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Maternal factors associated with preterm births at Thika level 5, Kiambu County, Kenya

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Abstract
Background: Preterm birth is one of the leading causes of neonatal mortality it contributes to 60-80 per cent of all neonatal deaths. The causes of preterm birth are unknown in over 50% of spontaneous preterm labour, and mechanisms of preterm labour remain poorly understood. The main objective of the study was to determine the factors associated with birth outcomes among post-natal mothers; secondarily to assess the sociodemographic factors, health seeking behaviours and obstetric factors associated with mothers who had preterm births.
Methods: This was a descriptive cross-sectional study. Quantitative approach was used in collection of data using structured interviewer administered questionnaire. Simple random sampling technique was used to sample the participants; and analysis performed using STATA.
Results: Chi square test of independence revealed that the iron and folic acid supplementation (IFAS) in pregnancy (p=0.035) and number of antenatal visits (p=0.001) were the significant factors associated with preterm births. Bivariate logistic regression was used to determine the factors independently associated with preterm births; only age was a significant determinant of birth outcomes p =0.005, OR=3.132(95%CI; 1.405,6.984)
Conclusions: Maternal age, IFAS supplements and antenatal visits are significant factors associated with preterm births.

Keywords: preterm births, maternal factors

Introduction
Preterm birth is one of the leading causes of neonatal mortality (Harrison & Goldenberg, 2016; Torchin & Ancel, 2016) [7, 11].
the contribution of neonatal mortality to child mortality nationally cannot be ignored. It is the most direct cause of neonatal mortality, which contributes to 60-80 per cent of all neonatal deaths (Glass *et al*., 2015) [5]. According to WHO, 2010, estimated numbers of more than 1 in 10 neonates die annually due to pre-term births and the survivors develop fatal disabilities like hearing, visual impairments and learning disabilities throughout their lifetime.
Neonatal mortality is not represented in the millennium development goals (MDGs), however, the MDGs goal 4 targets a two-thirds reduction in the under five deaths between 2005 and 2015 (Walani, 2020) [13]. Provision of quality maternal and infant health in pregnancy during delivery and post-delivery has ensured preventable maternal and new-born deaths.
Child birth outcomes have become the focus of achieving MDG 4 that aims to reduce child mortality and reduce the less than 5 mortality rate by two thirds. Most neonatal mortalities and complications are caused by preterm births and complications arising from labour and pregnancy at 24%.Causes of preterm birth are unknown in over 50% of spontaneous preterm labor, while mechanisms of preterm labor remain poorly understood (Kaguthi *et al*., 2018; Olack *et al*., 2021; Wu *et al*., 2016) [8, 10, 14]. Generally, previous authors have mainly concentrated on the prevalence of preterm births and the significance of neonatal mortality but not the causes of the preterm births such as maternal related factor

Methods
Research design
The study adopted a cross sectional descriptive study design and a quantitative approach in data collection.

Study Area
Thika Level 5 teaching and referral hospital is a tertiary hospital that receives multiple patients from the 5 bordering counties. The Newborn unit and newborn ICU receive preterm neonates as young as 24 weeks with an average weight of one kilogram.

Target population
The target population consisted of mothers who were admitted in the postnatal unit. It also involved mothers whose babies had been referred to the facility. In general, mothers whose neonates who were within 28 days following delivery were included in the study.

Exclusion Criteria
Mothers who could not voluntarily consent to the study; this includes women who were mentally unstable.

Sampling technique and sample size determination
Systematic sampling method was used to select the participants; the technique was employed where the participants were enrolled into the study as they were admitted into the post-natal unit. The study had a sample size made of 384 participants. The sample size was determined using the Cochran's formulae: In order to estimate the proportion of babies who have a negative outcome with 95% confidence interval with a level of precision of (+-5%) assuming the proportion of negative outcomes is 50%. The 50% prevalence was used because there is no reliable study that has been done on prevalence of negative birth outcomes in Kenya and the region.

Data collection instruments
The researcher used an elaborate semi structured interviewer administered questionnaire to collect data. The questionnaire form was divided into 3 sections according to the study objectives: Part 1: Socio demographic factors e.g. Are you married? Part 2: Health seeking behaviours e.g. How many antenatal clinics did you attend? Part 3: Maternal Obstetric factors e.g. Have you ever had a preterm birth?

Reliability and Validity
The pilot study consisted of 40 post-natal mothers from Kiambu level 4 Hospital. This sample size used in the pilot study was calculated based on the 10% of the sample projected for the larger parent study. This is according to Connelly, who stated that extant literature suggests that a pilot study sample should be 10% of the sample projected for the larger parent study (Becker, 2008) [1]. Internal validity was achieved given the representativeness of the study sample, methods and instrument. Subsequently the study findings can be extrapolated to all other pregnant women to other regions of similar setting.

Data Analysis Procedure
Data was analyzed using Stata 11.0. The researcher used descriptive statistics to measure the amount of spread of variability within the mean. Bivariate logistic regression was used to determine the factors independently associated with preterm births.

Results
Descriptive characteristics of Participants
The participants in this study were aged between 16 and 45 years. Most of the participants (49.1%) were aged between 21 and 26 years. The mean age was 25.5(SD 5.7).Most of the participants had attained secondary school education (45.3%), were married (77%), were unemployed (56.6%), and resided in urban areas(62.8%).This is presented in table 1.

Table 1: Descriptive statistics of Socio-demographic Characteristics

Variable	Number	%
Mothers Age, Mean (SD)	25.5	5.7
Level of Education of Mother		
Primary and below	100	31.3
Secondary education	145	45.5
Tertiary education	74	23.2
Marital status		
Single	70	21.9
Married	247	77.2
Divorced	3	0.9
Occupation		
Employed	39	12.2
Unemployed	181	56.6
casual laborer	100	31.3
Residence		
Rural	119	37.2
Urban	201	62.8

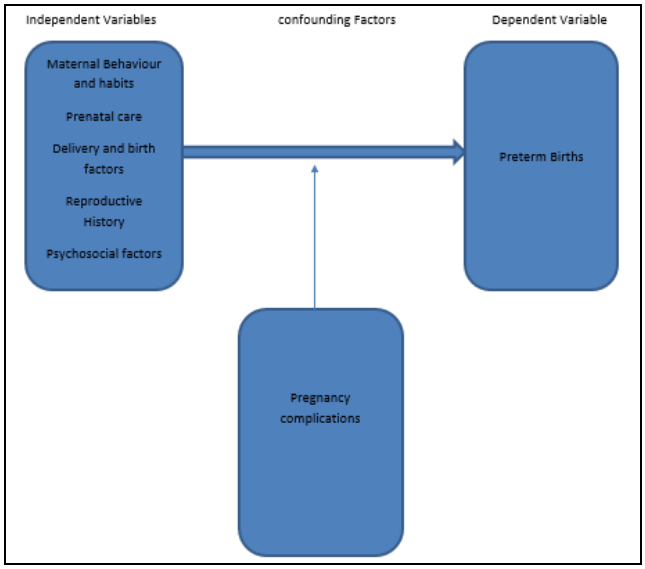

Fig 1

Descriptive characteristics of health seeking behavior.
Most of the participants reported to have attended the antenatal clinic 3 times or less (49%), majority had received IFAS supplements and tetanus toxoid vaccine during the antenatal visits at 81% and 74% respectively, and the majority reported to have attended private or faith based health facilities for antenatal care (85%)..This is presented in table 2.

Table 2: Descriptive characteristics of health seeking behaviour.

Variable	Number	%
Number of antenatal visits		
Less than 4	157	49.2
4 or 5	117	36.7
6 plus	45	14.1
IFAS Supplements		
Yes	258	80.9
No	61	19.1
Tetanus Toxoid Vaccine		
Yes	235	73.7
No	84	26.3
Hospital attended –ANC		
No Hospital	6	1.9
Public hospital	41	12.9
Private/Faith based	272	85.3

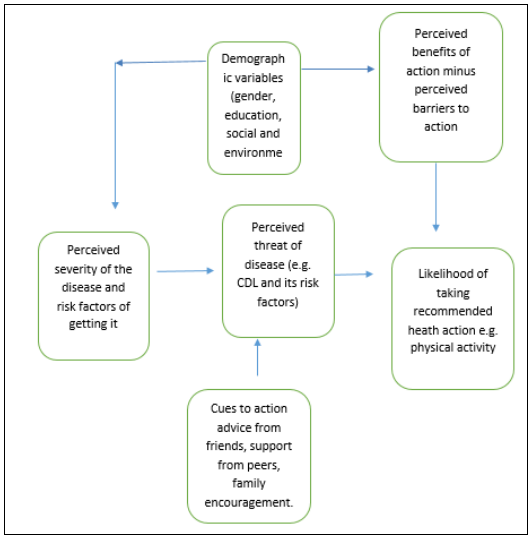

Fig 2

Descriptive statistics of obstetric factors.

The inter pregnancy interval for majority of the participants was 2-5 years at 60%, most of which admitted to have used family planning (67%).The most popular mode of delivery was spontaneous vaginal delivery (70%). Majority of the respondents confirmed that in pregnancy they had no malaria (95%), no diseases (83%), and no allergies (98%), used no medication (95%) and had no alcohol and substance abuse (96%). This is presented in the table 3;

Table 3: Descriptive statistics of obstetric factors

Variable	Number	%
Spacing (inter pregnancy interval)		
1	17	11.8
2-5`	86	59.7
6-9`	33	22.9
10 plus	8	5.6
Mode of delivery		
Vaginal	222	69.6
CS	97	30.4
Family Planning Use		
Yes	215	67.4
No	100	31.4
Not Disclosed	4	1.3
Malaria in Pregnancy		
Yes	17	5.3
No	302	94.7
Disease in pregnancy		
Yes	53	16.6
No	266	83.4
Allergies		
Yes	8	2.5
No	311	97.5
Medication Use		
Yes	17	5.3
No	302	94.7
Drug and Substance use		
Yes	14	4.4
No	304	95.6

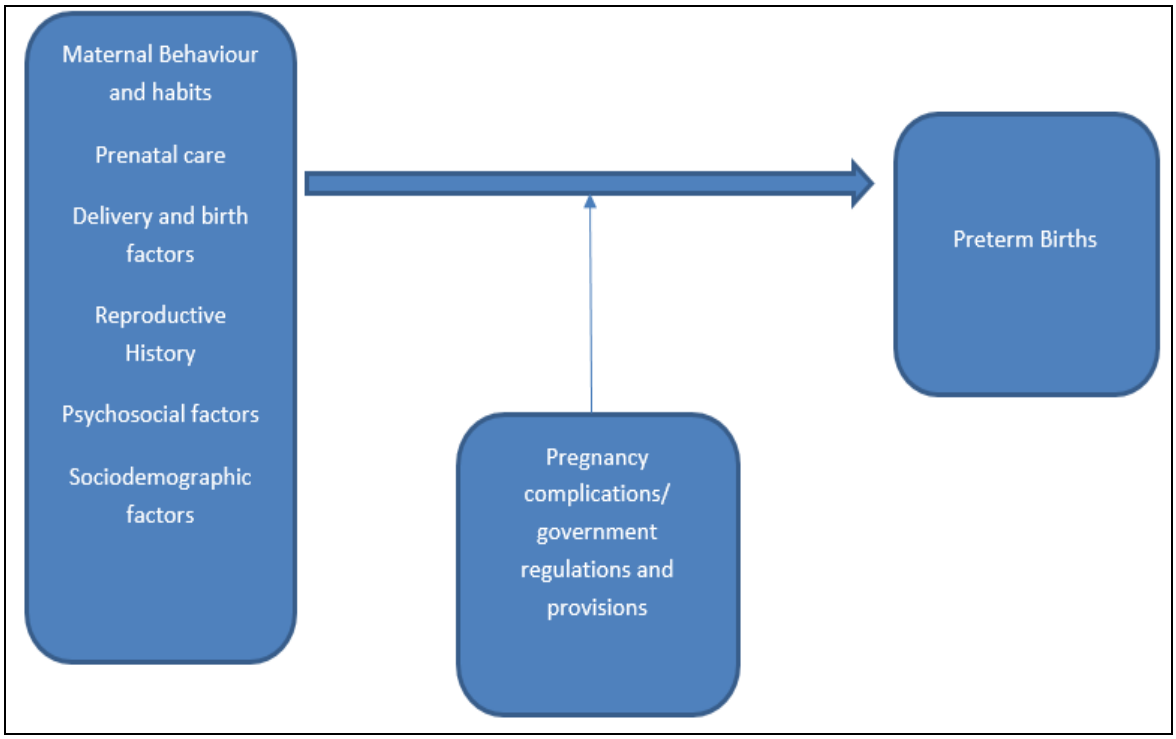

Fig 3

Bivariate analysis of sociodemographic characteristics and birth outcome

Demographic factors were not statistically significant to preterm births; this is presented in Table 4.

Table 4: Chi square analysis of socio-demographic characteristics

				p-
Characteristics	Total	Term vs. Pre-Term		value
		Preterm	Term	
	N (%)	n (%)	n (%)	
Mothers Age, Mean (SD)	25.5(5.7)	25.5(5.9)	25.6(5.6)	0.8889
Level of Education of Mother				
Primary and below	100(31.3)	47(47)	53(53)	
Secondary education	145(45.5)	58(40)	87(60)	
Tertiary education	74(23.2)	30(40.5)	44(59.5)	0.519
Marital Status				
Single	70(21.9)	31(44.3)	39(55.7)	
Married	246(77.1)	102(41.5)	144(58.5)	
Divorced	3(0.9)	2(66.7)	1(33.3)	0.652
Occupation of Mother				
Employed	38(11.9)	15(39.5)	23(60.5)	
Unemployed	181(56.7)	73(40.3)	108(59.7)	
Casual labourer	100(31.3)	47(47)	53(53)	0.518
Residence				
Rural	118(37)	45(38.1)	73(61.9)	0.246
Urban	201(63)	90(44.8)	111(55.2)	

Bivariate analysis of health seeking behaviours

The number of antenatal visits was statistically significant to birth outcomes (p =0.001*) and IFAS supplementation in pregnancy was statistically significant to birth outcomes (p= 0.038). This is presented in table 5.

Table 5: Chi square tests for health seeking behaviour characteristics and birth outcomes

Health Seeking Behaviour	Total	Term vs. Pre-Term		p-value
		Preterm	Term	
	n (%)	n (%)	n (%)	
Number of antenatal visits				
Less than 4	157(49.2)	80(51)	77(49)	0.001*
4 or 5	117(36.7)	34(29.1)	83(70.9)	
6 plus	45(14.1)	21(46.7)	24(53.3)	
IFAS Supplements				
Yes	258(80.9)	102(39.5)	156(60.5)	0.038*
No	61(19.1)	33(54.1)	28(45.9)	
Tetanus Toxoid Vaccine				
Yes	235(73.7)	93(39.6)	142(60.4)	0.097
No	84(26.3)	42(50.0)	42(50.0)	
Attendance of Public/private				
Hospitals				
No hospital	6(1.9)	2(33.3)	4(66.7)	0.645
Public Hospital	41(12.9)	15(36.6)	26(63.4)	
Private/Faith based	272(85.3)	118(43.4)	154(56.6)	

Bivariate analysis of Obstetric factors

Obstetric factors were not statistically significant to preterm births; this is shown in table 6.

Table 6: Chi Square tests for Obstetric factors associated with birth outcomes.

				p-
Maternal and Obstetrics	Total	Term vs. Pre-Term		value
		Preterm	Term	
	n (%)	n (%)	n(%)	
Spacing(inter pregnancy interval)				
1	17(11.8)	6(35.3)	11(64.7)	0.488

2-5`	86(59.7)	34(39.5)	52(60.5)	
6-9`	33(22.9)	17(51.5)	16(48.5)	
10 plus	8(5.6)	2(25)	6(75)	
Mode of delivery				
Vaginal	222(69.6)	97(43.7)	125(56.3)	0.452
CS	97(30.4)	38(39.2)	59(60.8)	
Family Planning Used				
Yes	215(67.4)	87(40.5)	128(59.5)	0.319
No	100(31.4)	45(45.0)	55(55.0)	
Not Disclosed	4(1.3)	3(75.0)	1(25.0)	
Malaria in Pregnancy				
Yes	17(5.3)	10(58.8)	7(41.2)	0.88
No	302(94.7)	125(41.4)	177(58.6)	
Disease in pregnancy				
Yes	53(16.6)	25(47.2)	28(52.8)	0.434
No	266(83.4)	110(41.4)	156(58.7)	
Allergies				
Yes	8(2.5)	3(37.5)	5(62.5)	0.435
No	311(97.5)	132(42.4)	179(57.6)	
Medication Use				
Yes	17(5.3)	7(41.2)	10(58.8)	0.157
No	302(94.7)	125(41.4)	177(58.6)	
Drug and Substance use				
Yes	14(4.4)	8(57.1)	6(42.9)	0.245
No	304(95.6)	126(41.5)	178(58.6)	

Independent determinants of preterm births

Only age was a significant determinant of birth outcome p =0.005, OR=3.132(95%CI; 1.405,.6.984). This is shown in Table 7 below.

Table 7: Unadjusted Bivariate Logistic Regression of Significant Factors Reporting Odds at 95% CI.

Term	Odds Ratio	P>|z|	[95% Conf. Interval]	
Age Groups				
20-29 years	3.132665	0.005*	1.40514	6.984064
30-48 years	2.799304	0.025	1.136747	6.893445
Antenatal Visits				
More than 4	1.358661	0.455	.6075597	3.03832
IFAS Supplementation				
Yes	1.694387	0.103	.8994595	3.191857

Discussion

The study model could not account for the specific causative factors of preterm births. This agrees with the common knowledge that the causative factors for preterm deliveries is unknown (Harlow *et al*., 1996) [6]. Apart from maternal age, other sociodemographic factors (education levels, occupation, and residence) were not associated with preterm births. This finding differs with a similar study done in Malawi that showed no association between age and preterm births (Broek *et al*., 2014) [2], but compared to a study on preterm births among Kenyan women done in Kenyatta National Hospital, age among other sociodemographic factors was significantly associated with preterm births.

None of the obstetric factors were statistically significant, this is indifferent compared to other studies that suggest mode of delivery, inter-pregnancy interval, family planning use, malaria in pregnancy and UTI in pregnancy are predisposing factors to preterm births. (Wagura *et al*., 2018) [12], (Mokuolu *et al*., 2010) [9].

On health seeking behaviour in pregnancy, the number of antenatal visits is significantly associated with birth outcome. This finding agrees with a study done in Zimbabwe that found that lack of prenatal care was associated with preterm births (Feresu *et al*., 2004) [3]. In a similar study done in Kenyatta National Hospital suggests that women at risk (those with hypertension, eclampsia, previous preterm births, and obstetric complications) should have increased antenatal visits.

Conclusions

- **Objective 1:** Apart from maternal age, other socio-demographic factors such as education levels, occupation, and residence, partner's educational level were not associated with preterm births.
- **Objective 2:** Obstetric factors were not significantly associated with preterm births.

- **Objective 3:** Health seeking behaviors: the number of antenatal visits, and IFAS supplementation was significantly associated with preterm births.

Only IFAS supplementations, number of antenatal visits are significant determinant of preterm births.

Limitations of the study

- Those mothers who had still births or miscarriages were not interviewed, and therefore the causative factors were not addressed.

Recommendations

Preterm birth is an obstetric complication that is significant towards achievement of the 3rd sustainable development goals (SDG). Therefore future strategies should focus more on Focused antenatal Care which is an initiative of WHO to optimize the minimum antenatal visits with an aim to achieve Sustainable Development Goals. More longitudinal research should be aimed at identifying specific maternal characteristics predisposing to preterm births.

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Declarations

Funding

There were no sponsors for this study.

Conflict of interest

There were no conflicts of interest

Ethical approval

The researcher got a permit letter from the National Commission for Science, Technology and Innovation (NACOSTI), an approval letter from ethics review committee Mount Kenya University (MKU), and, data collection authorization from Thika Teaching and Referral Hospital Research and Ethics Committee.

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