0.06-16.13)	0.751
Gynaecologist	8 (5.3)	13 (8.7)	0.59 (0.23-1.47)	0.183
General practitioner	105 (70.0)	106 (70.7)	0.96 (0.59-1.59)	0.500
Midwife	36 (24.0)	30 (20.0)	1.26 (0.73-2.18)	0.243

Most women in our study had undergone 1 to 3 ANCs, 59.3% and 52.0% respectively in the exposed and unexposed groups (p=0.123). The majority of these ANCs were carried out by a general practitioner (70.0% vs. 70.7%; p=0.500). Neither of these had any significant association with multifetal pregnancies.

Table IX: Population distribution according to prophylactic measures during pregnancy

Variables	Exposed group N=150; n(%)	Unexposed group N=150; n(%)	RR (CI at 95%)	p-value
Antitetanic vaccin				
< 2	29 (19.3)	35 (23.3)	0.78 (0.45-1.37)	0.241
≥ 2	121 (80.7)	115 (76.7)	1.27 (0.72-2.21)	0.241
Slept under treated mosquito net				
Yes	92 (61.3)	83 (55.3)	1.28 (0.80-2.02)	0.174
No	58 (38.7)	67 (44.7)	1	
Iron / folic acid consumption				
Yes	118 (78.7)	107 (71.3)	1.48 (0.87-2.51)	0.091
No	32 (21.3)	43 (28.7)	1	

The majority of women had received at least two doses of antitetanic vaccine (89.7% vs. 76.7%; p=0.241), slept under an impregnated mosquito net (61.3% vs. 55.3%; p=0.174) and had taken iron/folic acid (78.7% vs. 71.3%; p=0.091).Neither of these had any significant association with multifetal pregnancies.

4.6 PATHOLOGIES IN PREGNANCY

Table X: Distribution of the population according to pathologies in pregnancy

Pathologies during pragnancy	Exposed group N=150; n(%)	Unexposed group N=150; n(%)	RR (CI at 95%)	p-value
None	134 (88.7)	142 (94.0)	0.49 (0.21-1.15)	0.075
Malaria	11 (7.3)	7 (4.7)	1.61 (0.60-4.29)	0.233
Anaemia	1 (0.7)	0 (0.0)	/	0.500
Urinary tract infection	0 (0.0)	1 (0.7)	/	0.500
Genital tract infection	2 (66.7)	0 (0.0)	/	0.300
Cervical insufficiency	1 (0.7)	0 (0.0)	/	0.500
Preeclampsia	1 (0.7)	0 (0.0)	/	0.500

Pathologies developed during pregnancy were dominated by malaria, which accounted for 7.3% of cases among exposed women, versus 4.7% of cases among unexposed women but this was not statistically significant ($p<0.075$).

4.7 MATERNAL OUTCOME OF PREGNANCIES IN THE STUDY POPULATION

Table XI: Population distribution according to route of delivery and maternal complications

Variables	Exposed group N=150; n(%)	Unexposed group N=150; n(%)	RR (CI at 95%)	p-value
Mode of delivery				
Cesarian section	58 (38.7)	34 (22.7)	**1.70 (1.19-2.44)**	**0.002**
Vaginal delivery	92 (61.3)	116 (77.3)	0.79 (0.68-0.92)	0.002
Post partum complications				
No complication	144 (96.0)	147 (98.0)	0.98 (0.94-1.01)	0.251
Post partum haemorrage	4 (2.7)	3 (2.0)	1.33 (0.30-5.85)	0.500
Puerperal infection	1 (0.7)	0 (0.0)	/	0.500
Preeclampsia/Eclampsia	1 (0.7)	0 (0.0)	/	0.500

Women with multifetal pregnancies had 1.70 times the risk of delivering through caesarean section **(RR 1.70, 95% CI 1.19-2.44, p=0,002).** Post-partum haemorrhage occurred in both groups without any statistical significance.

4.8 FETAL AND NEONATAL OUTCOME OF THE STUDY POPULATION

Table XII: Fetal characteristics at delivery

Variables	Exposed group N=316; n(%)	Unexposed group N=150; n(%)	RR (CI at 95%)	p-value
Gestational age at delivery (in weeks)				
< 28	21 (6.6)	3 (2.0)	**3.32 (1.01-10.96)**	**0.023**
[28-31]	48 (15.2)	27 (18.0)	0.84 (0.54-1.29)	0.260
[32-34]	77 (24.4)	26 (17.3)	1.40 (0.94-2.09)	0.054
[35-36]	68 (21.5)	13 (8.7)	**2.48 (1.41-4.34)**	**< 0.001**
≥ 37	102 (32.3)	81 (54.0)	**0.59 (0.48-0.74)**	**< 0.001**
Notion of fetal detress				
Yes	96 (30.4)	35 (23.3)	1.30 (0.93-1.82)	0.070
No	220 (69.6)	115 (76.7)	1	

Neonates born following multifetal pregnancies had more than 3 folds the risk of having extremely premature deliveries **(RR 3.22, 95% CI 1.01-10.96, p=0.023).** Delivery at gestational age ≥37 weeks was protective **(RR 0.59, 95% CI 0.48-0.74, p<0,001).**

Table XIII: Neonatal and evolutionary characteristics of new-borns

Variables	Exposed group N=316; n(%)	Unexposed group N=150; n(%)	RR (CI at 95%)	p-value
Sex				
Male	160 (50,6)	91 (60.7)	**0.83 (0.70-0.98)**	**0.027**
Female	156 (49.4)	59 (39.3)	1	
Birth weight (in grams)				
< 1500	82 (25.9)	24 (16.0)	**1.62 (1.11-3.04)**	**0.010**
[1500-2000[	68 (21.5)	15 (10.0)	**2.46 (1.35-4.48)**	**0.001**
[2000-2500[	81 (25.6)	18 (12.0)	**2.13 (1.33-3.42)**	**< 0.001**
[2500-4000[	84 (26.6)	89 (59.3)	**0.44 (0.35-0.56)**	**< 0.001**
≥ 4000	1 (0.3)	4 (2.7)	0.11 (0.01-1.05)	0.039
Hypotophy				
Yes	14 (4.4)	1 (0.7)	**6.64 (0.88-50.06)**	**0.022**
No	302 (95.6)	149 (99.3)	1	
Apgar score				
0	17 (5.4)	2 (1.3)	**4.03 (0.94-17.23)**	**0.028**
1-6	33 (10.4)	13 (8.7)	1.20 (0.65-2.22)	0.337
≥ 7	266 (84.2)	135 (90.0)	0.93 (0.87-1.01)	0.058
Complications after birth				
Neonatal asphyxia	2 (0.6)	1 (0.7)	0.94 (0.08-10.38)	0.689
Neonatal resuscitation	96 (30.4)	34 (22.7)	1.34 (0.95-1.88)	0.051
Neonatal infection	6 (1.9)	4 (2.7)	0.71 (0.20-2.48)	0.409
Mortality				
Intrapartal death	20 (6.3)	2 (1.3)	**4.74 (1.12-20.04)**	**0.011**
Early neonatal death	17 (5.4)	5 (3.3)	1.61 (0.60-4.29)	0.234

The male sex was protective in multifetal pregnancies **(RR 0.83, 95% CI 0.70-0.98, p<0.027).** Multifetal pregnancies were associated with low birth weight **(RR 1.62, 95% CI 1.11-3.04, p=0.01),** fetal hypotrophy **(RR 6.64, 95% CI 0.888-50.06, p=0.022)**, APGAR score at 0 at birth **(RR=4.03 , 95% CI 0.94-17.23, P=0.028)** and intrapartal death **(RR 4.74, 95% CI 1.12-20.04, P=0.011).**

4.9 INDEPENDENT FACTORS ASSOCIATED TO MULTIFETAL PREGNANCIES: MULTIVARIATE BINARY LOGISTIC REGRESSION ANALYSIS.

Table XIV: Independent factors associated with multifetal pregnancies

Variables	Exposed group	Unexposed group	aRR	Adjusted p-value
	N=316; n(%)	N=150; n(%)	(CI at 95%)	
Gestational age at delivery (in weeks)				
≥ 37	102 (32.3)	81 (54.0)	0,95 (0,56-1,62)	0,874
Notion of fetal detress				
Yes	96 (30.4)	35 (23.3)	0,54 (0,09-3,16)	0,501
Birth weight (in grams)				
[2500-4000[	84 (26.6)	89 (59.3)	**0,27 (0,16-0,47)**	**< 0.001**
Hypotrophy				
Yes	14 (4.4)	1 (0.7)	3,28 (0,4-26,07)	0,260
Apgar score				
0	17 (5.4)	2 (1.3)	1,50 (0,11-19,48)	0,753
Complications after birth				
Neonatal resuscitation	96 (30.4)	34 (22.7)	1,90 (0,32-11,11)	0,474
Mortality				
Intrapartal death	20 (6.3)	2 (1.3)	2,20 (0,17-27,15)	0,537

After multivariate analysis using the binary logistic regression method for variables with a p-value strictly less than 0.10, neonates in the exposed group were significantly less likely to fall within the birth weight range of 2500-4000 grams **(aRR: 0.27, 95% CI 0.16-0.47; adjusted p < 0.001).**

CHAPTER 5: DISCUSSION

MULTIFETAL PREGNANCIES

Multifetal pregnancies are considered high risk due to the increased incidence of perinatal mortality and morbidity worldwide[5]. The highest incidence of multiple pregnancies has been found in low and middle-income countries particularly in Sub-Saharan Africa[4].This is quite common in our setting occurring in about 2.8% of pregnancies[1]. These pregnancies can imply an increased risk for women and children because of higher rates of obstetrical complications. It is therefore important to understand the relationship between these pregnancies and their outcomes. We therefore carried out a retrospective cohort study to evaluate the immediate neonatal outcome following multifetal pregnancies and compared the outcome with that of singleton pregnancies. Our results confirmed some of the findings from previous studies, that the outcome from these pregnancies are poorer than those of singleton pregnancies.

Limitations of the study

A possible limitation of our study is the fact that it was carried out in Yaoundé and in two hospitals only therefore the results cannot reflect the burden of multifetal pregnancies in the general population.

Sociodemographic characteristics of the study population

Women within the age group 25-29 years were the most protected in the two groups **(RR 0.64, 95% CI 0.32-1.01, p<0.035).** The highest number of multifetal pregnancies occurred among women aged between 30-34 (26.7%), the mean maternal age of the women was 27.9±6.2 years. This is similar to results published in Kenya in 2014 and in Ethiopia in 2022 which revealed mean maternal ages of 26±5 years and 26.6 years respectively[36,37].

The highest level of education among women in the exposed group was high school (40.0% vs. 28.0%) in contrast to women in the unexposed group who were mostly university graduates (46.7% vs. 30.7%) **(p < 0.05).**. This is contrary to the results published in Cameroon in 2022 which showed the highest level of education among women with multifetal pregnancies to be secondary [1].

Obstetrical profile and comorbidities of the study population

Grand multigravidity and grand multiparity were associated with multifetal pregnancies. Women who were grand multigravida had 4.25 times the risk of having multifetal pregnancies **(RR 4.25, 95% CI 1.87-9.65, p< 0.001).** In the same order, women who were grand multiparous had 5.16 times the risk of having multifetal pregnancies **(RR 5.61, 95% CI 1.87-16.85, p<0.001).** These findings are similar to a study done in Nigeria in 2011 which showed that multiple pregnancies occurred mostly among grand multiparous women [4].

There was no statistically significant association between personal/family history of multifetal pregnancy and the occurrence of multifetal pregnancy. This is contrary to the results published in Cameroon in 2022 which showed 65.5% of cases of multifetal pregnancies had a family history of multifetal pregnancy compared to 2% in our study. This discrepancy may be due to the difference in the sample size[1].

Pregnancy follow-up

Most women in our study had only 1 to 3 antenatal contacts, 59.3% and 52.0% respectively in the exposed and unexposed groups (p=0.123).This is contrary to results published in Nigeria in 2013 which showed that 61.5% of their study population had 4 or more antenatal contacts[38]. This can be explained by the fact that most women in our setting were not well informed on the importance of antenatal contacts or due to limited resources since most of them worked in the informal sector.

There was no statistically significant difference between pathologies developed during singleton and multifetal pregnancies. This is contrary to results published in India in 2016 which revealed a significant association between multifetal pregnancies and pathologies such as anaemia[39]. This is could be due to the fact that our study was retrospective therefore data concerning these pathologies might have been poorly filled or absent.

Maternal and foetal outcome of multifetal pregnancies

Women with multifetal pregnancies had 1.70 times the risk of delivering through caesarean section **(RR 1.70, 95% CI 1.19-2.44, p=0,002).** This correlates with a study carried out in Kenya in 2014 and in India in 2017 revealing that women with multifetal pregnancies had four times the risk of delivering through caesarean section [36,40]. This can be explained by the increased risk of malpresentation coupled with the higher rates of obstetrical

complications such as placenta praevia/abruption, preeclampsia in these pregnancies. Consequently, healthcare providers often opt for caesarean section to mitigate these risks and ensure the safety of both mother and babies.

Women with multifetal pregnancies had more than 3 folds the risk of having extremely premature deliveries **(RR 3.22, 95% CI 1.01-10.96, p=0.023).** These findings are supported by other studies. For instance, a study carried out at the Jimma University in Southwest Ethiopia in 2015 showed that the mean gestational age at delivery for twin deliveries was 35.1±2.5 weeks (p=0.002)[41]. A similar study carried out in the USA in 2021 showed that the mean GA for singleton was significantly higher at 38.30 weeks of gestation as against 36.39 weeks in twin pregnancies[20] .The results published in Nigeria in 2013 equally reported having a mean gestational age of 36.8 vs 38.7 weeks for twin and singleton deliveries respectively[38]. This prematurity can be explained by the fact that preterm premature rupture of membranes (PPROM) occurs more frequently in multifetal gestations coupled with uterine distension that occurs in these pregnancies as well as other factors such as increased incidence of placental abnormalities and other obstetrical complications.

The male sex was protective in multifetal pregnancies **(RR 0.83, 95% CI 0.70-0.98, p<0.027).** Multifetal pregnancies were associated with low birth weight **(RR 1.62, 95% CI 1.11-3.04, p=0.01),** fetal hypotrophy **(RR 6.64, 95% CI 0.888-50.06, p=0.022)**, and APGAR score of 0 at birth **(RR=4.03 , 95% CI 0.94-17.23, P=0.028) .** These results are consistent with those published from a study done in Cameroon in 2022 which revealed low birth weight and neonatal aspyxia in twins compared to singletons [1]. These results are most likely due to the fact that most of these babies are born prematurely. This can also be due to factors such as placental insufficiency as well as increased hormonal and physical demands which can impact the nutritional status of the foetuses.

In terms of mortality, neonates born to women in the exposed group were 4 times more likely to die during delivery than those born to women in the unexposed group**(RR 4.74, 95% CI 1.12-20.04, P=0.011)**. These findings are similar to those published in Nepal in 2015 which revealed that perinatal mortality is four times higher in twins and six times higher in triplets as compared to singletons[8]. A study carried out in Guinea equally had similar findings in 2017 with a twin-singleton rate ratio for neonatal mortality of 5·0 (95% CI 4·4–5·6)[42]. This can be explained by the poor monitoring of the pregnancy as most women (59.3%) had attended

just between 1-3 ANCs and probably due to inadequate neonatal resuscitation. Furthermore, because of the increased rates of low birth weight and prematurity in these pregnancies, the risk of perinatal mortality increases due to a variety of complications such as respiratory distress syndrome caused by immature lungs.

Independent variables associated to multifetal pregnancies

However, after multivariate logistic regression analysis, the only independent variable found to be associated with multifetal pregnancies was low birth weight. Neonates born following multifetal pregnancies were significantly less likely to fall within the birth weight range of 2500-4000 **(aRR: 0.27, 95% CI 0.16-0.47; adjusted p < 0.001).**

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

At the end of this study which had as main objective to evaluate the immediate neonatal outcome following multifetal pregnancies in two hospitals in Yaoundé, we can draw the following conclusions;

- Multifetal pregnancies mostly occurred among women in high school, aged between 30-34, who were grand multigravida and grand multiparous.
- Neonates born following multifetal pregnancies were most likely to be males, extremely premature, small-for-gestational age and have poor APGAR scores at birth.
- Multifetal pregnancies were associated with adverse neonatal outcomes such as low birth weight.
- Neonates born following multifetal pregnancies were more likely to have a low birth weight compared to singletons.

RECOMMENDATIONS

Following our study, we kindly recommend the following;

To pregnant women

- To respect the recommended WHO program for antenatal consultations.
- To be cautious and seek medical attention as soon as they notice any signs of preterm labor.

To the health personnel

- To provide specialized prenatal care to women with multifetal pregnancies tailored towards their unique needs. This involves close monitoring of maternal and fetal health, regular ultrasound examinations to assess fetal growth and well-being.
- To educate pregnant women about the signs of preterm labor and encourage them to seek prompt medical attention if they experience any symptoms.

To hospitals

- To establish a better archiving system for medical records.
- To prioritize the implementation of standardized protocols and guidelines for the management of multifetal pregnancies, ensuring consistency and quality of care across all clinical settings.

To the scientific community

- To conduct studies investigating the long-term health outcomes of children born following multifetal pregnancies, including neurodevelopmental outcomes, cardiovascular health, and metabolic health, can provide valuable insights into the impact of these pregnancies beyond the neonatal period.
- To prioritize research focused on identifying novel methods for preventing and managing complications associated with multifetal pregnancies such as preterm birth can inform the development of evidence-based clinical guidelines and interventions to improve neonatal outcomes.

REFERENCES

REFERENCES

1. Takang W, Pisoh D, Nyeumenou T, Mbu E. and Atanga, M. (2022) Outcomes of Twin Delivery at the Bamenda Health District, North West Region Cameroon. OJOG, 12, 465-481.
2. MacKay AP, Berg CJ, King JC, Duran C, Chang J. Pregnancy-Related Mortality Among Women With Multifetal Pregnancies. Obstetrics & Gynecology. 2006 Mar;107(3):563.
3. Centers for Disease Control and Prevention/National Center for Health Statistics. Multiple births . April 2024.
4. Olusanya BO. Perinatal Outcomes of Multiple Births in Southwest Nigeria. J Health Popul Nutr. 2011 Dec;29(6):639–47.
5. Santana DS, Silveira C, Costa ML, Souza RT, Surita FG, Souza JP, et al. Perinatal outcomes in twin pregnancies complicated by maternal morbidity: evidence from the WHO Multicountry Survey on Maternal and Newborn Health. BMC Pregnancy Childbirth. 2018 Nov 20;18(1):449.
6. Grantz KL, Kawakita T, Lu YL, Newman R, Berghella V, Caughey A. SMFM Special Statement: State of the science on multifetal gestations: unique considerations and importance. Am J Obstet Gynecol. 2019 Aug;221(2):B2-B12
7. Lazarov S, Lazarov L, Lazarov N. Complications of multiple pregnancies. Overwiew. TJS. 2016;14(1):108–11.
8. Pandey MR, Kshetri BJ, & Dhakal D. (2015). Maternal and Perinatal Outcome in Multifetal Pregnancy: A Study at a Teaching Hospital. Am J Public Health Res, 3, 135-138.
9. Namiiro FB, Mugalu J, McAdams RM, Ndeezi G. Poor birth weight recovery among low birth weight/preterm infants following hospital discharge in Kampala, Uganda. BMC Pregnancy Childbirth. 2012 Jan 9;12:1.

10. Charlotte TN, Didier BT, Njamen TN, Pierre NMJ, Roger EM, Henri E, et al. Pregnancies Outcome after Assisted Reproductive Technology: A Multicenter Case Control Study in a Low Income Setting Douala, Cameroon. OJOG. 2021 Jun 4;11(6):720–31.

11. Bellizzi S, Sobel H, Betran AP, Temmerman M. Early neonatal mortality in twin pregnancy: Findings from 60 low- and middle-income countries. J Glob Health. 8(1):010404.

12. WHO recommendations on antenatal care for a positive pregnancy experience. Geneva: World Health Organization; 2016.1 p. 978-92-4-154991-2

13. Choe J, Shanks AL. In Vitro Fertilization. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2023.

14. Martin J, Osterman M. Shifts in the distribution of births by gestational age, United States, 2014-2022. National Center for Health Statistics (U.S.); 2023.

15. World Health Organisation. Preterm birth. Geneva: WHO. May 2023.

16. Callahan T, Caughey AB. Blueprints Obstetrics and Gynecology. Lippincott Williams & Wilkins; 2013. 508 p.

17. D'Alton M, Breslin N. Management of multiple gestations. International Journal of Gynecology & Obstetrics. 2020;150(1):3–9.

18. Cunningham FG, Leveno KJ, Bloom SL, Dashe JS, Spong CY, Hoffman BL, et al. Multifetal pregnancy in: Williams obstetrics. Twenty-sixth edition. New York: McGraw Hill; 2022. 839 p.

19. American College of Obstetricians and Gynecologists. Multiple Pregnancy. ACOG: Women's Health.2021

20. Kalikkot Thekkeveedu R, Dankhara N, Desai J, Klar AL, Patel J. Outcomes of multiple gestation births compared to singleton: analysis of multicenter KID database. Maternal Health, Neonatology and Perinatology. 2021 Oct 28;7(1):15.

21. Demography - the study of human population and society - The map visualises the rate of twin deliveries (per 1000 total deliveries) in the world in the 2010-2015 period.

22. DeCherney AH, Roman AS, Nathan L, Laufer N, Margaret D. Multifetal gestation. CURRENT Diagnosis & Treatment: Obstetrics & Gynecology, 12e .McGraw Hill.2018, 303 p.

23. Barbieri RL. The Endocrinology of the Menstrual Cycle. In: Rosenwaks Z, Wassarman PM, editors. Human Fertility: Methods and Protocols. New York, NY: Springer, p. 145–69.

24. Menstrual Cycle (Normal Menstruation): Overview & Phases. Cleveland Clinic. 2023.

25. Teixeira AL da S, Fernandes Júnior W, Marques FAD, Lacio ML de, Dias MRC. Influence of different phases of menstrual cycle on flexibility of young women. Rev Bras Med Esporte. 2012 Dec;18:361–4.

26. Stanley GC. Menstrual cycle. Description, Phases, Hormonal Control, Ovulation, & Menstruation . Encyclopaedia Britannica.2024.

27. Georgadaki K, Khoury N, Spandidos DA, Zoumpourlis V. The molecular basis of fertilization (Review). Int J Molecular Med. 2016 Oct 1;38(4):979–86.

28. Kaufman MS. First Aid for the Obstetrics & Gynecology Clerkship. 2010.

29. Mogollón F, Casas-Vargas A, Rodríguez F, Usaquén W. Twins from different fathers: A heteropaternal superfecundation case report in Colombia. Biomedica. 2020 Dec 9;40(4):604–8.

30. Superfetation: Twins, Causes, Diagnosis, Risks & Delivery. Cleveland Clinic. 2023, Nov 17.

31. Stanford Medicine Children's Health .Overview of multiple pregnancy.2023 Nov 17

32. Asha J. Multifetal Pregnancy Clinical Presentation: History, Physical Examination.2021, April 19.

33. Narang K, Szymanski LM. Multiple Gestations and Hypertensive Disorders of Pregnancy: Curr Hypertens Rep. 2020 Nov 18;23(1):1.

34. Nkwabong E, Lhagadang F, Mbu R, Nana PN, Kouam L, Ngassa PC. Triple Gestations in Two University Teaching Hospitals in Yaounde, Cameroon Clinics in Mother and Child Health.2011.Vol.8.No 1.

35. Adank MC, Broere-Brown ZA, Gonçalves R, Ikram MK, Jaddoe VWV, Steegers EAP, et al. Maternal cardiovascular adaptation to twin pregnancy: a population-based prospective cohort study. BMC Pregnancy and Childbirth. 2020 May 29;20(1):327.

36. Marete I, Tenge C, Pasha O, Goudar S, Chomba E, Patel A, et al. Perinatal Outcomes of Multiple-Gestation Pregnancies in Kenya, Zambia, Pakistan, India, Guatemala, and Argentina: A Global Network Study. Am J Perinatol. 2014 Feb;31(2):125–32.

37. Beyene M, Komicha MA, Hussien H, Abdulwahed A, Hassen TA, Roba KT. Perinatal outcome of twin pregnancies among mothers who gave birth in Adama Hospital Medical College, Central Ethiopia. PLOS ONE. 2022 Sep 29;17(9):e0275307.

38. Vogel JP, Torloni MR, Seuc A, Betrán AP, Widmer M, Souza JP, et al. Maternal and Perinatal Outcomes of Twin Pregnancy in 23 Low- and Middle-Income Countries. PLOS ONE. 2013 Aug 1;8(8):e70549.

39. Katke R, Thakre N. Multifetal Pregnancy: Maternal and Neonatal Outcome. Int J Obstet Gynecol. 2015 Nov 2;3:00068.

40. Singh L, Trivedi K. Study of maternal and fetal outcome in twin pregnancy. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2017 May 25;6(6):2272–8.

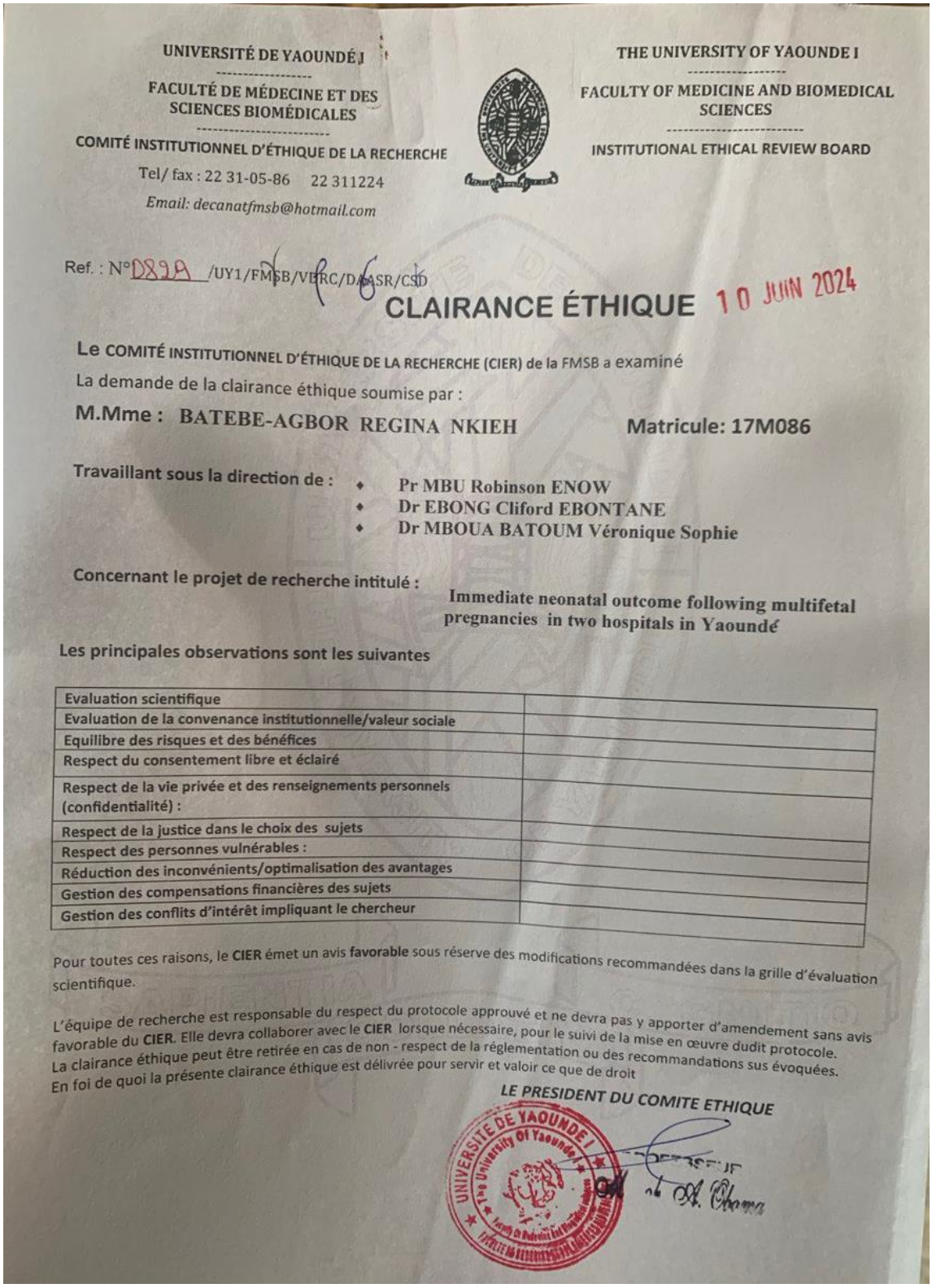
41. Tilahun T, Araya F, Tura G. Perinatal Complications of Twin Deliveries at Jimma University Specialized Hospital, Southwest Ethiopia: A Facility-based Cohort Study. Science, Technology and Arts Research Journal. 2015;4(1):134–8.

42. Monden CWS, Smits J. Mortality among twins and singletons in sub-Saharan Africa between 1995 and 2014: a pooled analysis of data from 90 Demographic and Health Surveys in 30 countries. The Lancet Global Health. 2017 Jul 1;5(7):e673–9.

APPENDIX

APPENDIX

APPENDIX I: ETHICAL CLEARANCE



UNIVERSITÉ DE YAOUNDÉ I
FACULTÉ DE MÉDECINE ET DES SCIENCES BIOMÉDICALES
COMITÉ INSTITUTIONNEL D'ÉTHIQUE DE LA RECHERCHE
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THE UNIVERSITY OF YAOUNDE I
FACULTY OF MEDICINE AND BIOMEDICAL SCIENCES
INSTITUTIONAL ETHICAL REVIEW BOARD

Ref. : N°0899 /UY1/FMSB/VDRC/DASR/CSD

CLAIRANCE ÉTHIQUE 10 JUIN 2024

Le COMITÉ INSTITUTIONNEL D'ÉTHIQUE DE LA RECHERCHE (CIER) de la FMSB a examiné
La demande de la clairance éthique soumise par :
M.Mme : BATEBE-AGBOR REGINA NKIEH Matricule: 17M086

Travaillant sous la direction de :
- Pr MBU Robinson ENOW
- Dr EBONG Cliford EBONTANE
- Dr MBOUA BATOUM Véronique Sophie

Concernant le projet de recherche intitulé :
Immediate neonatal outcome following multifetal pregnancies in two hospitals in Yaoundé

Les principales observations sont les suivantes

Evaluation scientifique	
Evaluation de la convenance institutionnelle/valeur sociale	
Equilibre des risques et des bénéfices	
Respect du consentement libre et éclairé	
Respect de la vie privée et des renseignements personnels (confidentialité) :	
Respect de la justice dans le choix des sujets	
Respect des personnes vulnérables :	
Réduction des inconvénients/optimalisation des avantages	
Gestion des compensations financières des sujets	
Gestion des conflits d'intérêt impliquant le chercheur	

Pour toutes ces raisons, le CIER émet un avis favorable sous réserve des modifications recommandées dans la grille d'évaluation scientifique.

L'équipe de recherche est responsable du respect du protocole approuvé et ne devra pas y apporter d'amendement sans avis favorable du CIER. Elle devra collaborer avec le CIER lorsque nécessaire, pour le suivi de la mise en œuvre dudit protocole.
La clairance éthique peut être retirée en cas de non - respect de la réglementation ou des recommandations sus évoquées.
En foi de quoi la présente clairance éthique est délivrée pour servir et valoir ce que de droit

LE PRESIDENT DU COMITE ETHIQUE

UNIVERSITE DE YAOUNDE I The University Of Yaounde I

APPENDIX II: RESEARCH AUTHORISATION 1

REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie

MINISTERE DE LA SANTE PUBLIQUE

HOPITAL GYNECO-OBSTETRIQUE
ET PEDIATRIQUE DE YAOUNDE

HUMILITE – INTEGRITE – VERITE - SERVICE

REPUBLIC OF CAMEROON
Peace-Work-Fatherland

MINISTRY OF PUBLIC HEALTH

YAOUNDE GYNAECO-OBSTETRIC
AND PEDIATRIC HOSPITAL

HUMILITY – INTEGRITY – TRUTH - SERVIC

COMITE INSTITUTIONNEL D'ETHIQUE DE LA RECHERCHE
POUR LA SANTE HUMAINE (CIERSH)

Arrêté n° 0977 du MINSANTE du 18 avril 2012 portant création et organisation des Comités d'Ethiques de la Recherche pour la santé Humaines. (CERSH).

AUTORISATION N° 610 /CIERSH/DM/2024

CLAIRANCE ETHIQUE

Le Comité Institutionnel d'Ethique de la Recherche pour la Santé Humaine (CIERSH) a examiné le 21 février 2024, la demande d'autorisation et le Protocole de recherche intitulé « **multifetal pregnancies and immediate neonatal outcome in two hospitals in Yaounde** » soumis par l'étudiant BATEBE AGBOR REGINA NKIEH.

Le sujet est digne d'intérêt. Les objectifs sont bien définis. La procédure de recherche proposée ne comporte aucune méthode invasive préjudiciable aux participants. Le formulaire de consentement éclairé est présent et la confidentialité des données est préservée. Pour les raisons qui précèdent, le CIERSH de HGOPY donne son accord pour la mise en œuvre de la présente recherche.

BATEBA AGBOR REGINA NKIEH, devra se conformer au règlement en vigueur à HGOPY et déposer obligatoirement une copie de ses travaux à la Direction Médicale de ladite formation sanitaire.

Yaoundé, le 28 FEV 2024

LE PRESIDENT

Prof MBU Robinson
Directeur Général
HGOPY

APPENDIX III: RESEARCH AUTHORISATION 2

REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie
MINISTERE DE LA SANTE PUBLIQUE
SECRETARIAT GENERAL
DIRECTION DE L' HOPITAL CENTRAL DE YAOUNDE
SECRETARIAT MEDICAL
N° 020/24/ AP/MINSANTE/SG/DHCY/CM/SM

REPUBLIC OF CAMEROUN
Peace-Work-Fatherland
MINISTRY OF PUBLIC HEALTH
GENERAL SECRETARY
DIRECTORATE OF CENTRAL HOSPITAL OF YAOUNDE
MEDICAL SECRETARY

Yaoundé, le 07 FEV 2024

ACCORD DE PRINCIPE

Je soussigné Professeur FOUDA Pierre Joseph, Directeur de l'Hôpital Central de Yaoundé, marque mon Accord de Principe à Madame BATEBE-AGBOR REGINA NKIEH , étudiante en 7ème année de Médecine générale à la Faculté de Médecine et des Sciences Biomédicales de l'Université de Yaoundé I, sous le thème « MULTIFETAL PREGNANCIES AND IMMEDIATE NEONATAL OUTCOME IN TWO HOSPITALS IN YAOUNDE» dans le service de Gynécologie et Obstétrique à l'Hôpital Central de Yaoundé, sous la codirection du docteur EBONG Cliford.

Pour Le Directeur et par ordre
Le Conseiller Médical

Le Conseiller Médical
Pr Olga Pierre Engolo Zogo

Ampliations :

- Conseiller Médical ;
- Chef service concerné ;
- Intéressée;
- Chrono/Archives.

APPENDIX IV: DATA COLLECTION SHEET

Topic: IMMEDIATE NEONATAL OUTCOME FOLLOWING MULTIFETAL PREGNANCIES IN TWO HOSPITALS IN YAOUNDE

Date:__ /__ /__ Questionnaire number:___
Patient Code: __ /__ /__ /__

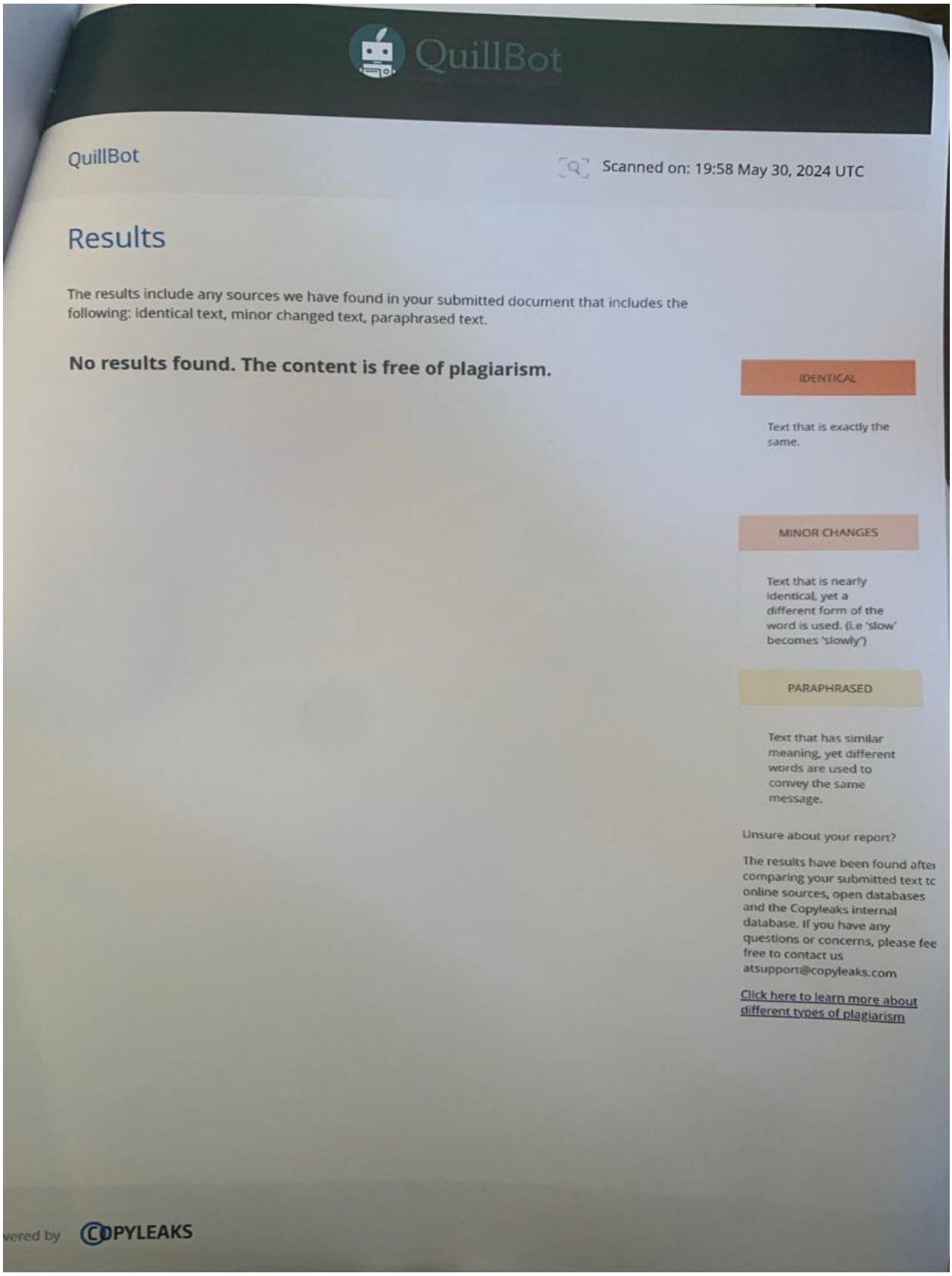
Number	Variable	Answer
1. SOCIODEMOGRAPHIC VARIABLES		
1.1	Exposed group=1, Unexposed group=2	
1.2	Recruitment site:Yaounde Central Hospital=1, Yaounde Gynaecology,Obstetrics and Pediatrics Hospital=2	
1.3	Age: 15-19=1, 20-24=2, 25-29=3, 30-34=4, 35-39=5, >/40=6	
1.4	Marital status: Married=1 , Single=2, Divorced=3, Widow=4	
1.5	Level of education: None=1, Primary=2, secondary(6eme-3eme)=3, High School(2^{nd}-Tle)=4, University=5	
1.6	Occupation: Civil=1, Private=2, Informal=3, Student=4, Housewife=5, Unemployed=6	
1.7	Region of origin: Extreme north = 1; North = 2; Adamawa = 3; Centre = 4; Littoral = 5; North West = 6; South West = 7; West = 8; East = 9; South = 10	
1.8	Religion: Christian=1, Muslim=2, Atheist=3	
1.9	Gravdity: 1-2=1, 3-4=2, 5-6=3, 7-8=4, 9-10=5,>10=6	
1.10	Parity: 1-2=1, 3-4=2, 5-6=3, 7-8=4, 8-9=5, >10=6	
2. OBSTETRIC HISTORY		
2.1	History of multifetal pregnancy? Yes=1, No=2	
2.2	If yes, what was the fetal number? One =1, Two=2, Three=3, >three=4	
2.3	What was the mode of delivery of the multifetal pregnancy? Vaginal=1, C-section=2	

	3. PAST MEDICAL HISTORY	
3.1	Medical conditions: Hypertension=1, Diabetes=2, HIV=3, Hepatitis=4, Others=5, None=6	
3.2	Do you smoke? Yes=1, No=2	
3.3	Do you consume alcohol? Yes=1, No=2	
3.4	Have you ever had an ART? Yes=1, No=2	
3.5	If yes, which one? IVF=1, Ovulation induction=2, Others=3	
3.6	Family history of multifetal pregnancy? Yes=1, No=2	
	4. FOLLOW-UP OF PREGNANCY	
4.1	Gestational age at time of diagnosis: 1st Trimester=1, 2nd Trimester=2, 3rd Trimester=3	
4.2	Number of antenatal consultations done : <8=1, >8=2	
4.3	Gestational age at first antenatal consultation: 1st Trimester=1, 2nd Trimester=2, 3rd Trimester=3	
4.4	Antenatal consultations done by: Gynaecologist = 1; Medical doctor = 2; Midwife = 2; Nurse = 3	
4.5	Number of obstetrical ultrasounds done : <3=1, >3=2	
4.6	Number of foetuses : One =1, Two=2, Three=3, >three=4	
4.7	Fetal or placental abnormalities on echography?Yes=1, No=2	
4.8	HIV done? Yes = 1; No = 2	
4.9	Hepatitis B done? Yes = 1; No = 2	
4.10	Hepatitis C done? Yes = 1; No = 2	
4.11	Syphilis done? Yes = 1; No =2	
4.12	Toxoplasmosis done? Yes = 1; No = 2	
4.13	Anaemia in pregnancy? Yes = 1; No = 2	
4.14	Did you take daily iron and folic acid? Yes = 1; No = 2	
4.15	Number of antitetanic vaccine taken: <2=1, >2=2	
4.16	Insecticide treated long lasting mosquito nets? Yes = 1; No = 2	
4.17	Any pathologies during pregnancy? Yes = 1; No = 2	
4.18	If yes ,which?Malaria=1, UTI=2, Other=3	
4.19	Mode of delivery: Vaginal delivery=1, C-Section=2, Instrumental delivery=3	
4.20	If C-section, circumstances of C-section: Elective=1, Emergency=2	
4.21	Qualification of surgeon: Consultant=1, Resident in Obstetrics and Gynaecology (Specify level) ,Other=3	
4.22	If> 1 foetus, interval between 1 foetus and the next (in minutes): <15 =1, 15-30 =2, >30=3	

	5.FOETAL OUTCOME	
5.1	Gestational age at delivery (in weeks): <37=1, 37-42=2, >42=3	
5.2	Sex of neonate(s): Male=1, Female=2	
5.3	Birth weight(s):<1000g=1, 1000-1499g=2,1500- 2000-2499g=3 2500g-3500g=4, >3500g=5	

5.4	Fetal length(s) in cm: <50=1, >50cm=2	
5.5	Fetal head circumference(s) in cm : <30=1, 30-35=2,>35=3	
5.6	Fetal mid upper arm circumference(s) in cm: <11.5=1,11.5-12.5>2, >12.5=3	
5.7	APGAR Score at 5 minutes: <7=1, >7=2	
5.8	Any notion of fetal distress? Yes=1, No=2	
5.9	Was there neonatal resuscitation? Yes=1, No=2	
5.10	Fetal demise? Yes=1, No=2	

APPENDIX V: ANTI-PLAGIARISM REPORT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