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Distribution of Pregnancy Complications by Gestational Age at Mbarara Regional Referral Hospital, Southwestern Uganda

Mayanja Ronald; MD[1*], Nkonwa Innocent; MD[1], Chakura Andrew; MD[1], Mubiru Musa;MD[1], Masembe Sezalio;MD[1], Musa Kayondo; MD[1], Kanyesigye Hamson;MD[1], Wasswa Ssalongo;MD[1], **Joseph Ngonzi;MD[1]**

[1]Department of obstetrics and Gynecology, Mbarara University of Science and Technology, Uganda

* Corresponding author: ksmarona@yahoo.com

Abstract
Background: During pregnancy; both the woman and her developing foetus face various health risks. Pregnancy complications can range from mild discomfort, to severe, sometimes life threatening illnesses. Our objective was to determine the pregnancy complications and the associated gestation ages at Mbarara regional referral hospital. **Methods:** It was a cross sectional study. The Primary outcome was any pregnancy complications. The sample size was 1016. Pearson Chi-square was used to determine association between categorical variables. Odds ratio was used to determine statistical significance. **Results:** The complications included abortion 6.2%, preterm labour 6.0%, and preeclampsia, premature rupture labour, preterm premature rupture of membranes, urinary tract infections 2.4%, malaria, intrauterine feotal death 1.5%, antepartum haemorrhage 1.5% and anaemia. The complications started rising from 29 weeks to 36 weeks and started declining thereafter but rose again after 42 weeks. Majority of complications occurred between 29 and 36 weeks. At bivariate analysis the following were found to be significantly associated with complications in pregnancy, age 35 years and above (OR 2.247(1.376-3.670), 95% CI), being single was negatively associated with absence of pregnancy complications(OR 0.435(0.219-0.863,95% CI), a gestational age bracket of 29-36 was negatively associated with absence of pregnancy complications (OR 0.169(0.123-0.233,95% CI), **Conclusion:** Though pregnancy complications can occur at any gestational age, there are three peaks at which complications are most common, early pregnancy between 5-16 weeks, 29–36 weeks and after 44weeks of gestation. Pregnancy complication drastically dropped towards term i.e. from 37-42 weeks and an increasing trend thereafter. A maternal age of 35 years and above, being single and a gestational age bracket of 29-36 are associated with pregnancy complications. **Recommendations:** Pregnant women who are 35 years and above and those who are single need to be monitored as high risk pregnancies. Investigations should be carried out for all women between 29-36 weeks when they come for antenatal care to rule out the potential risks. Pregnancies beyond 42 weeks should be induced. First antenatal care attendance should be as early as five weeks and efforts should be made to encourage preconception care in our setting since complications of pregnancy are high in the first few weeks of gestation.

INTRODUCTION

Gestational age is calculated using Naegele's rule, the rule estimates the estimated date of delivery by adding one year, subtracting 3months and adding 7 days to the first day of the woman's last menstrual period (LNMP). The result is approximately 280 days or 40weeks from the start of the last normal period (Wikipedia April 2016).The nine months or so, for which a woman carries a developing embryo and foetus in her womb or pregnancy, is for most women a time of great happiness and fulfilment. However, during pregnancy, both the woman and her developing foetus face various health risks (WHO/Karen Robinson 2016).

Complications of pregnancy are health problems that occur in pregnancy. They can involve the mother's health, baby's health or both. Some women have health problems that arise during pregnancy and others have existing health problems that could lead to complications if they become pregnant. Pregnancy complications can range from mild discomfort, to severe, sometimes life threatening illnesses. Complications during pregnancy may include physical and mental problems that affect the health of mother and foetus. The following are some common health conditions a woman may experience during pregnancy; anaemia, urinary tract infections, mental health conditions, hypertension, gestational diabetes mellitus, infections, hyper emesis gravid arum, premature labour, antepartum haemorrhage, oligohydromnious, abortions, intrauterine feotal death and postdates(Division of reproductive health, national centre for chronic disease prevention and health promotion Sept 2015 –CDC).

Below 23 weeks of gestational or birth weight of less than 500gm infants are too immature to survive (Seri I et al 2008Amini SB1, 1994). Many ante partum stillbirths who are currently designated as unexplained may be avoidable if slow fetal growth could be recognized as a warning sign (Hartley 2001, Gardosi J et al 1998, Grant 1987).The designation of post term pregnancy as those pregnancies which persist beyond 42 weeks of gestation or 294 days has existed for more than 25 years. A recent ACOG Technical Bulletin22 persisted with this designation despite evidence that both maternal and neonatal complications appear to increase prior to 42 weeks

of gestation (Aaron B et al 2007). The risk of maternal peripartum complications increase as pregnancy progresses beyond 40 weeks of gestation (RF Goldstein et al, 2013). Perinatal care of pregnant women at high risk for preterm delivery and of preterm infants born at the limit of viability (22-26 completed weeks of gestation) requires a multidisciplinary approach by an experienced perinatal team (Woods 2003). Limited precision in the determination of gestational age and feotal weight, as well as biological variability may significantly affect the course of action chosen in individual cases (Berger TM 2011, Robertson 1992, Lubchenco 1966). In a retrospective analysis of 353 preterm infants, bilateral intracranial hemorrhage (ICH) and hemorrhagic parenchyma infarction (HPI) had higher rates of adverse outcomes and were independently associated with death/neuro-developmental impairment (NDI). HPI was the most important variable for infants of lower birth weight, and bilateral ICH for larger infants. For infants surviving to 36 weeks, shunt placement was most associated with death/NDI (Davis AS et al 2014). The results of this study will help in identifying gestational ages at which to schedule mandatory ante natal visits and focus investigations to specific conditions at the different gestational ages.The main objective of this study was to determine the pregnancy complications and the gestation ages that are frequently associated with these complications at Mbarara regional referral hospital, southwestern Uganda.

Methods and materials:

Study design:

This was a cross sectional study of all pregnant mothers who presented to the admission area in the department of obstetrics and gynaecology of Mbarara Regional Referral Hospital regardless of gestational age.The study period was for four months starting from August to December 2015.

Study site:

The study was conducted at Mbarara Regional Referral Hospital, antenatal ward and admission area. MRRH is a 300 bed public hospital that serves as the referral Hospital for about districts ten districts in southwestern Uganda, with a population of about 4million people (Atukunda et al 2014). It is a teaching hospital for Mbarara University of Science and Technology, Faculty of Medicine and visiting students from other institutions. The hospital has obstetrics and gynecology department, with a maternity wing that conducts approximately 10,000 deliveries per year. The facility has a number of specialists who offer specialized services. This facility was thus suited to carry out this research.

Study population: All pregnant mothers attending on antenatal ward and those who presented to the admission area during the study period.

Inclusion criteria:

Pregnant mothers who presented to the admission area and antenatal ward in the department of obstetrics and gynecology at any gestation age.

Exclusion criteria:

Mothers with known chronic medical conditions like sickle cell disease, cardiac disease, diabetes mellitus, epilepsy and others were excluded. Women who did not know their last normal menstrual date were also excluded.

Outcome variables:

The Primary outcome was any pregnancy complications. The complications of pregnancy which occurred were described according to the gestation ages at which they did occur. At the end all the complications of pregnancy were grouped together at the analytical stage and defined as either absence or presence of pregnancy complication.

Independent variables:

Data was collected on, socio-demographic factors, obstetric factors, medical factors and gestation age as independent variables.

Sample size estimation:

A sample size of 1016 was used.

Sampling method:

Consecutive sampling was used to recruit eligible participants. Consented mothers were interviewed using a pretested standard questionnaire in the language they best understand. The principal investigator collected the data assisted by 2 trained research assistants at the level of a midwife. The questionnaire captured information including patient's socio-demographic characteristics, obstetric, medical factors and last normal menstrual period which was used to estimate the expected date of delivery and calculation of weeks of gestation.

Statistical data analysis:

The data was entered in an EXCEL spreadsheet and analyzed using SPSS statistical software, version 20 (SPSS, Chicago, IL, USA). Cross tabulations were conducted to obtain descriptive statistics which were presented as frequencies, percentages. Pearson Chi-square statistical test was used to determine association between

categorical variables. Bivariate analysis was used to test the association between the independent and outcome variables. Variables with p-value <0.05 at bivariate analysis were considered to be statistically significant. Odds ratios at corresponding 95% Confidence Intervals were used to test for the strength of association.

Ethical considerations:

Approval was sought from the department of Obstetrics and Gynecology Mbarara University of science and technology, Mbarara Regional Referral Hospital, Faculty of Medicine Research Committee and Mbarara University Institutional Research Board (IRB).

RESULTS:

The total number of respondents was 1016, with age range between 16 and 45 years. The respondents' social demographic,(Table1) and obstetric,(Table2) characteristics were as follows, regarding age majority (90.3%) were <35years old, <tertiary education 80.3%, married or cohabiting 95.8%, unemployed 66.3%, 60.8% were multigravida, 54.8% were above 37 weeks of amenorrhea, 74.8% had attended antenatal care (ANC) in the last 4 weeks,76.6% were in the gestational age bracket of 29-36 weeks. Regarding HIV serostatus 55.5% were HIV negative, 10.9% were HIV positive and 33.6% of the respondents did not have HIV test results.

Regarding reason for coming to hospital, 74.7% had no pregnancy complication (presented either in labour 44.75 or routine ANC 28.2%), 25.2% had a pregnancy a complication while 0.1% had missing results. The complications included the following abortion 6.2%, preterm labour 6.0%, preeclampsia (PET), premature rupture of membranes (PROM), preterm premature rupture of membranes (PREPROM), urinary tract infections (UTI)-2.4%, malaria, intrauterine fetal death(IUFD) 1.5%, ante partum hemorrhage(APH) 1.5% and anemia, (Table 3). The complications started rising from 29 weeks to 36 weeks and started declining thereafter but rose again after 44 weeks. Majority of complications occurred between 29 and 36 weeks,(Table 3,5 and Fig 1).

At bivariate analysis for the following were found to be significantly associated with complications in pregnancy, age 35 years and above (OR 2.247(1.376-3.670), 95% CI, P-value 0.001), being single was negatively associated with absence of pregnancy complications(OR 0.435(0.219-0.863,95% CI, P-value 0.014), a gestational age bracket of 29-36 was negatively associated with absence of pregnancy complications (OR 0.169(0.123-0.233,95% CI, P-value <0.001), (Table 6).

Table 1: Social demographic population characteristics

Variable	Frequency (%)
Age(years)	
<35	917(90.3)
35+	73(7.2)
Missing	26(2.6)
Education	
<Tertiary	816(80.3)
Tertiary+	184(18.1)
Missing	16(1.6)
Marital status	
Single	35(3.4)
Married	973(95.8)
Missing	8(0.8)
Occupation:	
Not employed	674(66.3)
Employed	334(32.9)
Missing	8(0.8)
HIV status	
Negative	564(55.5)
Positive	111(10.9)
Missing	341(33.6)

*Majority were of low age (<35), low education, were married, not employed and were HIV negative.

Table: 2 Obstetric population characteristics

Variable	Frequency (%)
Gravidity	
Prime	353(36.4)
Multi	618(60.8)
Missing	45(4.4)
Gestational age	
5-12	50(5.0)
13- 20	61(6.1)
21-28	78(7.8)
29-36	233(22.9)
37+	556(54.8)
Missing	5(0.5)
Interval since last ANC visit	
>4weeks	188(18.5)
≤4weeks	760(74.8)
Missing	68(6.7)
Gestational age 2	
29-36weeks	233(22.9)
Out of (29-36 weeks)	778(76.6)
Missing	5(0.5)

*Majority of women interviewed (54.8%) were at term.

Table: 3, outcomes (pregnancy complications)

Variable	Frequency (%)
PREPROM	17(1.7)
Spontaneous Abortion	63(6.2)
APH	15(1.5)
Preterm labour	61(6.0)
PET	25(2.5)
PROM	14(1.4)
IUFD	15(1.5)
Postdates	5(0.5)
Oligohydromnious	4(0.4)
Anaemia in pregnancy	2(0.2)
Symptomatic UTI	24(2.4)
Severe malaria in pregnancy	11(1.1)
Normal labour	454(44.7)
Normal antenatal	287(28.2)
Others	17(1.7)
Missing	2(0.2)
Pregnancy complication No	759(74.7)
Yes	256(25.2)
Missing	1(0.1)

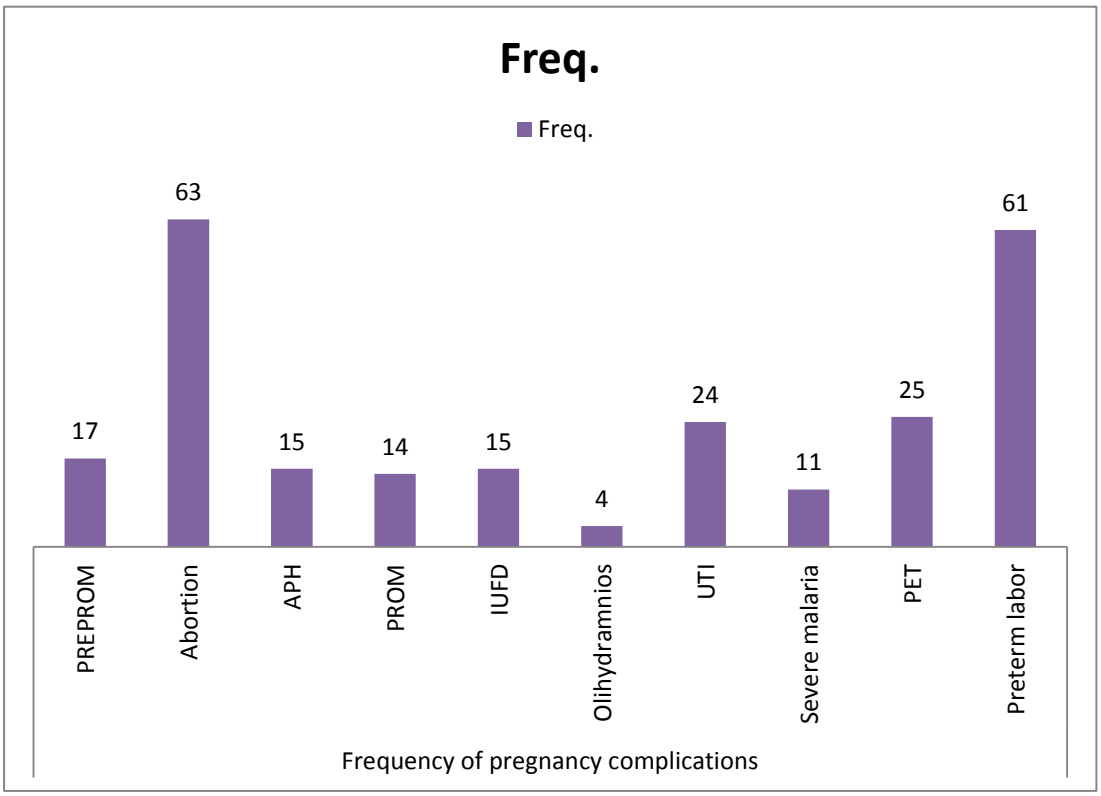
These are some of the reasons women were presented at the point of admission on the antenatal ward, abortions, ANC, APH, 1UFD, Labor, Malaria, PET, Postdates, PPROM, preterm labor, UTI (and others).

Table: 4, shows distribution of pregnancy complications within gestation age:-

Complication	Most freq. GA for complication	Total cases	Case at GA (%)
PPROM	29-36	17	16(94.0)
Abortions	5-12	63	22(35.0)
APH	29-36	15	7(47.1)
PROM	37-44	14	13(93.0)
IUFD	29-36	15	7(47.1)
Oligohydramnios	29-36	4	4(100.0)
UTI	29-36	24	12(50.0)
Severe Malaria	29-36	11	6(55.0)
PET	29-36	25	8(32.0)
Preterm labor	29-36	61	58(95.0)

*Apart from PROM, most complications occurred between 29-36 weeks.

Fig : 1, Shows the frequency of pregnancy complications



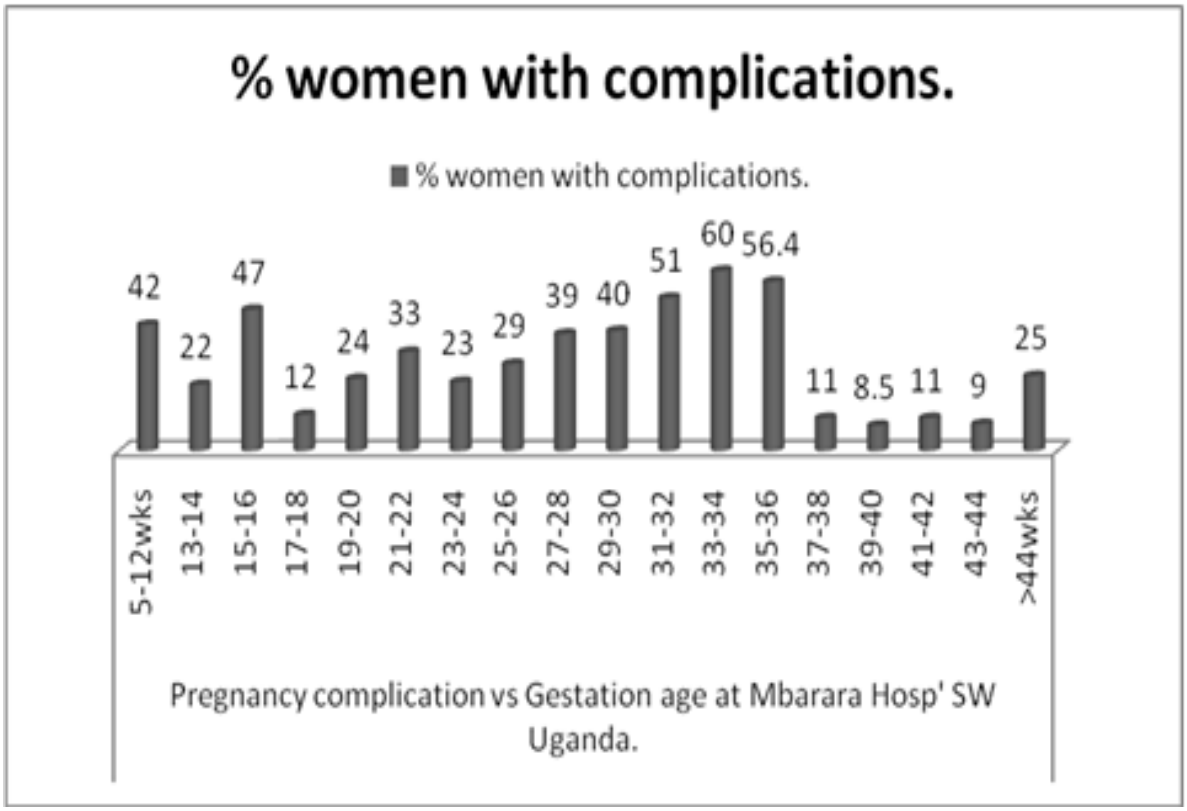
The most frequent pregnancy complication at Mbarara hospital is abortion, followed by preterm labour.

Table: 5, clients' gestation age vs. presence of complication

Weeks of gestation	Presence of complication		Total
	No	Yes	
5-12	21	29(42.0)	50
13-14	7	2(22.0)	9
15-16	10	947.0)	19
17-18	14	2(12.0)	16
19-20	13	4(24.0)	17
21-22	12	6(33.0)	18
23-24	10	3(23.0)	13
25-26	17	7(29.0)	24
27-28	**14**	**9(39.0)**	**23**
29-30	**27**	**18(40.0)**	**45**
31-32	**19**	**20(51.0)**	**39**
33-34	**23**	**35(60.0)**	**58**
35-36	**41**	**53(56.4)**	**94**
37-38	123	15(11.0)	138
39-40	249	23(8.5)	272
41-42	120	15(11.0)	135
43-44	29	3(9.0)	32
>44	6	2(25.0)	8

*Complications were high between 29-36 weeks of gestation and between 5-12 weeks, with peak between 33-34 weeks (60%).

Figure 2: percentage of women with complications vs. gestation age in weeks



*Majority of complication occurred between 29-36 weeks of gestation (with peak between 33-34 weeks), from then complication drastically dropped towards term and another increase in trends after.

Table: 6, bivariate analysis

Variable	**Pregnancy complication**		Odds ratio(95%CI)	P-value
	Absent	Present	**2.247(1.376-3.670)**	**0.001**
Age(years)				
<35	699	217		
35+	43	30		
Gravidity			1.338(0.983-1.822)	0.064
Prime	276	77		
Multi	450	168		
Gestational age(weeks)			**0.169(0.123-0.233)**	**<0.001**
29-36	107	126		
Out of(29-36)	648	129		
Education			0.755(0.513-1.112)	0.154
<Tertiary	601	214		
Tertiary	145	39		
Client's marital status			**0.435(0.219-0.863)**	**0.014**
Single	20	15		
Married /cohabiting	733	239		
Client's occupation			0.781(0.576- 1.071)	0.126
Not employed	494	179		
Employed	260	74		
HIV serostatus Negative			1.112(0.695-1.781)	0.657
Positive	432	131		
	83	28		
Last ANC attendance			1.392(0.945-2.051)	0.093
>4wks	149	39		
≤4wks	557	203		

*Clients' age, marital status and gestational age are significantly associated with pregnancy complications at bivariate analysis.

DISCUSSION

Prevalence of pregnancy complications at different gestation age groups:

Majority of the women with complications were in the gestation age group of 29-36 weeks. During this period PPROM, PET, False labor, preterm labor, severe malaria, UTIs, Oligohydromnious, IUFD, and APH were the most frequent complications that mothers reported with in the hospital. There was also high prevalence of pregnancy complications below 16 weeks. First trimester complications can be explained by the poor antenatal attendance and lack of pre conception care. There was an increasing trend in pregnancy complication from 29 weeks up to 36 weeks of gestation. Related findings were found by Berger 2011, Seri Iet al 2008, Amini SB1, 1994. Pregnancy complication drastically dropped towards term i.e. from 37-42 weeks and an increasing trend thereafter. Similar findings were reported by Aaron B et al 2007, Hartley 2001McCaughey 2007, Yudkin PL 1987. The increase in complications after 42 weeks can be explained by placenta insufficiency due to postdates. Elevated risks are observed after exposure to urinary tract infection these include low birth weight, prematurity, preterm low birth weight, premature labor, hypertension/preeclampsia, maternal anemia, amnionitis, and perinatal death. These findings underscore the importance of antepartum urine screening to identify patients at risk for adverse outcomes(Schieve et al., 1994).

Distribution of pregnancy complications with gestation age groups:

Pregnancy complications were more common between 29-36 weeks, at low gestational ages (5-16 weeks) and in post term pregnancies. Post term pregnancy has been defined for more than two decades as a pregnancy that persists beyond 294 days or 42 weeks of gestation. The post term pregnancy, which likely occurs among less than 5% of pregnant women, has been associated with an increased perinatal mortality rate, perinatal morbidity, meconium aspiration syndrome, oligohydromnious, macrosomia, fetal birth injury, fetal distress in labor and increased rates of cesarean delivery. It is not well elucidated whether these risks increase prior to 42 weeks' gestation. This is in agreement with Aaron B. McCaughey 2007, Yudkin PL 1987.

Increasing parity

Parity refers to the number of times a woman has been pregnant for 20 or more weeks regardless of whether the infant is dead or alive at birth. Parity, or the number of previous pregnancies, has been shown to impact the long-term health status of women and pregnancy outcomes. The parity has a clear effect on pregnancy complications this is concordant with; UDHS 2011, Nkonwa 2016. We did not find any association between parity and pregnancy complications.

Client unemployment

Mothers who didn't have employment whether formal or non-formal are more prone to pregnancy complications than their counterparts in formal employment. This is because with little or no earnings health seeking behavior and nutrition which impact on both fetal and maternal wellbeing are affected (Petraro2013, UDHS 2011, Nkonwa 2016). In our study we did not find any association between occupation and pregnancy complications.

Marital status

Mothers who were not married were associated with developing pregnancy complications compared to their married counterparts. This can be explained by the fact that support from the husband improves general wellbeing i.e. nutrition and health seeking behavior thereby improving out comes. Previous studies found that husbands are the bread winners and most families entirely rely on them for their support (Petraro 2013, UDHS 2011 and Nkonwa 2016).

Increasing age

Increasing age (≥35years) was significantly associated with complications of pregnancy unlike their counterparts the young mothers. This is concordant with Seri I et al 2008. Mothers with age >35 were more prone to pregnancy related complication. This could be because most of the mothers with age above 35years had higher parities and of which parity has an established relationship on negatively impacting maternal and fetal outcomes. At older age group mothers start developing systemic diseases like hypertension and diabetes which may have negative impact on pregnancy.

Antenatal attendance

Antenatal attendance was not associated with pregnancy related complication. During antenatal mothers receive supplements, health education and screening for infection on top of infection preventive measures like mosquito nets, cotrimoxazole prophylaxis for the HIV positive and intermittent malaria prevention therapy for malaria. Therefore poor ANC attendees are prone to getting pregnancy complications compared to mothers who attend more than four times. However when we compared women who attended ANC within 4 weeks and those who had taken long than 4 weeks there was no statistically significant difference, this shows that the current ANC protocol are either not very effective in preventing pregnancy complications or are not focused on prediction and prevention of complications.

Conclusion

Though pregnancy complications can occur at any gestational age, there are three peaks at which complications are most common, early pregnancy between 5-16 weeks, 29–36 weeks and after 42weeks of gestation. Pregnancy complication drastically dropped towards term i.e. from 37-42 weeks and an increasing trend thereafter. A maternal age of 35 years and above, being single and a gestational age bracket of 29-36 are associated with pregnancy complications.

Recommendations

Pregnant women who are 35 years and above and those who are single need to be monitored as high risk pregnancies. Investigations should be carried out for all women between 29-36 weeks when they come for antenatal care to rule out the potential risks. Pregnancies beyond 42 weeks should be induced. First antenatal care attendance should be as early as five weeks and efforts should be made to encourage preconception care in our setting since complications of pregnancy are high in the first few weeks of gestation.

Authors' information:
1: Mayanja Ronald, MBChB(MUST), MMed O&G(MU), Lecturer, Department of obsGyn(MUST), Uganda
2: Ngonzi Joseph, MBChB(MUST), MMed O&G(MUST), PhD candidate, Senior lecturer, Chair Department of obstGyn(MUST), Uganda
3: Nkonwa Innocent H, MBChB(MUST),MPHL(UCU), Mbarara University of Science and Technology.
4:Kayondo Moses, MBChB(MUST), MMed O&G(MUST), Lecturer, Department of ObsGyn(MUST), Uganda

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