



# **Factors Influencing Early Neonatal Adverse Outcomes among Women with HIV with Post Dated Pregnancies Delivering at Kampala International University Teaching Hospital, Uganda**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. Author GE conceptualized the study and participated in data collection. Author EIO guided and contributed to study design and analysis. Author KD Contributed to data analysis, and author OSP oversaw the overall running of the study from start to finish and wrote the final manuscript. All authors read and approved the final manuscript.*

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## ABSTRACT

**Introduction:** Postdated pregnancies have been shown for centuries in several studies of having increased risk to the mother and their fetus when compared to term pregnancies with complications increasing with increase in gestational age beyond 40 weeks. The purpose of this study was to determine the factors influencing early neonatal adverse outcomes among women with postdate pregnancies delivering at Kampala International University Teaching Hospital.

**Methods:** A quantitative cross-sectional study employed simple random sampling among 108 pregnant postdated mothers admitted in labour in maternity ward at Kampala International University Teaching Hospital.

**Results:** From total respondents, 58 (53.7%) mothers had babies with neonatal complications with confidence interval of (53.4–61.6). Majority 14 (24.1%) of women revealed that they had meconium aspiration while the least 3 (5.2%) had Low birth weight complications. Statistically significant factors associated with early neonatal adverse outcomes among women with postdated pregnancies at Kampala International University Teaching Hospital included age group 25 – 29 years of age (OR =5.73: 95%CI, 2.31-28.4: P<0.001), no educational background (OR=3.29: 95%CI, 1.94–5.57: P<0.001), being a single women (OR=2.61: 95%CI, 0.77–8.85: P=<0.001), smoking (OR=4.36: 95%CI, 3.18-29.63: P=<0.001), gravity of 4 and above (OR=7.93: 95%CI, 0.55–38.33: P<0.001), ANC between 1 to 2 times (OR=3.81: 95%CI, 0.57–29.01: P=0.004), and previous postdated pregnancy (OR=10.47: 95%CI, 7.69–14.26: P=<0.001).

**Conclusion:** In conclusion, with good antenatal care and multidisciplinary approach, HIV-infected women can ensure quality care of mothers and newborns.

*Keywords: Early neonatal adverse outcomes; women; HIV; post dated pregnancies delivering.*

## 1. INTRODUCTION

Postdated pregnancy has been known as the pregnancy extending beyond 40 weeks or 280 days from the first day of the last menstrual period [1-6]. The terminologies such as postdated, post term, post maturity, and prolonged pregnancy are used synonymously for decades as accepted terms by World Health Organization (WHO) to describe pregnancies that have exceeded the expected date of delivery while post term pregnancy has been referred to as a pregnancy that extends after 294 days or 42 weeks of gestation [7-8]. Postdated pregnancies have been shown to occur due to multiple etiologies of which the exact etiology is not well identified [9]. These etiologies are classified into either maternal factors such as wrong dating of last menstrual period (LMP); fetal factors that comprises of congenital fetal anomalies like anencephaly which disrupt the hypothalamic pituitary axis and adrenal hypoplasia causing poor fetal cortisol response which delays the initiation of the process of labour; and placental factors such as placental corticotrophin releasing hormone and sulphatase enzyme deficiencies [1].

It has been shown that in prolonged pregnancies, combination of continued fetal growth and arrested placental growth may result into decreased placental nutrient reserve,

compromised fetal circulation leading to decreased fetal oxygen supply and important in genesis of post maturity syndrome [8]. These placental changes increase with increase in weeks of gestation resulting into adverse perinatal outcomes including fetal hypoxia, asphyxia, cord compression, intracranial damage, meconium aspiration syndrome (MAS), macrosomia, atelectasis, shoulder dystocia, oligohydramnios, stillbirths and neonatal risk of post maturity syndrome and its complications [1].

There are two methods for the determination of gestational age to aid in the diagnosis and subsequent management of postdated pregnancy, namely Naegles rule that computes gestational age from the first day of the LMP [10] and early pregnancy ultrasonography which has been reported to significantly reduce the number of postdated pregnancies compared to dating based on the last menstrual period alone [7].

Post maturity syndrome describes the neonatal features who have been in utero longer than 42 weeks of gestation resulting from intrauterine growth restriction due to utero-placental insufficiency which is found frequently in postdated pregnancies [11]. Features of a neonate with post maturity syndrome that includes (stage 1) loss of vernix, unstained skin and evidence of malnutrition in the loss of subcutaneous fat and the wrinkling of the skin; or

(stage 2) loss of vernix, green meconium stained cord, amniotic fluid, skin and membranes with an evidence of malnutrition; and or lastly (stage 3) cord, skin and nails stained yellow, severe evidence of malnutrition and therefore, the loss of the vernix (protective layer) leads to the typical alligator skin-dry and scaling, with superficial cracking and desquamation of the palms and the soles of the feet whereby Clifford indicated that 25% neonatal mortality occurred when Stages II and III exist with an additional 54% of serious morbidity [12].

Some factors influencing postdated pregnancies reported in many studies include parity, maternal age, obesity, past history of post term pregnancy and genetics [9]. Another similar study found that obesity, advanced maternal age and primiparity have been strongly associated risk factors for postdated pregnancy and caesarean delivery [13].

It has also been shown in studies that postdated pregnancies have increased risk of oligohydramnios, meconium-stained amniotic fluid, macrosomia, fetal post maturity syndrome, and cesarean delivery and if pregnancies crossed their expected date of deliveries should be attended as high risk due to increased perinatal morbidity and mortality [10-11] due to placental insufficiency [12]. It has also been reported that induction of labour at the expected date of delivery reduces the complications of postdated pregnancies compared to expectant management [14,15].

Mya and colleagues reported that postdated pregnancies have been shown to be associated with an increased incidence of low Apgar score, stillbirths, meconium aspiration syndrome, macrosomia, shoulder dystocia and increased admissions to NICU [1,8]. A similar study reported prolonged pregnancy complications such as increased perinatal mortality, meconium aspiration syndrome, stillbirth, macrosomia and or fetal growth restriction [14].

## **2. MATERIALS AND METHODS**

### **2.1 Study Design, Duration, and Site**

The study was a prospective cohort study conducted in Kampala International University Teaching Hospital (KIU-TH) a government facility which is found in Bushenyi District located along Bushenyi-Mbarara high way about 55 kilometers from Mbarara city. KIU-TH has the obstetrics and

gynecology department which consists of labour suit, post-natal ward, antenatal care clinic, gynecology clinic and family planning clinic. The department of obstetrics and gynecology has gynecologists, Senior Health officers and midwives assigned to all its subunits. The maternity ward where labour suit is a component, conducts about 5 to 10 deliveries daily coming from within the district and is where the study was conducted.

### **2.2 Study Population**

The study population involves 180 pregnant women admitted in labour in maternity ward at Kampala International University Teaching Hospital.

### **2.3 Inclusion Criteria**

All pregnant women with a gestational age of >40 weeks with a known first day of last menstrual period or who have done first trimester obstetric ultrasonography for reliable expected date of delivery, have a singleton pregnancy in cephalic presentation and at age group 18 to 44 years who have consented to participate in this study.

### **2.4 Exclusion Criteria**

The study excluded women with obstetric complications such as with indication for caesarean delivery or previous cesarean section, hypertension disorders of pregnancy, gestational diabetes; those with history of recent oral contraceptive use and those who gave birth to neonates with major congenital abnormalities.

### **2.5 Data Collection Procedure**

The participants were recruited in the labour suit of the maternity ward at Kampala International University Teaching Hospital where the study is conducted. The eligible participants were educated and counseled about the study and their consent was requested. Those who accepted signed a consent and filled investigator administered questionnaire sociodemographic and obstetric variables. The estimation of the gestational age was calculated from the first day of the last menstrual period or first trimester ultrasound scan results. The pregnancy is considered postdated when it exceeds 40 weeks of gestation.

After delivery the neonatal clinical characteristics were recoded within the first 24 hours after birth

which was referred to as the early neonatal period. Follow up of the neonates was conducted by the principle investigator within the first 24 hours where by the desirable and undesirable characteristics will be registered on the investigator administered questionnaire. The completeness of the questionnaire was ensured at the end of the study.

## **2.6 Data Analysis**

Data was entered into an MS Excel sheet, cleaned and coded. Data was analyzed using SPSS 20.0 statistical software package. Descriptive statistics such as means, median and standard deviations were calculated for continuous variables. The prevalence of non-adherence was computed by dividing the number of study participants who are non-adherent to their ART by the total number of study participants recruited, multiplied by 100.

To determine the factors associated with nonadherence, we used chi-square statistics – where a p-value of less than 0.2 was considered associated with non-adherence. We then used binary logistic regression to determine factors independently associated with non-adherence and their strength of associations. A p-value of less than 0.05 was considered for an association to be considered as statistically significant.

## **3. RESULTS**

A total of 108 mothers were enrolled in the study. The majority of the participants were aged between 25 - 29 years with 39 (36.1%) and least proportion was aged 35 and above years with a total respondents of 15 (13.9%). Majority, 51(47.2%) attained secondary level of education while the least 10 (9.3%) attained Tertiary level of education. On the other hand, majority 114(77%) were married while the least 9(6.1%) were single. Majority of women 99 (91.7%) were none smokers while the least 9(8.3%) of the mothers were smokers. Majority of women 34 (31.5%) had Overweight BMI (25.0-29.9) while the least 19 (17.6%) had Normal Weight BMI (18.5-24.9). The above results are summarized in Table 1.

From total respondents, 58 (53.7%) mothers had babies with neonatal complications with confidence interval of (53.4–61.6).

From the responses on complications, majority 14 (24.1%) of women revealed that they had

meconium aspiration while the least 3 (5.2%) had Low birth weight complications.

Age categories, level of education, marital status and smoking habits were statistically significantly associated with early neonatal adverse outcomes among women with postdated pregnancies at Kampala International University Teaching Hospital in the model at 5% level.

Women in age group of 18-24 years were 5times more likely to experience early neonatal adverse outcomes compared to those who belonged to age group 25 – 29 years of age (OR =5.73: 95%CI, 2.31-28.4: P<0.001). Women with no educational background were 3 times more likely to experience early neonatal adverse outcomes compared to those who attained college tertiary level of education (OR=3.29: 95%CI, 1.94–5.57: P<0.001). Single women were 2times more likely to experience early neonatal adverse outcomes compared to the married women (OR=2.61: 95%CI, 0.77–8.85: P=<0.001). Women who were smokers were 4times more likely to experience early neonatal adverse outcomes compared to none smokers (OR=4.36: 95%CI, 3.18-29.63: P=<0.001). Body mass index was not statistically significant to early neonatal adverse outcome. The results are discussed in Table 2.

Gravidity, number of ANC attendance and previous postdated pregnancy were found to be statistically significantly associated with early neonatal adverse outcomes among women with postdated pregnancies at Kampala International University Teaching Hospital at 5% level.

Women who had gravity of 4 and above times were 7 times more likely to experience early neonatal adverse outcomes compared to those who had 2 to 3 times (OR=7.93: 95%CI, 0.55–38.33: P<0.001). Women who attended ANC between 1 to 2 times were 3times more likely to experience early neonatal adverse outcomes compared to those attended 4 and above times (OR=3.81: 95%CI, 0.57–29.01: P=0.004). Women who had previous postdated pregnancy were 10 times more likely to experience early neonatal adverse outcomes compared to those who did not have previous postdated pregnancies (OR=10.47: 95%CI, 7.69–14.26: P=<0.001). Other factors like gestation age, Parity and mode of delivery were not statistically significant on occurrence of early neonatal adverse outcomes among women with postdated pregnancies delivering at Kampala International University Teaching Hospital, Uganda.

**Table 1. Showing the demographic characteristics of the sample**

Variable	Frequency (n=108)	Percentage (%)
<b>Age categories</b>		
18-24	22	20.4
25 – 29	39	36.1
30 – 34	32	29.6
35 and above	15	13.9
<b>Marital status</b>		
Single	30	27.8
Married	78	72.2
<b>Level of education</b>		
None	18	16.7
Primary	29	26.9
Secondary	51	47.2
Tertiary	10	9.3
<b>Do you smoke</b>		
Yes	9	8.3
No	99	91.7
<b>Body Mass Index</b>		
Underweight BMI (less than 18.5)	23	21.3
Normal Weight BMI (18.5-24.9)	19	17.6
Overweight BMI (25.0-29.9)	34	31.5
Obese BMI (greater than or equal to 30.0)	32	29.6

**Table 2. Showing proportion of early neonatal adverse outcomes**

Proportion	Frequency (n=108)	Percentage (%)
Yes	58	53.7
No	50	46.3

#### 4. DISCUSSION

More than half of women 58 (53.7%) had early neonatal adverse complications, Kampala International University Teaching Hospital. Nationally 42% of children of mothers with postdated pregnancies have neonatal complications.

In the study, women in age group of 18-24 years (OR =5.73: 95%CI, 2.31-28.4: P<0.001) had highest odds of experiencing early neonatal adverse outcomes compared. These findings contrast with findings from a study by Choudhury, S. N., & Saji, P. N. (2020) on short Term Neonatal Morbidities of Post-Term Births who revealed that young mothers were 3times more likely to have neonatal complication who belonged to age below 25 years.

On the other hand, women with no educational background were 3 times more likely to experience early neonatal adverse outcomes compared to those who attained college tertiary level of education (OR=3.29: 95%CI, 1.94–5.57: P<0.001). These results were supported by other

scholars like China by Deng and colleagues had shown that younger mothers with lower level of education and who delivered at a level ≤2 hospital had increased associated risk for post term pregnancy.

Furthermore, single women were 2times more likely to experience early neonatal adverse outcomes compared to the married women (OR=2.61: 95%CI, 0.77–8.85: P=<0.001). The above findings were in association with study findings by Kandalgaonkar, V. P., & Kose, V. (2019) on Fetomaternal outcome in postdated pregnancy who found out that single women were more likely to experience early neonatal adverse outcomes compared to the married women.

Women who were smokers were 4times more likely to experience early neonatal adverse outcomes compared to none smokers (OR=4.36: 95%CI, 3.18-29.63: P=<0.001). The above findings of the study were in line with findings of the study by Morken, N., Klungsøyr, K., & Skjaerven, R. (2014) on perinatal mortality by gestational week and size

at birth in singleton pregnancies at and beyond term who revealed that women who take substances like cigarette and alcohol are more likely to experience early neonatal adverse complications.

Women who had gravity of 4 and above times were 7 times more likely to experience early neonatal adverse outcomes compared to those who had 2 to 3 times (OR=7.93: 95%CI, 0.55–38.33: P<0.001). The above study findings were in contrast with the findings of [13], on maternal risk factors for post term pregnancy and cesarean delivery following labor induction who revealed that gravidity is not statistically significantly associated with occurrence of early neonatal adverse outcomes [AOR=3.2 95% CI, 1.1, 9.2].

On the other hand, women who attended ANC between 1 to 2 times were 3times more likely to experience early neonatal adverse outcomes

compared to those attended 4 and above times (OR=3.81: 95%CI, 0.57–29.01: P=0.004). The findings are in line with findings of the study by Dobariya et al. [16] who revealed that not attending regular antenatal check-up has been shown is linked with postdated pregnancy with increased associated risks to the especially as the pregnancy increases beyond 40 weeks of gestation [16].

Women who had previous postdated pregnancy were 10 times more likely to experience early neonatal adverse outcomes compared to those who did not have previous postdated pregnancies (OR=10.47: 95%CI, 7.69–14.26: P=<0.001). The study by Galal and colleagues also found that the most prevalent risks associated with prolonged pregnancies after 41 weeks of gestation were primiparity and women whose twin sister had had a previous postdated birth with association seen increased in monozygotic than in dizygotic twins [11].

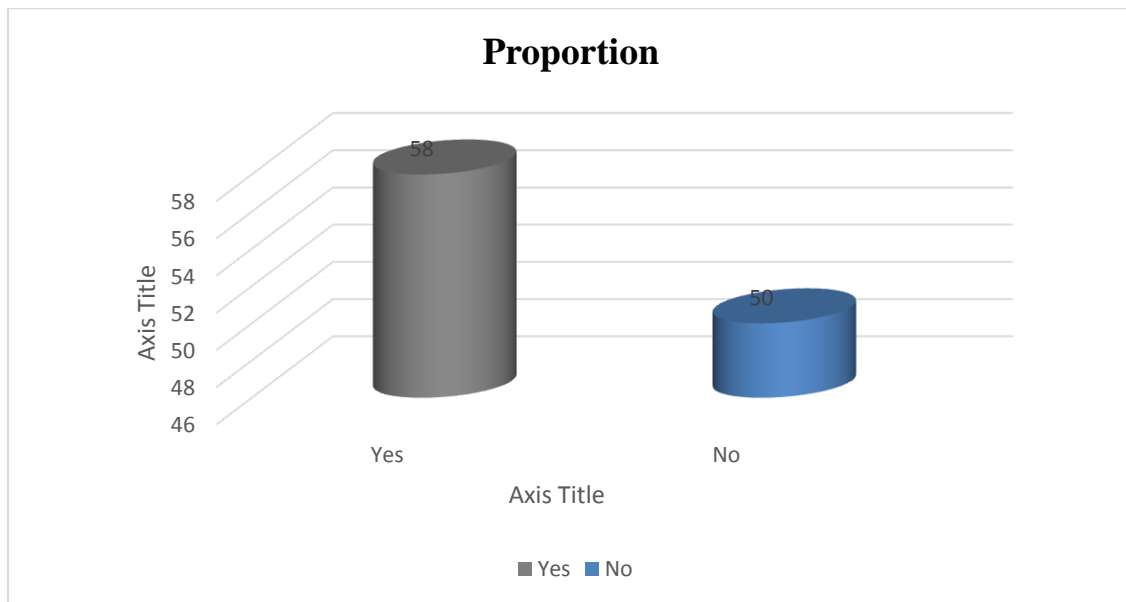


Fig. 1. Showing proportion of early neonatal adverse outcomes

Table 3. Showing summary of neonatal complication

Complications		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low APGAR score	9	15.5	15.5	15.5
	Low birth weight	3	5.2	5.2	20.7
	Admission to NICU	7	12.1	12.1	32.8
	Early neonatal death	10	17.2	17.2	50.0
	Still birth	7	12.1	12.1	62.1
	Meconium aspiration	14	24.1	24.1	86.2
	Macrosomia	8	13.8	13.8	100.0
	Total	58	100.0	100.0	

**Table 4. Showing association between demographic characteristics and early neonatal adverse outcomes**

Variable	Early neonatal adverse outcomes		OR (95% CI)	P-Values
	Yes	No		
<b>Age categories</b>	<b>n=58</b>	<b>n=50</b>		
18-24	16(72.7%)	6(27.3%)	5.73(2.31-28.4)	<0.001
25 - 29	20(51.3%)	19(48.7%)	Ref	
30 - 34	18(56.2%)	14(43.8%)	1.98(0.27-13.6)	0.071
35 and above	4(26.7%)	11(73.3%)	1.50(0.19-11.45)	0.096
<b>Level of education</b>				
None	17(94.4%)	1(5.6%)	3.29 (1.94–5.57)	<0.001
Primary	9(31.0%)	20 (69.0%)	1.47 (0.86–2.53)	0.620
Secondary	29(56.9%)	22(43.1%)	1.99 (0.31–3.04)	0.411
Tertiary	3(30.0%)	7(70.0%)	Ref	
<b>Marital status</b>				
Single	20(66.7%)	10(33.3%)	2.61 (0.77–8.85)	<0.001
Married	38(48.7%)	40(51.3%)	Ref	
<b>Smoking</b>				
Yes	1(14.3%)	6(85.7%)	4.36(3.18-29.63)	<0.001
No	27(51.9%)	25(48.1%)	1.33(0.15-6.46)	0.023
<b>Body Mass Index</b>				
Underweight BMI	16(69.6%)	7(30.4%)	1.28(0.69-4.16)	0.020
Normal Weight	13(68.4%)	6(31.6%)	Ref	
Overweight BMI	16(47.1%)	18(52.9%)	1.36(0.16-3.33)	0.022
Obese BMI	13(40.6%)	19(59.4%)	1.24((1.76-1.35)	0.024

**Table 5. Showing association between obstetric factors and early neonatal adverse outcomes**

Variable	Early neonatal adverse outcomes		OR (95% CI)	P-Values
	Yes	No		
<b>Gravidity</b>	<b>n=58</b>	<b>n=50</b>		
Once	23(50.0%)	23(50.0%)	1.05 (0.89–3.76)	0.041
2 to 3 times	12(50.0%)	12(50.0%)	Ref	
4 and above	23(60.5%)	15(39.5%)	7.93(0.55–38.33)	<0.001
<b>Parity</b>				
Once	23(52.3%)	21(47.7%)	Ref	
2 to 3 times	8(61.5%)	5(38.5%)	3.81(0.57–29.01)	0.014
4 and above	27(52.9%)	24(47.1%)	0.97(0.65–1.35)	0.030
<b>Number of ANC attendance</b>				
1 – 2	21(75.0%)	7(25.0%)	4.53 (1.86–21.72)	0.003
3 – 4 times	25(58.1%)	18(41.9%)	Ref	
4 and above	12(32.4%)	25(67.6%)	3.37 (1.77–14.74)	0.011
<b>Previous postdated pregnancy</b>				
Yes	18(60.0%)	12(40.0%)	10.47 (7.69–14.26)	<0.001
No	40(51.3%)	38(48.7%)	Ref	

**5. CONCLUSION**

With good antenatal care and multidisciplinary approach, HIV-infected women can ensure quality care of mothers and newborns.

**CONSENT AND ETHICAL APPROVAL**

Informed consent and respect for participants: Voluntary recruitment was done and an informed consent was signed. Systemic random sampling

method was used to select participants to ensure equal chance of being selected for the study. Approval to carry out the study was sought from Kampala International University Teaching Hospital Chief Executive Officer to give permission to the principal investigator to collect data at the hospital family planning clinic.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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