UNIVERSITY OF NIGERIA

The Obstetrician and the Female Pelvic Floor: Protecting the 'Floor' and Improving Childbirth Experience

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By

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The Obstetrician and the Female Pelvic Floor: Protecting the 'Floor' and Improving Childbirth Experience

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Ladies and Gentlemen

I feel honoured to stand before you today to deliver the 185th Inaugural Lecture of this great University that moulded me. My major regret is that my parents Mr. Augustine Ugwu and Mrs Janeth Ugwu are not alive today to witness this great and memorable event organized solely for me. May their gentle souls rest in peace, Amen. But am happy that my Step Mother -- Mrs Dorathy Ugwu who took me as her son and saw me through my training, is alive and here to witness this joyous moment.

I am grateful to the Vice Chancellor, Prof Charles Igwe who permitted a seamless and faster appraisal process in the university, and ensured that external assessors returned their assessments on time. I welcome all of you present; and thank you for making out time, out of your busy schedule, to be here

WHO IS PROF. EMMANUEL ONYEBUCHI VALENTINE UGWU?

I am the first child of Late Mr. Augustine and Late Mrs. Janet Ugwu of Amogbo-Akuma village, Ibagwa-Ani, Nsukka LGA, Enugu State. I had my primary education at the Central School, Okpaligbo. Thereafter, I started my secondary education at Community Secondary School Ibagwa-Ani, graduating as the best student of my class. Afterwards, I gained admission into the medical school of University of Nigeria (UNN) in 1994 for a six-year medical training which eventually extended to seven years as a result of the prolonged 'Academic Staff Union of Universities' (ASUU) industrial action at that time. Prompted by the death of my mother, who died while giving birth due to poor obstetric care, I chose to specialize in Obstetrics & Gynaecology so as to improve women's experiences during childbirth and ensure that no woman dies during childbirth from a preventable cause. And this I have ensured to the best of my abilities. I gained admission on merit into a residency program in the Department of Obstetrics and Gynaecology of UNTH Enugu in August 2005, immediately after my national youth service corp (NYSC).

During the residency training program, I applied myself very well and was appointed the 'Chief Resident' of the department. I obtained the Fellowship of the West African College of Surgeons (WACS) within four (4) years (2009) of the training and that of the National Postgraduate Medical College (NPMCN) (2011).

After my specialist training, I was retained by the UNTH Management as a 'Post-Fellowship Senior Registrar' pending availability of a 'consultant position' in the hospital or 'lecturer position' in the University of Nigeria. I was appointed as 'Lecturer 1' by the University of Nigeria in April 2011, and as an 'Honorary Consultant Obstetrician & Gynaecologist' by the UNTH in August 2011.

In other to acquire capacity for independent research and personnel management, I sought for and obtained admissions into several postgraduate academic and professional programs: Master in Public Health, MPH (UNN, 2012); Master of Public Administration, MPA (NOUN, 2014); Fellowship of International College of Surgeons (FICS, 2017); Master of Science (MSc) in Human Reproduction and Women Health (UNN, 2018); Doctor of Medicine in Obstetrics & Gynaecology (MD) (NPMCN, 2022); and Doctor of Philosophy, PhD (UNN, 2023). The acquisition of these academic and professional degrees must have contributed to the numerous high quality and ground-breaking publications I have co-authored, and my rapid progression to professorial cadre in the University of Nigeria. It must have also contributed to my managerial

capacity including Editorship of several journals, and appointment as chairman, medical advisory committee (CMAC) and director of clinical services and training of UNTH, Enugu.

I have over one hundred and fifty (150) academic publications (Appendix 1) with over one hundred (100) of these papers published in journals with Thomson Reuters and SCimago Impact Factors. I have over 100 publications indexed in PubMed; Google Scholar citation of 3077; h-index of 29; and i10-index of 61. I have a ResearchGate Score (RG Score) of 35.25; and Research Interest of 1411. I have presented over 50 papers in international conferences. I currently serve as the Editor in Chief of the prestigious International Journal of Medicine and Health Development (Int J Med Health Dev) -- The official publication of the 'Directorate of Research and Publications', College of Medicine, UNN. I also currently serve as the 'Section Editor' of the great 'Nigerian Journal of Clinical Practice' (NJCP) -- The official publication of the 'Medical and Dental Consultants Association of Nigeria' (MDCAN). The NJCP is one of the very few Nigerian Medical Journals with Thomson Reuters Impact Factor. I also serve in the editorial board of several local and international medical journals.

I have served (and still serving) in several College/University committees, and in Nigerian Medical Association, and the Federal Ministry of Health. My astuteness and dedication to research and innovations have won me many competitive academic awards including -- Meritorious winner of the 2017 Prof Nwokolo Price Award for Academic Excellence in the College of Medicine (Academic Staff Category); Meritorious Winner of the 2018 University of Nigeria Nsukka (UNN) Academic Excellence Award (Academic Staff Category); John Sciara 'Honorary Mention' Award for Best Academic Research Paper from Low and Middle Income Countries (2015); The Journal of Obstetrics and Gynaecology Research Award for Best Research Article for Pelvic Floor Protection in 2019; to mention but a few.

By 2022, I have thought over 1500 medical doctors, and supervised the final Fellowship Dissertations of over 30 Postgraduate Resident Doctors who are now Consultants and Lecturers at various universities and hospitals across the world. I am an examiner for the Part I and II examinations in Obstetrics & Gynaecology for both National Postgraduate Medical College (NPMCN) and West African College of Surgeons (WACS); I also serve in the accreditation teams of both Colleges. I am an external examiner to several medical schools including Nnamdi Azikiwe University (NAU) Medical School, Anambra State University Medical School, Madona University

Medical School, etc. I am the current Chairman, Medical Advisory Committee (CMAC) and the Director of Clinical Services, Research and Training of the great University of Nigeria Teaching Hospital (UNTH).

Besides the Nigerian Medical Association, I also belong to a number of other academic/professional Associations including: Society for Gynaecology and Obstetrics of Nigeria (SOGON), West African College of Surgeons (WACS), National Postgraduate Medical College (NPMCN), Cochrane Collaborations Groups, International Urogynecology Association (IUGA), American Society of Urogynecology (AUGS), etc.

I enjoy workouts, "gisting", listening to good music, and watching football. I am happily married to Dr. Angela Ogechukwu Ugwu and we are blessed with four lovely children – Val (Jnr), Dumebi, Toni, and Kenenna.

CHOICE OF THE TITLE FOR TODAY'S LECTURE

Like I stated earlier, I went into OBGYN to improve women's childbirth experiences and prevent preventable maternal deaths -- the kind that took away my dear mum at her very young age of 25years. During the course of my residency training and in the early years of my career, I realized that women often suffer during labour especially in poor-resource settings of Africa. I also realized early that most of the sufferings and discomfort arose as a result of prolonged pregnancy (pregnancy lasting longer than usual); prolonged labour (labour duration lasting longer than usual); adverse events during the birthing process; and some other complications that follow childbirth. Bearing this in mind, I began to generate and test hypothesis that could help improve women's childbirth experiences, and protect their perineum and pelvic floor from harm and consequent postpartum morbidities. I hypothesized that any interventions that could reduce the duration of pregnancy (preventing it from being prolonged), reduce the duration of labour (preventing it from lasting longer than usual, and getting prolonged or obstructed); and prevent the development of certain postpartum complications including perineal tear/lacerations, urinary incontinence (involuntary leakage of urine) and anal incontinence (involuntary leakage of flatus or faeces) would ultimately result in improved women's childbirth experience. Consequently, I tailored majority of my researches and publications into interventions to achieving these desired objectives. All these culminated to the choice of this lecture titled "The Obstetrician & The Pelvic Floor: Protecting The Floor & Improving Childbirth Experience." Upon

arriving at this title for this lecture, I quickly sent it to one of my great academic mentors, Prof Cyril Dim to thinker on and make necessary modifications but surprisingly he responded within few minutes stating that the title was apt and captured most of my research works in OBGYN practice. His spontaneous approval was no doubt the booster I needed to develop the lecture which I am sharing with you today.

INTRODUCTION

I will begin this section by asking: who is an Obstetrician?

An Obstetrician is a "physician that specializes in the care of women during pregnancy, labour (childbirth), and puerperium (after they have given birth)."[1] They also treat medical conditions unique to pregnancy and perform surgeries related to labor and delivery. On the other hand, a Gynaecologist is a physician that specializes in treating conditions that affect the female reproductive system — which includes the vulva, vagina, uterus (womb) and ovaries.[1] The training for both specialties often go together and the specialist is usually referred to as Obstetrician & Gynaecologist.

Now that we have understood who an Obstetrician is, the next is to understand what the perineum and pelvic floor refer to. The female perineum is that diamond-shaped structure inferior to the pelvic diaphragm, between the symphysis pubis and coccyx and between the inner aspects of the thighs. And a very important part of the perineum is the perineal body (PB). This part (PB) is very important to the obstetrician and it is also referred to as the 'central tendon' of the perineum. It is a fibro-muscular structure located in the mid-line of the perineum. Its exact location is in the mid-line of the perineum at the junction of the anus and urogenital triangle in both females and males.[2] In females, it is found between the anus and the posterior limit of the vulvar orifice. The perineal body helps strengthen the pelvic floor and provides attachments to several muscles of the pelvic floor (Figures 1 and 2 below).[2,3] Though small, this is an important and vital area of the lower part of a woman's body because it holds many tissues that support the Vagina and Anus in their respective places. The muscles in this area are responsible for tightening and loosening the vagina. When there is deformity or significant damage or defect on the perineum, a cosmetic surgery called *perineoplasty* could be done. This surgery aims at removing any scar tissue, bulges, unwanted skin and loosening or tightening of the muscles and vagina.

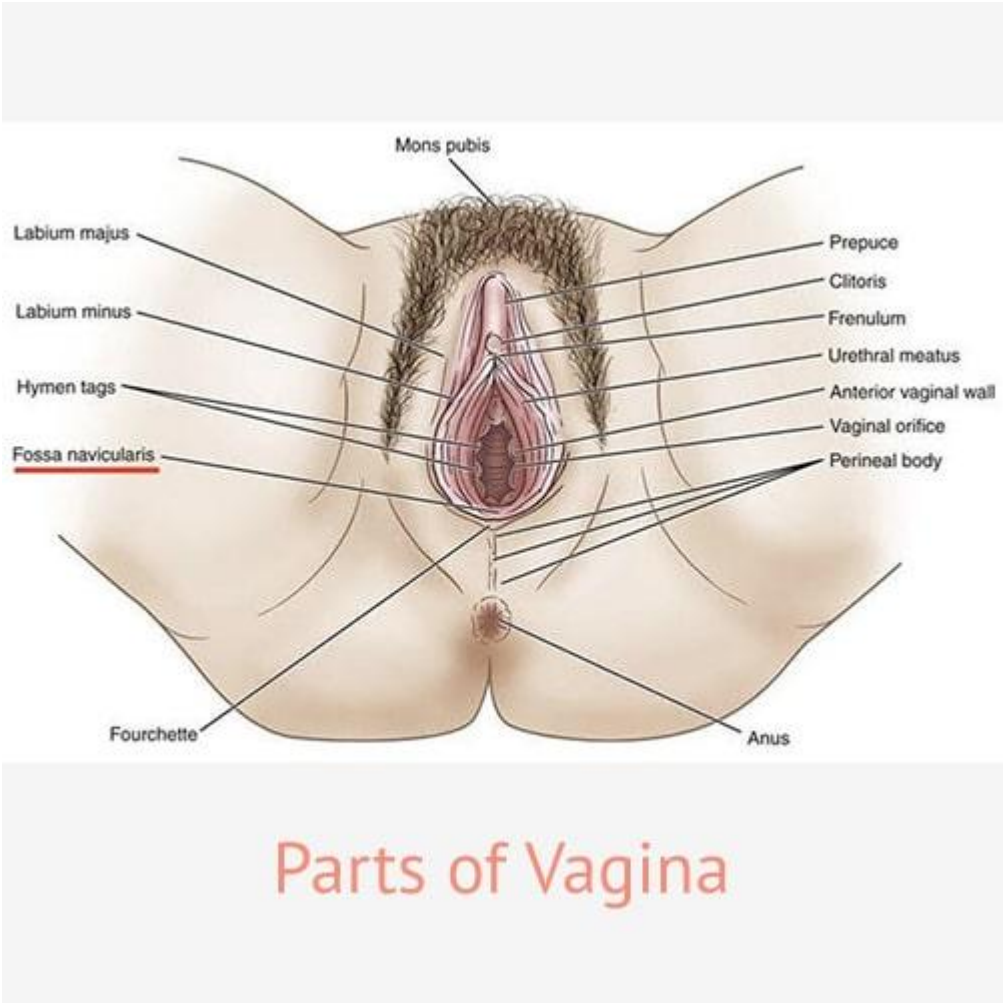
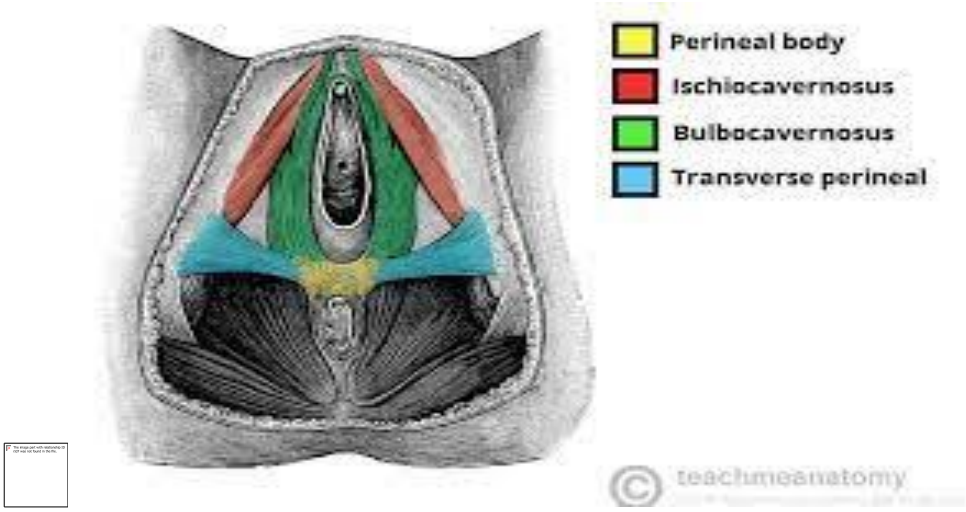


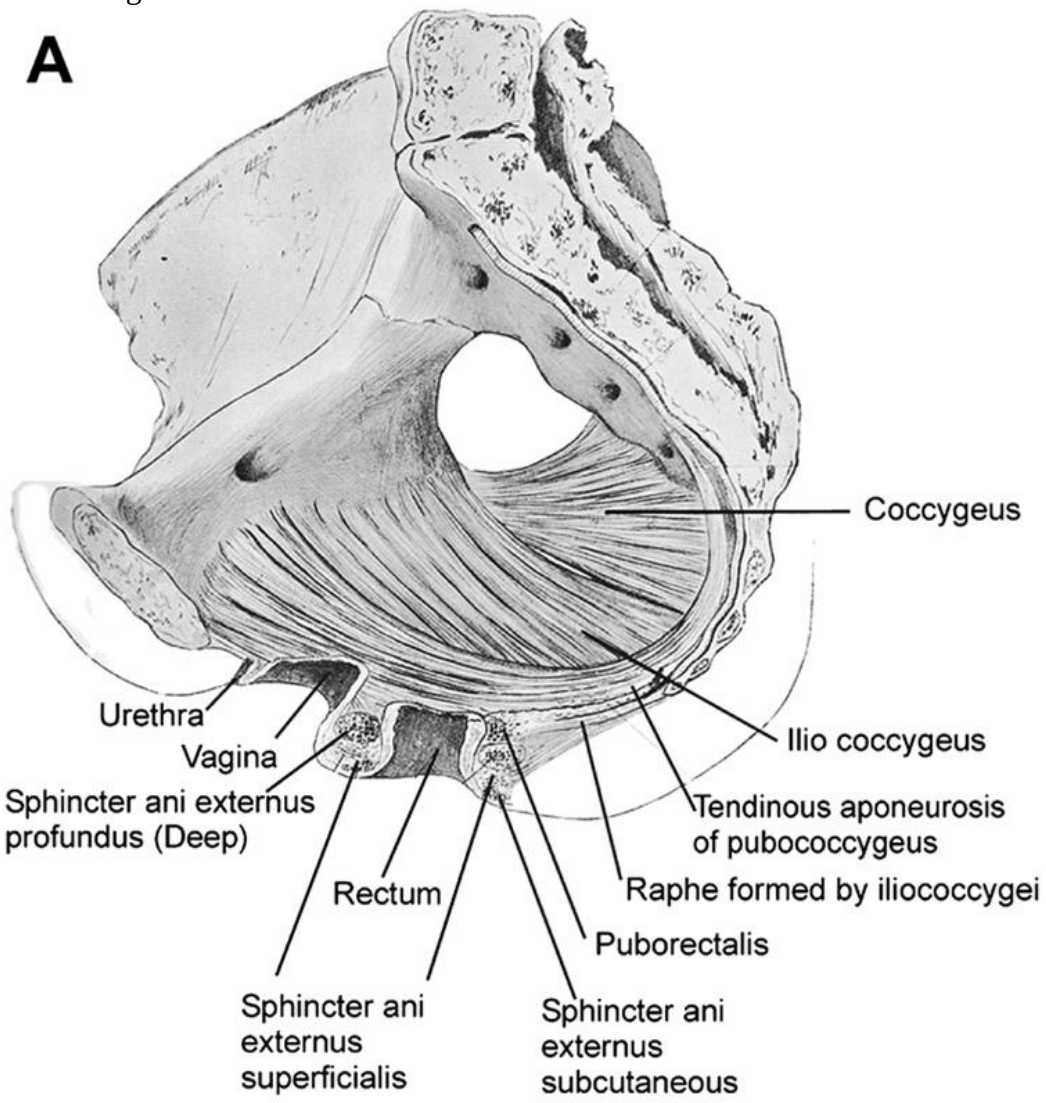
Figure 1: Kraima AC, et al. The anatomy of the perineal body in relation to abdominoperineal excision. Colorectal Dis. 2016;18(7): 688-95/

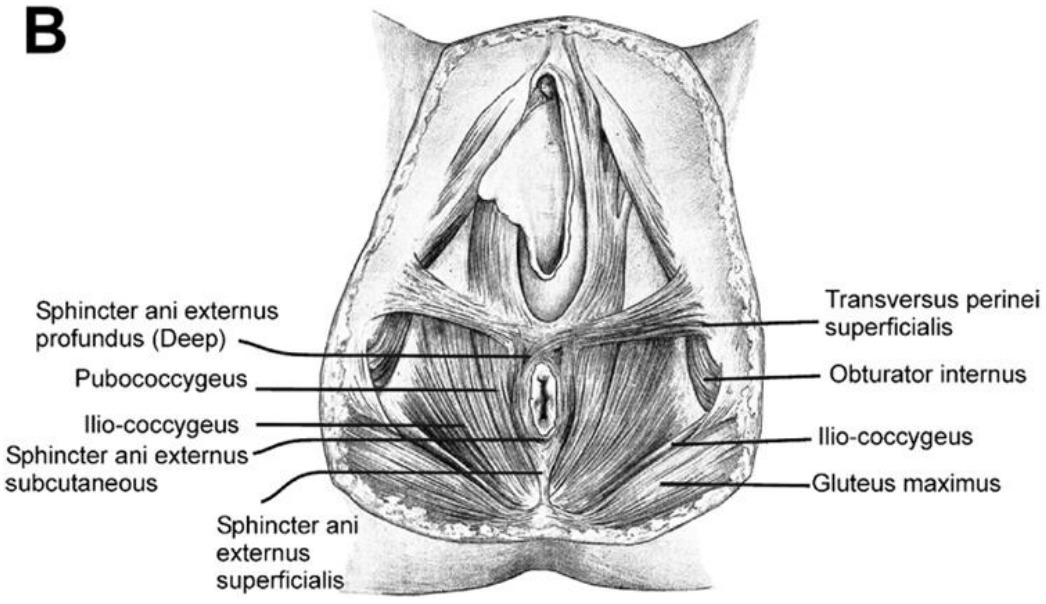


Fgure 2: Pelvic Floor Muscles Seen in the sagittal section of pelvis. Adapted from Thompson P. The Myology of the Pelvic Floor. Newton: McCorquoddale; 1899.

Now that we know what the perineum is, the next important term to define and understand before I proceed with this lecture is the pelvic floor. The pelvic floor is a dome-shaped muscular sheet separating the pelvic cavity above from the perineal region below.[2] This cavity encloses the pelvic viscera - bladder, intestines, and uterus (in females). The pelvic floor muscles (figures A & B) are located *between the tailbone (coccyx) and the pubic bone within the pelvis.*[2] They support the bowel and bladder (as well as the uterus and vagina in females). Muscular bands (sphincters) encircle the urethra, vagina and anus as they pass through the pelvic floor.

Figures


A
Coccygeus
Urethra
Vagina
Sphincter ani externus profundus (Deep)
Rectum
Sphincter ani externus superficialis
Ilio coccygeus
Tendinous aponeurosis of pubococcygeus
Raphe formed by iliococcygei
Puborectalis
Sphincter ani externus subcutaneous


B
Sphincter ani externus profundus (Deep)
Pubococcygeus
Ilio-coccygeus
Sphincter ani externus subcutaneous
Sphincter ani externus superficialis
Transversus perinei superficialis
Obturator internus
Ilio-coccygeus
Gluteus maximus

The Pelvic floor muscles above have two major functions; they provide: (1); support or act as a “floor” for the abdomino-pelvic viscera including the bladder, uterus, rectum, etc. and (2); constrictor or continence mechanism to the urethral, anal and vaginal orifices (in females).[4] These functions are very critical in women as pregnancy and childbirth predispose to injuries to the pelvic floor with consequent malfunction of the floor musculature, fascia and nerves leading to certain morbidities including pelvic organ prolapse (POP); urinary incontinence (UI); anal incontinence (AI) -- faecal incontinence, flatus incontinence; sexual dysfunction (SD); poor body image; and low quality of life (QoL); etc.

Now that we know what an Obstetrician is, and what the perineum and pelvic floor refer to, it is important at this point to note that while the obstetrician is caring for the woman during pregnancy and during childbirth they must ensure that the integrity and strength of the perineum and pelvic floor are maintained as much as possible to avert the development of certain maternal morbidities as a result of injuries and weaknesses to the pelvic floor musculature and nerves.

Thus, since my appointment as a clinical lecturer in Obstetrics and Gynecology in 2011, I have been involved in several researches and clinical trials aimed at improving women’s childbirth experiences via formulation and testing of hypothesis that could protect the perineum and pelvic floor during pregnancy and childbirth. This is in view of the fact that a good Obstetrician doesn't only ensure that a healthy baby is delivered but also ensures that the childbirth experience is associated with minimal risk to the mother including her perineum and the pelvic floor. This is even more important now as Obstetricians are increasingly faced with litigation for any adverse events to the mother and/or baby traceable to maleficence (negligence or wrong doing) during pregnancy or childbirth. Reports of such litigation abound especially in developed clime. Therefore, the need and significance of care and caution to the pelvic floor during pregnancy and childbirth cannot be overemphasized.

This inaugural lecture is therefore made of three parts: the first part centers on the antepartum (during pregnancy) measures that have potentials to reducing obstetric injuries to the perineum/pelvic floor and minimizing antepartum and postpartum morbidities, the second discusses the intrapartum (during labour) measures that could minimize these injuries and postpartum morbidities. Each of these two parts discusses the outcome of my study interventions alongside other related studies in the literature that could improve women’s experiences during childbirth and reduce the risks of

certain postpartum morbidities including urinary and anal incontinence. The third and final part of this lecture presents my current and future research interests/directions.

Antepartum interventions for reducing perineal/pelvic floor injuries and improving childbirth experience

Perineal and pelvic floor trauma during childbirth is a very common event. It can occur spontaneously as a laceration or intentionally as an episiotomy, especially during the first vaginal birth.[6] The incidence is high and ranges from 30 to 85%, with 60–70% requiring suturing.[6,7] It is associated with significant morbidities, including post-partum hemorrhage, precarious maternal bonding with baby, post-partum perineal pain, postpartum urinary incontinence (UI), anal incontinence (AI), sexual dysfunction and delayed time to resume sexual intercourse.[6-8]

In order to reduce the incidence of perineal trauma/injuries and associated postpartum morbidities, we designed a randomized controlled trial in 2018 to determine the effectiveness of antenatal perineal massage (APM) in reducing perineal trauma and post-partum morbidities.[9] The intervention group received APM, while the control group did not receive APM. We observed that women who received APM were significantly more likely to have an intact perineum after childbirth [27/53 (50.9%) vs 16/55 (29.1%); RR: 1.75; 95% CI: 1.07–2.86; P = 0.02]. The incidence of episiotomy was lower in the intervention group [20/53 (37.7%) vs 32/55 (58.2%); RR: 0.65; 95% CI: 0.43–0.98; P = 0.03; NNT = 5]. Interestingly, we also observed that only five women need to receive APM in order to prevent a case of episiotomy (numbers needed to treat (NNT) = 5). Also the women who received APM were significantly less likely to develop flatus incontinence [4/53 (8.3%) vs 13/55 (26.0%); RR: 0.32; 95% CI: 0.11–0.91; P = 0.03]. We concluded that APM reduces the incidence of episiotomy and increases the incidence of women with an intact perineum after vaginal delivery. We also concluded that APM reduces the risk of flatus incontinence after childbirth without increasing maternal or neonatal complications. In view of these findings we recommended that women should be counseled on the likely benefits of APM and the information provided during antenatal care. Also, Obstetricians should consider the technique as a routine prenatal care for nulliparous women so as to reduce the incidence of perineal trauma during vaginal birth. It is important to note here that this intervention is currently being widely used especially in Europe by women who wish to achieve intact perineum during childbirth. The study has received over 500 citations within 5

years of publication and was selected as the best impact and clinical (research) article by the Society of Obstetrician and Gynecologist of Japan in 2021.

Prolonged pregnancy otherwise known as post-term pregnancy has been shown to be associated with increased risk of instrumental deliveries, perineal injuries, and sexual dysfunction. It is also often associated with increased risk of perinatal morbidity and mortality, especially in low resource settings.[10] The incidence of post-term pregnancy is high and varies widely depending on the method of determination of the gestational age,[11,12] local practice protocol, and the study population.[12]

In an effort to reduce the incidence of post-term pregnancy and its associated feto maternal risks, we designed a randomized controlled trial in 2014 to evaluate the effectiveness of Membrane stripping (sweeping) to prevent post-term pregnancy and improve women experiences during childbirth.[13]

This study involved 134 postdate pregnant women at the University of Nigeria Teaching Hospital, Enugu, Nigeria. The intervention group received membrane stripping while the control group did not receive membrane stripping. We observed that the incidence of post-term pregnancy in the membrane stripping group was 16.1 % (10/62) versus 39.3 % (24/61) in the control group (RR 0.41; 95 % CI 0.22–0.78; P = 0.004; NNT = 4). Only four women were needed to undergo membrane stripping in order to prevent a case of post-term pregnancy. Also Membrane stripping reduced the duration of pregnancy by 3 days (P < 0.001). And the procedure significantly reduced the need for 'formal' labor induction [7/62 (11.3 %) vs. 23/61 (37.7 %); RR 0.30; 95 CI 0.14–0.65; P = 0.002]. Thus the women did not need to spend money and time for formal induction of labour. The intervention was not associated with any maternal and/or neonatal complications. We concluded that membrane stripping reduces the incidence of post-term pregnancy and need for formal induction of labor in post-date pregnant women, without increasing maternal or neonatal complications. And should be considered first for women with post-datism before embarking on formal induction of labour. Note here that this intervention study contributed data to the systematic review and meta-analysis commissioned by World Health Organization (WHO) which has recommended membrane stripping as a first line strategy for prevention and management of prolonged pregnancy.

Induction of labour is a common strategy that obstetricians often employ to artificially initiate labour. And it is widely carried out all over the world in cases where continuation of pregnancy is hazardous to the mother and/or the fetus. The incidence

varies widely ranging from 3% to 20%,[14] and in over 80% of cases where induction of labour is indicated, the cervix is often unfavourable, requiring prior cervical ripening.[15] Transcervical Foley catheter is a commonly used technique in our environment.[16] However, the duration to achieve cervical ripening with this method could be up to 5 days.[17,18] The risks associated with the technique increase with increasing duration to achieve a favourable cervix. On the other hand, vaginal misoprostol has been shown to produce a more rapid change in cervical scores.[16,19] At doses above 25 μ g 4-hourly, misoprostol is more effective in cervical ripening than the conventional methods, including the Foley catheter.[20] However, it is associated with significantly higher risks of hypertonus, tachysystole, uterine hyperstimulation and uterine rupture at these high doses.[20]

In view of the above, we therefore hypothesized that since lower doses of 25 μ g and below have been shown to be similar with the conventional methods, including the Foley catheter both in effectiveness and risks,[20,21] the synchronous use of the Foley catheter and low dose 25 μ g misoprostol may hasten the ripening process and enhance effectiveness without increasing risks. We also additionally hypothesized that Caesarean section can to a large extent be avoided in some of the clinical situations where it is performed because of unfavourable cervix, e.g. pre-eclampsia and eclampsia. These led us to design a randomized controlled trial for my Part 2 dissertation of the National Postgraduate Medical College of Nigeria (NPMCN) in 2010, to assess the comparative effectiveness of Foley catheter and synchronous administration of low dose misoprostol with Foley catheter alone and low dose misoprostol alone for pre-induction cervical ripening, and also to establish the relative safety of these three techniques in a low resource setting.[22] In this study we assigned term pregnant women with unfavourable cervices (Bishop 's score 6) requiring cervical ripening/induction of labour randomly into three groups: Group A, transcervical Foley catheter was used synchronously with low dose intravaginal misoprostol; Group B, transcervical Foley catheter alone was used and Group C, low dose intravaginal misoprostol alone was used. We observed that the time to achieve a favourable cervical status as well as vaginal delivery was significantly shorter in the synchronous group than in the control groups ($p < 0.05$). We concluded that the synchronous use of Foley catheter and misoprostol is very effective in cervical ripening and should be considered in clinical situations where there is need to hasten vaginal delivery in the presence of an unripe cervix. It is worthy of note that this technique is now widely used across the world whenever there

is need to expedite vaginal delivery in the face of unripe cervix. The favourable outcome of this study has also increased our local confidence in the use of misoprostol (cytotec) for cervical ripening and induction of labour. Prior to this study many obstetricians were skeptical with use of this agent because of its potential to cause uterine rupture.

In our further efforts to make labour less stressful for our women and improve their experiences during childbirth, we explored alternate route of administration of misoprostol other than the traditional vaginal route which is sometimes embarrassing for the women. We therefore designed another randomized controlled trial in 2015 aimed at comparing the effectiveness and maternal satisfaction of orally administered misoprostol versus vaginally administered misoprostol for induction of labor at term.[23] In this study, we randomized the women equally into two groups (A and B) to receive oral and vaginal misoprostol, respectively. We observed that both routes of administration were effective, however the vaginal route reduced the mean induction–vaginal delivery interval by four-and-half hours (20.7 ± 12.1 vs. 16.2 ± 10.4; mean difference: 4.50, 95 %CI 0.63–0.82; p = 0.02). We also observed that the mean dose of misoprostol required to achieve induction of labor and the mean duration of oxytocin augmentation when indicated were significantly less in the vaginal group than in the oral group (2.5 ± 1.3 vs. 2.0 ± 1.1; mean difference: 0.50, 95 % CI 0.10–0.90; p = 0.02 and 4.6 ± 3.2 vs. 3.4 ± 3.1; mean difference: 1.20, 95 % CI 0.15–0.23; p = 0.03 respectively). However, neonatal complications and maternal satisfaction were similar between the two groups. We therefore concluded that both routes of administration are effective in the induction of labor at term and have comparable maternal satisfaction. However, the vaginal route has the added advantage of shorter induction–delivery interval among others, and thus should be highly considered when induction of labor is indicated at term.

In 2019, we observed that although castor oil has long been used as a way of inducing labor and preventing post-term pregnancy, its safety and effectiveness has not been conclusively investigated and still controversial. We therefore designed a randomized controlled trial to evaluate the effectiveness of single oral dose of castor oil at 40-41 weeks of gestation for prevention of post-term pregnancy, in a low resource setting.[24] In the study, eligible participants were randomized into two groups; group A (intervention group) received oral castor oil (60mls) and group B (control group) did not receive castor oil. We observed that the intervention group had a lower incidence

of post term pregnancy compared to the control group (18/105(17.1%) vs 44/106(41.5%), RR= 0.41, NNT= 4). And interestingly, only four women needed to take castor oil to prevent one case of post term pregnancy (NNT = 4). We also observed that the proportion of women requiring formal induction of labor with misoprostol or with oxytocin was significantly lower in the intervention group than in the control group (18/105 (17.1%) vs 44/106(41.5%), RR= 0.41, NNT= 4). And that the intervention group were less likely to have their labor augmented with oxytocin compared to the control 41/87(47.1%) vs 44/62(71.0%), RR 0.66, NNT 4). We also observed that there was no significant difference in the maternal complications due to castor oil in the two groups. We therefore concluded that single oral dose of castor oil administration significantly reduces the incidence of post- term pregnancy, without higher risk of maternal and/ or neonatal complications.

Still on our antepartum interventions to improve women's experiences during childbirth, we tested the efficacy and safety of a novel biomarker (Primaquick) for preinduction cervical assessment at term by conducting a multicentre, double-blind randomized clinical trial in 2018 on 151 nulliparous women to test whether Premaquick biomarkers were superior to modified Bishop score for preinduction cervical assessment at term.[25] We considered the cervix 'ripe' when at least two out of three Premaquick biomarkers were positive or a Bishop score of ≥ 6. Our main outcome measures were proportion of women who were administered or had additional prostaglandin E1 analogue (PGE1) as a preinduction agent and incidence of uterine rupture. We observed that the need for initial PGE1 analogue (77.6% vs 98.7%, risk ratio [RR] =0.47, 95% confidence intervals [95% CI] =0.38-0.59, $P < 0.001$) and additional PGE1 analogue for cervical ripening after one insertion (44.7% vs 68.0%, RR = 0.63, 95% CI = 0.46-0.86, P = 0.004) was significantly lower in Premaquick group. And that the frequency of transition to labor was statistically higher in Premaquick group (44.7% vs 22.7%, RR = 1.59, 95% CI = 1.17-2.15, P = 0.004). We therefore concluded that preinduction cervical assessment with Premaquick was significantly associated with higher frequency of transition to labor and reduced need for PGE1 analogue when compared to modified Bishop score.

In a related intervention, we compared the efficacy of Premaquick biomarkers (combined insulin-like growth-factor binding protein 1 and interleukin-6) versus transvaginal ultrasound for cervical length measurement for pre-induction cervical

evaluation at term among pregnant women.[26] In this randomized clinical trial published this year (2023), we randomized consenting women equally into Premaquick group and Transvaginal ultrasound group. We adjudged the cervix 'ripe' if the Premaquick test was positive or if the Trans-vaginal measured cervical length was less than 28 mm. Our primary outcome measures were the proportions of women who needed prostaglandin analogue for cervical ripening and the proportion that achieved vaginal delivery after induction of labour. We observed that there was no statistically significant difference between the two groups in terms of proportion of women that required prostaglandins for pre-induction cervical ripening (41.7 versus 47.2%, p = 0.427), vaginal delivery (77.8 versus 80.6%, p = 0.783), mean induction to delivery interval (22.9 ± 2.81 h versus 24.04 ± 3.20 h, p = 0.211), Caesarean delivery (22.2 versus 19.4%, p = 0.783), proportion of neonate with birth asphyxia (8.30 versus 8.30%, p = 1.00) and proportion of neonate admitted into special care baby unit (16.7 versus 13.9%, p = 0.872). Subgroup analysis of participants with 'ripe' cervix at initial pre-induction assessment showed that the mean induction to active phase of labour interval and mean induction to delivery interval were significantly shorter in Premaquick than Transvaginal ultrasound group. We concluded that the pre-induction cervical assessment at term with either Premaquick biomarkers or Transvaginal ultrasound for cervical length is effective, objective and safe with similar and comparable outcome. However, when compared with women with positive Transvaginal ultrasound at initial assessment, women with positive Premaquick test at initial assessment showed a significantly shorter duration of onset of active phase of labour and delivery of baby following induction of labour.

Intrapartum interventions for reducing perineal/pelvic floor injuries and improving childbirth experience

In our further efforts to protect the perineum/pelvic floor and improve childbirth experiences, we hypothesized in 2019 that intraparum perineal massage could significantly prevent perineal trauma in nulliparous women during the second stage of labour compared with stand-alone conventional hands-on technique. We believed that such intervention would also reduce severe perineal pain associated with stretching and tearing of the perineum and pelvic floor muscles during second stage labour. In other to test this hypothesis, we designed a randomized controlled study to determine the effectiveness of perineal massage during the second-stage-of-labour in preventing

perineal trauma in nulliparous women.[27] We randomized 104 nulliparous women undergoing vaginal delivery into two arms (intervention group 'A' and control group 'B') in a 1:1 ratio. The intervention group had lubricated perineal massage and routine hands-on= technique according to the hospital protocol while the control group received only hands-on technique. The primary outcome measure was the proportion of participants having perineal tears during vaginal delivery, while the secondary outcome measures were episiotomy rate, duration of second stage of labour, perineal pain and its severity, and neonatal head circumference, neonatal birth weights, and 1st and 5th minute Apgar scores. We observed that perineal trauma in the intervention group (massage group) was significantly in the intervention group (27(51.9%) vs 40(76.9%); p=0.003). The episiotomy rate (25.0% vs 42.3%; p=0.038), mean level of perineal pain at 4 hours postpartum (4.25±0.27 vs 6.12±0.53; p=0.027), mean level of perineal pain at 24 hours postpartum (2.23±0.12 vs 4.15±0.31; p=0.019), and mean duration of the second stage of labour (83.10±17.49 minutes vs 94.23±18.92 minutes; p=0.002) were also significantly lower in the intervention group. We concluded that perineal massage during second stage labour significantly decreases the risk of perineal tears, episiotomy rate, perineal pain and duration of second stage of labour among nulliparous parturients. Labor is ideally a joyous experience but may sometimes turn unpleasant especially when prolonged.[28] Management of prolonged labor represents a challenging experience in the daily obstetrics practice. This is because it is associated with maternal exhaustion, postpartum hemorrhage, feto-maternal sepsis, fetal asphyxia and fetal distress. In view of these complications, active management of labor was proposed with view to eliminating the morbidity and mortality associated with this condition. Therefore, any obstetric interventions to shorten the duration of labor without jeopardizing feto-maternal status are highly indicated.[29] It is hypothesized that hyoscine butylbromide (HBB) reduces the duration of the first stage of labor by overcoming cervical spasm and promoting cervical dilatation.[30] Thus, its antispasmodic property could be an effective intervention and treatment strategy in obstetrics practice in decreasing the incidence of prolonged labor.[31,32] HBB is marketed under the trade name buscopan and is on the World Health Organization (WHO) list of essential medicines.[30] A recent Cochrane review by Rohwer et al in 2013 concluded that more randomized controlled studies are needed to evaluate effect of antispasmodics including HBB on duration of labor.[32] In view of these observations, we designed a double blinded randomized placebo-controlled study aimed at addressing this evidence-based research gap by

evaluating the effects of HBB administration on duration of labor (first, second and third stages) and other materno-fetal outcomes.[33] The women were randomly (1:1 ratio) given intramuscular injection of either 40 mg (2 mL) of HBB or 2 mL of water for injection as a placebo. The primary outcome measures were the duration of first and second stages of labor. Subgroup analysis of primigravid and multigravid women were also performed for various outcomes. We found that the mean duration of first stage of labor was significantly shorter in the HBB group for both the primigravidas (246.6 ± 21.9 vs 391.8 ± 56.6 min for control; $P < 0.001$) and for multigravidas (205.9 ± 17.8 vs 323.8 ± 16.0 min for control; $P < 0.001$). There was also significantly shorter duration of second stage of labor in the HBB group (primigravida: $P = 0.013$; multigravida: $P = 0.016$). The duration of third stage of labor, mode of delivery and maternal and/or neonatal outcomes for both classes of parturients were not significantly different. We concluded that HBB is effective in reducing the first and second stages of labor without adverse maternal or neonatal outcome. HBB does not significantly influence the duration of third stage of labor and the route of delivery.

The practice of the "timing" for umbilical cord clamping following delivery varies, with early cord clamping generally carried out within 30 seconds after birth, whereas delayed cord clamping typically involves clamping the umbilical cord one minute after birth or when umbilical pulsation has ceased.[34,35] The proponents of delayed cord clamping posit that the practice has potential to improving neonatal haemogbobin while the opponents are reluctant because of possibility of neonatal polycythaemia and risk of maternal postpartum haemorrhage from the delay in the cord clamping.[36,37] Recent Cochrane review concluded that there is insufficient evidence to show what duration of delay for umbilical cord clamping is best and recommended more trials.[38] This gap in the Cochrane review prompted us to design an intervention aimed at determining the effect of delayed umbilical cord clamping to neonatal hemoglobin level and serum bilirubin on term new-borns.[39] We carried out a randomized controlled trial of parturients with singleton pregnancy where eligible women were randomly assigned (1:1 ratio) to either delayed clamping of umbilical cord (60 s after delivery) or immediate clamping (0-15s). The primary outcome measures were hemoglobin and bilirubin levels of the newborn measured at birth and 48 h of life. We observed that at 48 h of birth, mean hemoglobin concentration was significantly higher in delayed clamping group than immediate clamping group (16.51 ± 1.71 g/dl vs 15.16 ± 2.27 g/dl; $p < 0.001$) but total mean bilirubin concentration was not significantly different (3.88

± 1.54 mg/dl vs 3.71 ± 1.20 mg/dl; p = 0.380). There was no significant difference in postpartum hemorrhage (p = 0.653), neonatal jaundice (p = 0.856), and need for phototherapy (p = 0.561). We concluded that delayed cord clamping at childbirth is more advantageous for term infants in terms of more hemoglobin concentration compared to traditional immediate cord clamping. The maternal and perinatal complications were either not significantly different or absent.

Postpartum interventions for reducing perineal/pelvic floor injuries and improving childbirth experience

In order to appreciate the impact and magnitude of childbirth on pelvic floor and postpartum morbidities, we undertook a prospective longitudinal study in 2015 to study the "Prevalence and predictors of urinary/anal incontinence after vaginal delivery among Nigerian women".[40] This is because urinary and anal incontinence are major public health problems impacting on the quality of life of affected women, with resultant loss of self-esteem.[40,41] Also, despite the anticipated magnitude of this public health problem in sub-Saharan Africa, there was paucity of data on the prevalence of urinary and/or anal incontinence after childbirth in the region. We therefore, believed that studying the prevalence and predictors of UI/AI after vaginal delivery in the most populous nation in Africa will no doubt help elucidate the extent of these public health problems in the region, and help in patient counseling as well as designing strategies/policies to reduce the burden of the disease in our environment. In this longitudinal study, 230 consecutive parturients at the University of Nigeria Teaching Hospital, Enugu, Nigeria were followed up immediately after delivery, at 6 weeks, and 3 months postpartum to assess the development of urinary and/or anal incontinence using validated questionnaires. We observed that overall, 28 women had urinary incontinence, giving a cumulative prevalence rate of 12.2 %. The cumulative prevalence rate was 13.5 % for anal incontinence and 3 % for combined urinary and anal incontinence. Age, social class, parity, prolonged second stage of labor, and neonatal birth weight were significantly associated with postpartum urinary incontinence ($P < 0.05$). On the other hand, age, parity, prolonged second stage of labor, episiotomy, and instrumental vaginal delivery were significantly associated with postpartum anal incontinence ($P < 0.05$). We concluded that urinary and anal incontinence are common after vaginal delivery in Enugu, Nigeria. Also, modification of obstetric care and discouraging preventable predisposing factors for incontinence,

such as prolonged second stage of labor and vaginal delivery of macrosomic babies, are measures that may reduce the prevalence of postpartum incontinence in our population. It was obvious from the above study that the incidence of UI and AI is very high among our women after vaginal birth. But we did not determine during the study if Caesarean section could reduce the incidence of these postpartum morbidities after childbirth. In order to fill this gap, we designed a prospective cohort study in 2017 aimed at determining the effects of mode of delivery on incidence of urinary incontinence (UI) and anal incontinence (AI) after childbirth.[42] The study participants were grouped into two. The exposed group (Group A) had Caesarean section (CS) while the unexposed control group (Group B) had vaginal delivery (VD). The group A was further categorized into: elective CS (A1CS), emergency CS in first stage (A2CS), and emergency CS in second stage (A3CS). Participants were followed up to access for UI and/or AI, using validated questionnaires. We observed that for UI, VD had higher risk of UI than CS (P=0.02). Sub-group analysis showed that VD had higher risk of UI than A1CS (P = 0.03) or A2CS (P = 0.02). However, VD had less risk of UI than A3CS (P < 0.01). For AI, VD had higher risk of AI than CS (P=0.03). Sub-group analysis showed that VD had higher risk of AI than A1CS (P=0.02) or A1CS (P=0.01). However, VD had less risk of AI than A3CS (P<0.001). We therefore concluded that Caesarean section done 'electively' and at first stage labor reduces risk of UI and AI but increases the risk when done at second stage. And that elective CS may be encouraged in women at risk of postpartum UI and AI.

In our further effort to understand the magnitude of childbirth injuries on pelvic floor and the accompanying postpartum morbidities, we designed a prospective cohort study in 2020 aimed at determining the effects of obstetric anal sphincter injuries (OASIS) on incidence of urinary and anal incontinence after childbirth in Nigeria.[43] This study which was my Thesis for the National Post graduate Medical College of Nigeria (NPMCN) Doctor of Medicine (MD) in Obstetrics & Gynaecology program, was based on the background that OASIS are a serious complication of vaginal birth,[44,45] and the burden is expected to be high in sub-Saharan Africa where there is high fertility and aversion to Caesarean section; yet the incidence is largely unknown in the sub-region. It was also based on the fact that there is very limited data on the incidence and risk factors of OASIS, and its effect on urinary incontinence (UI) and anal incontinence (AI), and quality of life (QoL) of the sufferers. Eligible participants were selected from three

secondary health health facilities in Enugu, South-East, Nigeria. The study consisted of three groups — 'exposed' (Group A), and two 'unexposed' control Groups (Groups B and C). Group A had OASIS; Group B had episiotomy/2nd degree spontaneous perineal tear (SPT), while Group C had intact perineum/1st degree SPT. The women were followed up to 3 months to determine the incidence of UI and AI, and the QoL using validated questionnaires. During the period under study, there were 6,093 vaginal deliveries with 60 OASIS, giving an incidence of 0.98%. The incidence of UI was higher with OASIS than episiotomy/2nd degree SPT (RR: 2.45; 95%CI: 1.1 – 5.5; P = 0.026), and intact perineum /1st degree SPT (RR: 3.03; 95%CI: 1.3 – 7.2; P = 0.011). Similarly, risk of AI was higher with OASIS than episiotomy/2nd degree SPT (RR: 2.83; 95%CI: 1.3 – 5.8; P = 0.005), and intact perineum/1 st degree SPT (RR: 3.51; 95%CI: 1.6 –7.4; P = 0.003). There was no difference in the risks between episiotomy/2nd degree SPT and intact perineum/1 st degree SPT (P > 0.05). Risk factors for OASIS were age ≥ 35 years, low social class, nulliparity, previous Caesarean section, prolonged labour, and macrosomia. The QoL mean scores were lower with OASIS than episiotomy/2nd degree SPT (P = 0 .027), and intact perineum/1st degree SPT (P = 0 .009). We concluded that OASIS is not uncommon in Enugu, Nigeria, and it is associated with risk of UI and AI. Thorough perineal assessment by skilled birth attendant is necessary after childbirth for early detection. Counselling, follow up, and support are necessary for women who suffered OASIS because of associated risk of UI/AI and reduced QoL.

Sexuality and pregnancy

Improving women's experiences during pregnancy cannot be complete without attending to their sexuality. It has been observed that pregnancy is a potential risk factor for sexual dysfunction.[46] While studies are abound on postpartum incidence of sexual dysfunction, they are very limited during pregnancy especially in low and middle income countries (LMIC). For instance, recent studies observed that childbirth has a significant impact on female sexual function (FSF), but did not determine the possible effects of pregnancy on this maternal dysfunction.[46-48] Pregnancy could influence sexual function because of its potential to cause weakness, nausea, vomiting, heartburn, psychological symptoms and other physiological changes in pregnancy.[46-48] When sexual dysfunction occurs in pregnancy, it could cause marital disharmony and psychological distress that could promote sexual infidelity. Despite the above possible

effects of pregnancy on sexual health, this issue is rarely discussed during antenatal care services probably because of limited sound data in this regard. Interestingly, there are positive opinions that conversation on this topic during antenatal visits could improve sexual function and decrease the emotional and psycho-social distress commonly associated with sexual dysfunction.[49] Furthermore, the available information on effects of pregnancy on sexual function is heterogeneous and controversial.[50,51] While some observed a decrease in sexual function as pregnancy advanced, others could not establish any significant difference.[50,51] Consequently, a study on the effects of pregnancy on sexual function will help provide evidence-based information on the variations across the trimesters and the possible risk factors. Such information will guide the clinicians in women counseling during antenatal care services. All these provided the justification for a part (published) of my PhD Thesis (Human Reproduction & Women Health) aimed at determining the comparative effects of different trimesters of pregnancy on sexual function, and the risk factors of sexual dysfunction in pregnancy.[52] In this study which was longitudinal in design, we recruited 270 pregnant women attending antenatal care at the two largest tertiary hospitals in Enugu, Nigeria. Interviews were conducted at specific times in the three trimesters and data regarding sexual functions were obtained using validated questionnaires. We observed that the female sexual function index (FSFI) mean 'total score' decreased as pregnancy advanced. We also observed that this score was significantly lower in second trimester (T2) than in first trimester (T1) ($P < 0.001$), and significantly lower in third trimester (T3) than T1 ($P < 0.001$), but no difference between T3 and T2 ($p = 0.759$). It was also observed that the mean frequency of coitus per week declined across the trimesters; lower in T2 than T1 (2.2 ± 0.7 vs. 2.4 ± 0.6; $p < 0.01$), and lower in T3 than T1, but no difference between T3 and T2. The overall rate of sexual dysfunction in pregnancy was found to be 50.7% and the risk factors were age ≥ 35 years, multiparity, and a previous history of Caesarean section. We concluded that sexual function declines as pregnancy advances and the rate of sexual dysfunction is high in Enugu, Nigeria. We recommended that obstetricians should discuss sexual health issues during antenatal care services and make more efforts towards reducing the modifying obstetric risk factors for sexual dysfunctions.

A further part (published) of my PhD Thesis was titled: "Urinary and incontinence in pregnancy in a Nigerian population: A prospective longitudinal study".[53] This study which was aimed at determining the comparative effects of different trimesters of

pregnancy on urinary incontinence (UI) and anal incontinence (AI), and their possible risk factors was based on the background that studies are abound from low and middle income countries (LMICs) on postpartum urinary UI and AI, but very rare in pregnancy.[54] And that such data will guide obstetric care givers in providing appropriate counseling to the women as well as minimizing the risk factors. The study was longitudinal in design, and study population consisted of 270 pregnant women receiving care at the two largest tertiary health institutions in Enugu, South-East Nigeria. The recruitment was in the first trimester and the women were followed up to term. Interviews were conducted at specific times in the three trimesters and data regarding UI and AI symptoms were obtained using validated questionnaires. We observed that the incidence of UI increased across the trimesters: 22%, 30.5%, and 48% in the first trimester, second, and third trimesters, respectively with a cumulative incidence rate of 50.2%. Also, the incidence of AI also increased across the trimesters but not as high as UI: 1.7%, 3.6%, and 5.8% respectively, with cumulative incidence rate of 6.7%. The risk factors for UI were found to be maternal age > 35years, multiparity, previous prolonged second stage labor, and previous neonatal macrosomia, while that of AI were previous instrumental vaginal delivery, and previous prolonged second stage of labor. We concluded that the incidence of UI and AI increases as pregnancy advances. And we recommended that obstetricians be encouraged to discuss these pelvic floor issues (UI and AI) during antenatal care services and make more efforts towards reducing the modifying obstetric risk factors.

Sexuality and childbirth

Improving women's sexuality following childbirth would require first of all understanding their sexual functions during childbirth and whether the mode of delivery affects sexual functions. The female sexual function disorders (FSFDs) constitute a major public health problem, affecting women, their husbands, and society in general. Although the condition is common during pregnancy,[56-58] it is mostly prevalent at puerperium, affecting 41–83% of women during this period.[59-60] Female sexual function disorders traditionally include six key disorders: desire (libido), arousal, lubrication, pain (discomfort), orgasm, and satisfaction.[61] The disorders of desire, arousal, and orgasm are the most common.[59] In spite of the high prevalence of FSFDs, which appears to surpass that of male sexual dysfunction, less attention has been paid to the sexual problems of women.[59] Also, despite the significance and clinical relevance of

FSFDs, insufficient research has been conducted so far to pinpoint the problem more accurately.[59] A recent systematic review on the effect of mode of delivery on FSFs[62] concluded that there is a need for more powered studies, as the current studies are limited by small sample sizes. Future studies on the use of validated instruments are also recommended—for reliable answers to the study questions.[62] All these motivated me to fill this knowledge gap by undertaking a study for my MSc (Human Reproduction and Women's Health) project titled: "Effects of mode of delivery on sexual functions of parturients in Nigeria: a prospective cohort study".[63] This study was aimed at determining the comparative effect of Caesarean section (CS) and vaginal delivery (VD) on FSFs. It was a prospective cohort study of postnatal mothers at two hospitals in Enugu, Nigeria. The exposed group of women delivered via CS whereas the control group had a VD. Both groups were followed up to 3months to determine the time to first coitus and other FSFs using a validated questionnaire. We observed that at 6 weeks postpartum, the mean time (days) to first coitus was shorter in the CS than in the VD group (29.2 ± 4.3 vs 32.1 ± 4.9; $t = 2.38$; $p = 0.02$). However, no difference was observed at 3 months (37.3 ± 8.7 vs 40.9 ± 9.9; $t = 1.83$; $p = 0.07$). Also, there were no differences in mean Female Sexual Function Index (FSFI) total scores at 6 weeks and 3 months ($p > 0.05$). The mean FSFI domain scores at 6 weeks for orgasm, satisfaction, and pain were significantly higher in the CS group ($p < 0.05$). However, there were no differences in any of the domain scores at 3 months ($p > 0.05$). We concluded that the mode of delivery does not affect time to resumption of coitus after childbirth, and FSF disorders by 3 months postpartum. Caesarean section should therefore not be recommended to women merely for early resumption of coital activity or preservation/maintenance of sexual function after childbirth.

Respectful Maternity Care: The Universal Rights of Childbearing Women

No remarkable improvement can be achieved in women's health and childbirth experiences without upholding their right and respectful conduct during maternity care.[64] According to the 'White Ribbon Alliance' of 2013 on respectful maternity care and universal right of women and newborn, the first and most important right states that "every woman has the right to freedom from harm and ill-treatment. And no one is allowed to physically hurt her or her newborn. They should both be taken care of in a

gentle and compassionate way and receive assistance when experiencing pain or discomfort." [65]

It has been observed that the autonomy, dignity, preferences, and fundamental human rights of women giving birth are so frequently violated especially in low and middle income countries (LMICs) that such a dehumanizing care is now seen by the communities as normal.[66] Unfortunately, many women often bear this disrespectful and abusive care without complaint, and the insults often continue unabated for decades. Consequently, women quietly resort to alternative — often substandard childbirth services where their autonomy, dignity, and rights would be respected.

In order to understand and appreciate the magnitude of this disrespectful maternity care, Bowser and Hill[66] performed a landscape analysis commissioned by the US Agency for International Development (USAID) and identified seven categories of attributes that effectively defined disrespectful and abusive care in facility-based skilled childbirth: physical abuse, non-consented care, non-confidential care, non-dignified care, discrimination, abandonment/neglect of care, and detention in facilities until hospital bills are paid. It is well known that prevalence estimates for disrespect and abuse during facility-based childbirth are necessary for the design, monitoring, and evaluation of interventions to promote respectful care during childbirth, especially in low-resource settings but that the data is lacking. I observed with co-authors in 2015 that there was a general lack of a well-designed study in literature that measured the magnitude of disrespect and abuse during facility based childbirth especially in low income countries. This prompted us to undertake a simple but 'groundbreaking' study titled "Disrespect and abuse during facility-based childbirth in a low-income country".[67] This study which was published in International Journal of Obstetrics and Gynecology was noted by the journal as one of best clinical research articles (Honorable Mention) in 2015. It has achieved over a thousand citations in less than a decade. In the study, we determined the prevalence and pattern of disrespectful and abusive care during facility-based childbirth in Enugu, southeastern Nigeria. The study was cross sectional in design and involved eligible women accessing immunization services for their newborns at the immunization clinic of a tertiary hospital in Enugu, Nigeria. The main outcome was the proportion of women who had experienced disrespectful and abusive care during their last childbirth. We observed that a total of 437 (98.0%) out of the 446 respondents interviewed reported at least one form of disrespectful and abusive care during their last childbirth, giving a prevalent rate of disrespect and abuse during childbirth of 98%. We

also observed that non-consented services and physical abuse were the most common types of disrespectful and abusive care during facility-based childbirth, affecting 243 (54.5%) and 159 (35.7%) respondents, respectively. Non-dignified care was reported by 132 (29.6%) women, abandonment/neglect during childbirth by 130 (29.1%), non-confidential care by 116 (26.0%), detention in the health facility by 98 (22.0%), and discrimination by 89 (20.0%). We concluded that disrespect and abuse during childbirth are highly prevalent in Enugu, Nigeria. And that the findings indicate the size of the issue of disrespectful and abusive care during childbirth in low-income countries.

Following the publication of this great paper in 2015, the Bill and Melinda Gates Foundation and the John D. and Catherine T. MacArthur Foundation, commissioned a systematic review and comparative analysis of methods titled: "Methods used in prevalence studies of disrespect and abuse during facility based childbirth: lessons learned".[68] This paper was aimed to aggregate and present lessons learned from published studies that quantified the prevalence of Disrespect and Abuse (D&A) during childbirth. Yours sincerely was invited to collaborate with renown researchers from Harvard and across the globe to co-author this second award winning paper published in the Reproductive Health journal in 2017.[68] It was conceived on the background that several recent studies have attempted to measure the prevalence of disrespect and abuse (D&A) of women during childbirth in health facilities but with conflicting designs. And that variations in reported prevalence may be associated with differences in study instruments and data collection method. Five papers met the criteria for the study and were included for analysis. We developed an analytical framework depicting the basic elements of epidemiological methodology in prevalence studies and a table of common types of systematic error associated with each of them. We performed a head-to-head comparison of study methods for all five papers. Using these tools, an independent reviewer provided an analysis of the potential for systematic error in the reported prevalence estimates. We found that sampling techniques, eligibility criteria, categories of D&A selected for study, operational definitions of D&A, summary measures of D&A, and the mode, timing, and setting of data collection all varied in the five studies included in the review. And that these variations present opportunities for the introduction of biases – in particular selection, courtesy, and recall bias – and challenge the ability to draw comparisons across the studies' results. We therefore concluded that our review underscores the need for caution in interpreting or comparing previously reported prevalence estimates of D&A during facility-based childbirth. The lack of

standardized definitions, instruments, and study methods used to date in studies designed to quantify D&A in childbirth facilities introduced the potential for systematic error in reported prevalence estimates, and affected their generalizability and comparability. We noted that chief among the lessons to emerge from comparing methods for measuring the prevalence of D&A is recognition of the tension between seeking prevalence measures that are reliable and generalizable, and attempting to avoid loss of validity in the context where the issue is being studied.

RESEARCH WORKS AFTER PROFESSORIAL POST

I have not relented in my research and publications after my professorial promotion. Thus, between 2020 when I was assessed for professorial promotion and now, I have co-authored a total of thirty seven (37) publications out of which twenty five (25) were published in Journals with Thomson Reuters impact factor.

I have continued to demonstrate the benefits of protecting the perineum/pelvic floor during pregnancy/childbirth and in designing interventions to improve women's childbirth experience. This includes studies demonstrating the impact of obstetric anal sphincter injuries (OASIS) on certain postpartum morbidities including urinary and anal incontinence;[69] techniques and maneuvers for preventing OASIS during childbirth;[69] effects of pregnancy and childbirth on sexual functions, pelvic floor symptoms, body image, and quality of life of women.[70]

I have also continued to work on how to improve antenatal care and birthing experiences of our women. For instance, we recently identified that we could improve women's childbirth experience by investigating an intervention that could improve their haemoglobin status during pregnancy and childbirth and reduce the burden of anaemia in pregnancy. In order to achieve this we secured a TetFund Grant in 2021 titled "Efficacy and safety of Mojeaga remedy in combination with conventional oral iron therapy for correcting anemia in obstetric population: A phase II randomized pilot clinical trial."[71] This intervention which was published in *PLoS One journal* in May 2023, determined the efficacy, safety and tolerability of Mojeaga remedy (a special blend of Alchornea cordifolia, Pennisetum glaucum and Sorghum bicolor extracts) as adjunct to conventional oral iron therapy for correction of anemia in obstetric population. It was a pilot open-label randomized clinical trial. Participants with confirmed diagnosis of anemia in three tertiary hospitals in Nigeria were studied. Eligible participants were randomized 1:1 to either Mojeaga syrups 50 mls

(200mg/50mls) administered three times daily in conjunction with conventional iron therapy (Mojeaga group) for 2 weeks or conventional iron therapy alone without Mojeaga (standard-of-care group) for 2 weeks. Repeat hematocrit levels were done 2 weeks post-initial therapy. Primary outcome measures were changes in haematocrit level and median haematocrit level at two weeks post therapy. Maternal adverse events and neonatal outcomes (birth anomalies, low birthweight, preterm rupture of membranes and preterm labor) were considered the safety outcome measures. Analysis was by intention-to-treat. Ninety five participants were enrolled and randomly assigned to the Mojeaga group (n = 48) or standard-of-care group (n = 47). At two weeks follow-up the median rise in haematocrit values from baseline (10.00±7.00% vs. 6.00±4.00%; $p < 0.001$) and median haematocrit values (31.00±2.00% vs 27.00±3.00%; $p < 0.001$) were significantly higher in the Mojeaga group. There were no treatment-related serious adverse events, congenital anomalies or deaths in the Mojeaga group and incidence of other neonatal outcomes were similar ($p>0.05$). We concluded that Mojeaga represents a new adjuvant for standard-of-care option for patients with anemia. And that Mojeaga remedy is safe for treating anaemia during pregnancy and puerperium without increasing the incidence of congenital anomalies, or adverse neonatal outcomes.

I have also recently collaborated in a study to demonstrate the efficacy of a novel biomarker (Premaquick) for pre-induction cervical assessment at term in a trial tilted: "A randomized clinical trial of Premaquick biomarkers versus transvaginal cervical length for pre-induction cervical assessment at term among pregnant women."[72] We observed that there was no statistically significant difference between the two groups in terms of proportion of women that required prostaglandins for pre-induction cervical ripening (41.7 versus 47.2%, $p = 0.427$), vaginal delivery (77.8 versus 80.6%, $p = 0.783$), mean induction to delivery interval (22.9 ± 2.81 h versus 24.04 ± 3.20 h, $p = 0.211$), caesarean delivery (22.2 versus 19.4%, $p = 0.783$), proportion of neonate with birth asphyxia (8.30 versus 8.30%, $p = 1.00$) and proportion of neonate admitted into special care baby unit (16.7 versus 13.9%, $p = 0.872$). We concluded that Pre-induction cervical assessment at term with either Premaquick biomarkers or transvaginal ultrasound for cervical length is effective, objective and safe with similar and comparable outcome. However, when compared with women with positive transvaginal ultrasound at initial assessment, women with positive Premaquick test at initial assessment showed a significantly shorter duration of onset of active phase of labour and delivery of baby following induction of labour.

In an effort to improve the quality of care given to sickle cell disease (SCD) patients during pregnancy, we sought in 2021 to determine the predictors of Obstetricians' pattern of care for SCD in pregnancy in Nigeria.[73] We used a self-administered, pre-tested, pre-validated questionnaires to obtain relevant data from the attendees of the 2018 conference of the Society of Obstetrics and Gynaecology of Nigeria (SOGON), and a regression analysis to determine the possible predictors, at a significant level was < 0.05. We observed that majority of the Obstetricians,74.9% and 98.4% knew that foetal medicine specialists and haematologists should be part of preconception care team, respectively. The Obstetricians' practice centre and designation, significantly contributed to their "willingness to consult a haematologist" (P = 0.004)," and willingness to consult a foetal specialist" (P = 0.047), while practice centre and practice population significantly contributed to their response to "ideal centre for management of SCD pregnancy": (P = 0.049), (P = 0.024) respectively. We concluded that the obstetricians' level of training, practice centre, and practice population of pregnant women with SCD were significant contributors to their pattern of care towards antenatal care for pregnancy in SCD.

In a related survey in 2022, we sought to determine Obstetricians' approach in diagnosing and treating obstetrics disseminated intravascular coagulopathy (DIC) in a low resource setting (LRS) as a prelude to designing interventions to improve outcome of management.[74] We used a semi-structured pre-tested 4-sectioned questionnaire to obtain relevant data from Nigerian Obstetricians on their practice in the diagnosis and treatment of obstetrics DIC. We observed that platelet count determination was the test mostly used (95.9%) to make a diagnosis of DIC whereas, antithrombin assay was the least (20.6%) requested investigation. We also observed that while about two-third of Obstetricians would monitor the evolution of DIC, a little less than half would not repeat laboratory testing more than every 2 days, reason mainly (61.8%) due to patient's financial constraint. And that almost three-quarter of the Obstetricians preferred fresh whole blood as the first line of treatment of DIC. We concluded that DIC remains a challenge in the obstetrics practice in RLS especially in investigations, monitoring and index of suspicion for non-overt DIC.

Because of the increasing burden of infertility on women’s health in Nigeria, I recently in March, 2023 collaborated with colleagues to evaluate the possible role of chlamydia

infection in a study titled "Antichlamydia antibodies and sperm quality among male partners of infertile couples in Nigeria".[75] This study which detected anticlamydia antibodies in as high as 55.3% of male partners of infertile couples, and observed significant association with poor sperm quality showed the need for increased public awareness and advocacy campaigns on the impact of Chlamydia infection on male factor infertility. We also recommended routine screening for antichlamydial antibodies and appropriate treatment in cases of suspected male factor infertility.

In order to understand the increasing burden of recurrent pregnancy loss (RPL) (pregnancy loss occurring at greater than two consequent occasions) and finding measures to ameliorate it, I embarked on a study with colleagues in 2023 titled: "Prevalence and associated factors of recurrent pregnancy loss in Nigeria according to different national and international criteria (ASRM/ESHRE vs. WHO/RCOG)."[76] We observed that RPL was common among the women and that increased maternal age was the only predictor after adjusting for other variables.

Because of the increasing impact of viral infections particularly hepatitis B virus and HIV virus on women's health, I collaborated with colleagues from University of Lagos (UNILAG) in a TetFund sponsored project in 2022 to determine the Sero-prevalence of Hepatitis B, and C Viruses and HIV Infections among Antenatal Women in Nigeria.[77]

I have recently collaborated with several authors across the country on a TetFund sponsored grant to undertake "A systematic review and meta-analysis of the prevalence of triplex infections (combined human immunodeficiency virus, hepatitis B virus, and hepatitis C virus) in pregnancy."[78]

I have also recently contributed a chapter on "Formulation of questions" in a TetFund sponsored book project titled "Fundamentals of Systematic Reviews and Meta-analysis."[79]

Most importantly, I have become more interested in Cochrane Collaborations and Systematic Reviews and Meta-analysis since the successful assessment of my professorial promotion. Consequently, I have recently collaborated with Cochrane experts across the country to perform a systematic review and meta-analysis titled: "Risk-reducing bilateral salpingo-oophorectomy in women with BRCA1 or BRCA2 mutations."[80] This review provided evidence that risk reducing salpingo-ophorectomy (RRSO) may increase overall survival and lower HGSC and breast cancer mortality for

BRCA1 and BRCA2 carriers. It also provided evidence that RRSO reduces the risk of death from HGSC and breast cancer in women with BRCA1 mutations. Participating in this great review has attracted two international Cochrane travel grant awards to south Africa and the US for participation and presentation of related articles and reviews.

In 2020, I led the publication of a Cochrane Protocol titled: "Antivirals for prevention of hepatitis B virus mother-to-child transmission in human immunodeficiency virus positive pregnant women co-infected with hepatitis B virus" (Protocol).[81] The full review of this title has just been published in the Cochrane database for systematic reviews and meta-analysis.[82] This review which was considered and rated of high priority by the "Cochrane collaboration" was designed to assess the benefits and harms of tenofovir-based antiviral combination regimens for HBV for the prevention of mother-to-child transmission of HBV in HIV-positive pregnant women co-infected with HBV. We included randomised clinical trials comparing tenofovir-based antiviral combination regimens (anti-retroviral regimen with lopinavir-ritonavir therapy, or any other antiviral therapy, and two drugs with activity against HBV, specifically, tenofovir alafenamide (TAF) or tenofovir disoproxil fumarate (TDF), plus lamivudine or emtricitabine) with placebo alone, or tenofovir alone, or non-tenofovir-based antiviral regimen (zidovudine, lamivudine, telbivudine, emtricitabine, entecavir, lopinavir-ritonavir, or any other antiviral therapy) either alone or in combination with at least two other antivirals. A total of five completed trials were included, of which four trials contributed data to one or more of the outcomes. This included a total of 533 participants randomized to tenofovir-based antiviral combination regimens (196 participants) and control (337 participants). The control groups received non-tenofovir-based antiviral regimen either as zidovudine alone (three trials) or as a combination of zidovudine, lamivudine and lopinavir-ritonavir (five trials). None of the trials used placebo or tenofovir alone. We were very uncertain about the effect of tenofovir-based antiviral combination regimen versus control on all-cause infant mortality (RR 2.24, 95% CI 0.72 to 6.96; participants = 132; trials = 1; I2 = 0%; very-low-certainty evidence); proportion of infants with serious adverse events (RR 1.76, 95% CI 1.27 to 2.43; participants = 132; trials = 1; I2 = 0%; very-low-certainty evidence), and proportion of mothers with serious adverse events (RR 0.90, 95% CI 0.62 to 1.32; participants = 262; trials = 2; I2 = 1%; very-low-certainty evidence). We found that tenofovir-based antiviral combination regimen probably results in a higher proportion

of infants with serious adverse events. We concluded that we are very uncertain about the effect estimate of tenofovir-based antiviral combination regimen on all-cause infant mortality, proportion of infants with serious adverse events, and proportion of mothers with serious adverse events, proportion of infants with adverse events not considered serious, and proportion of mothers with detectable HBV DNA before delivery because the certainty of evidence was very low. We concluded that future randomized clinical trials should be at low risk of systematic and random errors and should fully report all-cause infant mortality and serious adverse events.

FUTURE RESEARCH WORKS

Having gotten the professorial post at a relatively young age, I have many years ahead to impact further on women's health through policy-relevant research and interventions a bait administrative exegesis. My current desire is to seek for intervention grants to commence the treatment of women who may develop pelvic floor disorders during pregnancy or after delivery despite all the preventive interventions discussed today to protect the perineum and pelvic floor. Thus I intend to develop 'home grown' interventions that could be effective in the treatment of the various types of urinary incontinence, fecal and flatus incontinence, pelvic organ prolapse, and sexual dysfunction during pregnancy and after childbirth. I also intend to seek for a grant to set up a "pelvic floor facility" in the teaching hospital (UNTH) for treating women with these conditions using both the home grown techniques and the current techniques such as 'sling operations' for incontinence procedures;[83,84] 'urodynamics studies' for proper diagnosis and management of various urinary incontinence; laparoscopic and suspension techniques for pelvic organ prolapse; and the vaginoplasty (vaginal tightening) and 'designers perineum' (labiaplasty) techniques for pelvic floor issues (UI & AI, POP), improving female sexual function, and vulval aesthetics (cosmetics).[85] I also intend to acquire the skill for non-surgical vaginal rejuvenation treatments including the use of lasers to stimulate the mucosa, or inner lining of the vagina, and LED light treatments to stimulate the vagina to produce more tissues, all in an effort to correct any impacts of childbirth on the perineum and pelvic floor which could cause women's dissatisfaction of their labial appearance, discomfort during working or exercise, or pains during sex from remnant scar tissues.

Furthermore, I also intend to consolidate my capacity in Cochrane systematic reviews and meta-analysis and to embark on more future review interventions to protect the pelvic floor from undue harm and improve women's childbirth experience.

I will also continue to collaborate with Cochrane colleagues in organizing regular seminars, workshops and webinars in systematic reviews and meta-analysis until a critical mass of the university community is able to build capacity for independent Cochrane systematic reviews and meta-analysis.

CONCLUSION

A good obstetrician would ensure not only a successful pregnancy and delivery of a healthy neonate at term but a mother with minimal risk to her perineum and pelvic floor. Achieving these expectations would ultimately result in improved women's childbirth experience and reduced postpartum morbidities. The preliminary part of this 185th inaugural lecture of the University of Nigeria presented a concise overview of the female perineum and pelvic floor visa-viz their structures and functions. Thereafter I proceeded to the first and second parts of this lecture which centered respectively on the antepartum (during pregnancy) and intrapartum (during labour) measures that have potentials to reducing obstetric injuries to the perineum and pelvic floor and minimizing anteparum and postpartum morbidities. In each of these two parts I discussed the outcomes of my study interventions alongside other related studies in the literature that have improved women's experiences during childbirth and reduced the risks of certain postpartum morbidities including urinary and anal incontinence. I have also discussed the third and final part of this lecture which presented a concise description of my research output since appointment as a professor in October 2020 and ended with my proposed future research goals and directions.

APPRECIATION

I thank God almighty for his grace and blessings on my family and my person, despite my unworthiness. Just as my name "Emmanuel" suggests, God is always with me; "Onyebuchi", who is as good as God; and "Valentine", God loves me. I am no doubt a 'child of serendipity' and a child after God's heart. My life has been a testimony starting from my birth and very humble background, then through my education, marriage, family, appointments, and promotions. I thank Him for always shining His light on my pathway.

My family: To my sweet baby, angel, queen, wife, and special mother - Dr Angela Ogechukwu Ugwu, I cannot appreciate you enough. My instant feelings the day I set my eyes on you confirmed the biblical account of Adam/Eve and the missing rib (Gen. 2: 22-4). You are indeed my special half designed from haven for and only me. God really blessed the day I found you as corroborated in Proverbs 18: 22 -- That "he who finds a wife finds a good thing and obtains favour from the Lord". Thank you so much for accepting, tolerating, and managing my excesses, inadequacies, and encumbrances. To our lovely children – Val (Jnr), Dumebi, Toni, and Kenenna: you are special God's gifts to us; we love and cherish you. May God continue to bless and direct you.

My Parents: My late father, Pa Augustine A. Ugwu, *Nkeonyemetalu,* a renowned police officer who never intimidated anyone unjustly throughout his career. He stood for the truth and upheld the truth throughout his life and strongly believed that one's deeds will be reaped in full hence his favourite saying "nkeonyemetalu". Upon his death I adopted the title "Ikpemalueziokwu" which am now popularly called in my parish as a way of upholding his great virtues. I still feel so much pain today because all my medical interventions could not make him live to see this day!

My late mother, Mrs Janet Ugwu was a very intelligent woman and an epitome of a mother. Although I didn't get to know her much as she died while giving birth to her 3rd child when I was just 7 years of age, she was a good woman and a devoted Christian. She ensured I had passed all the catechism classes and started receiving Holy Communion before her death. Her avoidable maternal (obstetric) death motivated me to specialize in Obstetrics and Gynecology in order to help reduce the burden of maternal mortality and morbidity in Nigeria. May her gentle soul continue to rest in the bosom of the Lord. Amen.

My step mother -- Mrs Dorathy Ugwu, who is here today, is a virtuous woman. She is a woman sent by God to comfort and relief us (my father and my siblings) of the burden of my Mom's death. She took me as her biological son, and laboured tirelessly to ensure I had a successful medical education. I thank God that has kept her alive to reap the dividends (fruits) of her hard work and sacrifices.

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Finally, to the audience, thank you for listening to me and celebrating this day with me. May God continue to bless you and lead you safely to your various homes. Amen!!

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APPENDDIX 1: LIST OF SOME PUBLICATIONS

Prof. Ugwu's Articles Published in Journals with Impact Factor (Total = 80)

1. **Ugwu EO,** Eleje GU, Ugwu AO, Nwagha UI, Ikechebelu JI, Umeh UA, Okafor HU. Antivirals for prevention of hepatitis B virus mother-to-child transmission in human immunodeficiency virus positive pregnant women co-infected with hepatitis B virus. *Cochrane Database of Systematic Review* 2023; 6(6): CD013653. doi: 10.1002/14651858.CD013653.
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