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SPECIAL THEME: PERINATAL AND PAEDIATRIC EPIDEMIOLOGY

Risk factors for prematurity at Harare Maternity Hospital, Zimbabwe

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Background Prematurity remains the main cause of mortality and morbidity in infants and a problem in the care of pregnant women world-wide. This preliminary study describes the socio-demographic, reproductive, medical, and obstetrical risk factors for having a live pre-term delivery (PTD) in Zimbabwe.

Methods This case-control study examined risk factors for PTD, at Harare Maternity Hospital between March and June 1999.

Results The frequency of PTD among live birth was 16.4%. Prior history of stillbirth or abortion was associated with PTD (adjusted relative risk [ARR] 1.50; 95% CI: 1.06, 2.11). Nutritional factors, including drinking a local non-alcoholic beverage (mahewu) during pregnancy and mother's increasing mid-arm circumference reduced the risk of PTD (ARR = 0.75; 95% CI: 0.60, 0.93 and ARR = 0.95; 95% CI: 0.92, 0.99 per cm of circumference, respectively). Obstetric conditions including eclampsia, anaemia, ante-partum haemorrhage, and placenta praevia were infrequent, but when present, were strongly associated with PTD (ARR = 3.57; 95% CI: 1.67, 7.63; ARR = 4.12; 95% CI: 1.80, 9.43; ARR = 3.05; 95% CI: 1.86, 5.00 and ARR = 3.30; 95% CI: 1.34, 8.14, respectively). Malaria, although less frequent, nonetheless was associated with an increased risk of PTD (ARR = 2.93; 95% CI: 1.70, 5.04). These results suggest that in addition to established obstetric risk factors, nutrition and malarial infection are important. About 43% of the mothers initiated prenatal care after 28 weeks of gestation.

Conclusion Addressing prematurity in this population will require earlier initiation of prenatal care to allow for early detection and management of complications of pregnancy, and improving nutritional status of reproductive age with locally available foods. Further exploration of the potential benefits of mahewu, is warranted.

Keywords Prematurity, pre-term delivery, pre-term birth, prenatal care, malaria

The pre-term delivery (PTD) of an infant has been and continues to be one of the most serious problems encountered in the care of pregnant women in both developed and developing countries.[1–4] Prematurity accounts for more than 35% of infant mortality world-wide.[1] In the US pre-term births account for more than 75% of fetal and neonatal deaths annually in infants without congenital abnormalities.[5] Limited data from Zimbabwe suggests that prematurity is a common obstetric problem,[4,6] and an important contributor to infant mortality.[7] Levels of infant mortality in Zimbabwe (73 per1000 live births) are high compared with South Africa (55 per 1000 live births), mid-income countries such as and Mexico (25 per 1000 live births), and to developed countries including the US, UK, or Sweden (7,6, and 3 per 1000 live births, respectively).[7]

Although prematurity has been well studied in developed countries,[1–3] data from developing countries is limited.[1–3] This preliminary study is among the first to assess risk factors for prematurity in Zimbabwe. Our aim was to describe the socio-demographic, reproductive, medical, and obstetrical risk factors of pre-term birth among live births over a 3-month period at Harare Maternity Hospital.

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Methods

This case-control study was conducted among women delivering at Harare Maternity Hospital between March and June 1999. All women delivering a singleton infant that survived the first hour of life were eligible to participate. Malformed babies were excluded, as malformations can themselves be the cause of pre-term birth. In this preliminary study, very ill babies, early neonatal deaths, and stillbirths were also excluded, because it was not possible to administer a neurological assessment to estimate gestational age, which was of primary interest in this study. Twins were excluded because they are a different subset of deliveries with a well-known contribution, but could distort estimates, and their effects had been measured previously.[8–10] Spontaneous abortions, that is, deliveries before 20 weeks and those weighing <500 g, were excluded. Of the 3722 women who delivered during the study period, 527 (14.2%) were ineligible including 198 (5.3%) multiple pregnancies, 26 (0.7%) very ill babies, 248 (16.7%) stillbirths, and 52 (1.4%) early neonatal deaths. Of the 3195 eligible women, 24 (0.8%) refused to participate, 27 (0.8%) could not be interviewed before discharge, 30 (0.9%) had incomplete records, and 14 (0.4%) did not have a Ballard score, leaving 3103 (97.1%) eligible women for this analysis. The study was approved by the University of Michigan Institutional Review Board and the Medical Research Council of Zimbabwe and permissions were obtained from the Ministry of Health and Harare Central Hospital.

The main outcome of interest was pre-term birth. Since gestational age is difficult to assess if last menstrual period (LMP) is inaccurate or not known, the Ballard method[11,12] was administered within 2–48 hours post delivery to estimate gestational age. Cases were all women who delivered a liveborn singleton infant before 37 completed weeks but after 20 weeks of pregnancy.[1,3,5,8,9,13] Controls included all women who delivered a liveborn singleton baby at term.

Each day at 8 a.m. and 2 p.m., a list of women was made from the delivery logbook. Eligible women who agreed to participate and who signed the consent form completed a short interview regarding demographic and lifestyle factors, had their baby examined for maturity, and had their medical records abstracted. Six registered nurses and one woman with 4 years of secondary education were trained to administer the Ballard method of assessing gestational age.[11,12] This training involved simulations, piloting of the instruments, and evaluation of intra and inter-observer variation for each item of the Ballard scale. To maintain data quality, weekly spot checks and meetings of the research team were held.

Age of mother was calculated as the number of years from her date of birth to her previous birthday. Marital status (currently married or living as married, never married, separated, divorced or widowed), education of mother and father (less than primary education, having achieved primary education which is 7 years of schooling, secondary education and above), employment status of father and mother (yes/no) and residence (urban/rural) were obtained by interview. Women were asked whether or not they smoked, drank alcohol (chibuku, beer, spirits, or wine), or drank home brew (mahewu) during pregnancy. Mahewu is a local non-alcoholic nutritious beverage made from corn meal, rapoko or sorghum, beans, and sugar. Weight and height were collected from medical records. Body mass index (BMI) was calculated as weight (kg) divided by height (m^2). Mid-arm circumference was obtained by measuring the length between shoulder and the elbow with arm bend, with circumference measured at the midpoint.[14] Midarm circumference was later categorized, using Jellife standards at cut off of 28.5, and <28.5 denoting undernutrition.[15]

A mother was considered 'booked' when she had received any prenatal care during her pregnancy, and 'unbooked' otherwise. Once a patient is booked, they receive a booklet containing their complete obstetric record, which they bring to delivery. Patients maintain their booking status irrespective of where they deliver. Parity (0, 1–2, >2 pregnancies), prior history of abortion, stillbirth, or low birthweight birth defined as delivering an infant 500 g–<2500 g at birth (yes/no), and sex of the infant was abstracted from obstetric records. Information on whether the woman had been diagnosed with a chronic medical condition or obstetric complication including diabetes, hypertension, anaemia, pregnancy induced hypertension, eclampsia, cardiovascular disease, ante-partum haemorrhage, and placenta praevia was abstracted from obstetric records. History of infections during pregnancy including diagnosis of and treatment for malaria, urinary tract infection, or syphilis was also obtained.

The population delivering at Harare Central Hospital Maternity Unit is composed of referrals from the 12 Harare Municipal clinics and women who receive prenatal care at the hospital, and women who deliver at the hospital because it is the closest facility. All women with risk factors or obstetric complications are referred to Harare Maternity, often late in pregnancy or during labour. The referral criteria are not strictly adhered to and many patients without any significant complications deliver at Harare Maternity Hospital.[16]

As the complete population of births over a 3-month period within the hospital was ascertained, we first estimated the incidence of prematurity in live births. Crude relative risks and 95% CI were calculated to assess the association between each potential risk factor and prematurity. Cross-tabulations with each pair of covariates were examined and χ^2 tests were calculated using EPINFO 2000 to assess associations between independent variables. Generalized linear regression models with a complimentary log-log link function were used to estimate the adjusted relative risks of preterm birth for potential demographic, reproductive, and nutritional risk factors, for medical and obstetric complications, and for infections. We first looked at all the potential risk factors in their subsets including, socio-demographic, anthropometric and nutritional factors; reproductive factors, medical and obstetric complications, and infections. We then built a model, of socio-demographic, anthropometric and nutritional factors, and reproductive factors, using a cut-off of a *P*-value of 0.10 for variables to be included and also taking into consideration their contribution to the model. In the final model we adjusted for whether the mother was referred to Harare Maternity Hospital or not. We also examined the risk associated with medical and obstetric complications and for infections after adjustment for those relevant covariates including socio-demographic, anthropometric, and nutritional factors, and reproductive factors. In our final models, we excluded mid-arm circumference because it had been introduced late in the study and about 15% of women did not have their mid-arm circumference measured, thus estimates were not stable with its inclusion. Data were analysed using SAS versions 6.12 and 8.1 (SAS Institute, Cary, NC).

Results

Demographic characteristics, anthropometric and nutritional factors

Among the 3103 live births at Harare Maternity Hospital over the 3-month period, 16.4% (n = 509) were preterm births. Age of mother ranged from 13 to 49 years (mean = 24.4 years). Very few mothers (7.3%) were above 34 years old (Table 1). Almost all women were married, the majority lived in urban areas, and about three-quarters of the mothers had attained a secondary level of education. Very few women (14%) were employed while 83% of fathers had some form of employment. More than a quarter of the women (28%), reported not having electricity, but fewer reported not having piped water (12%), or toilet facilities (7%). No demographic characteristics were associated with risk of PTD among live births.

The mean maternal weight was 64.7(±11.4) kg (range: 25–135 kg), BMI 26.0 (±4.6) (range: 11.4–63.8), and mid-arm circumference was 17.5(±3.2) cm (range: 17.5–43 cm). Mother's

Table 1 Crude relative risks for pre-term live births by socio-demographic characteristics for 3103 deliveries at Harare Maternity Hospital March–June 1999

	Total births		Pre-term births		Relative risk (95% CI)
	n	%	n	%	
Total	3103		509	16.4	
Mother's age (years)					
<20	644	21.0	115	17.9	1.12 (0.93, 1.36)
20–34	2196	71.7	350	15.7	Ref.
>34	222	7.3	31	14.0	0.88 (0.62, 1.23)
Maternal education					
Less than primary	142	4.6	22	15.5	0.92 (0.62, 1.37)
Primary	626	20.5	95	15.2	0.90 (0.74, 1.11)
Secondary and above	2293	74.9	385	16.8	Ref.
Marital status					
Currently or living as married	2948	95.0	476	16.2	Ref.
Never married	73	2.4	14	19.2	1.19 (0.74, 1.92)
Separated, divorced or widowed	81	2.6	19	23.5	1.45 (0.97, 2.17)
Residence					
Urban	2718	88.0	439	16.2	Ref.
Rural	370	12.0	66	17.8	1.10 (0.87, 1.40)
Mother employed					
Yes	418	13.5	79	18.9	1.18 (0.95, 1.47)
No	2684	86.5	430	16.0	Ref.
Body mass index					
<19.8	48	3.5	13	27.1	1.82 (1.11, 2.99)
19.8–<26	726	52.8	108	14.9	Ref.
≥26	601	43.7	75	12.5	0.84 (0.64, 1.10)
Mid-arm circumference (cm)					
17–28.5	1769	66.83	268	15.2	1.24 (1.01, 1.53)
28.6–43	879	3.2	107	12.2	Ref.
Drank home brew during pregnancy					
Yes	1721	59.1	259	15.1	0.85 (0.72, 1.00)
No	1193	40.9	211	17.7	Ref.
Alcohol during pregnancy (chibuku, bottled beer, spirits, or wine)					
Yes	264	8.5	49	18.6	1.15 (0.88, 1.49)
No	2838	91.5	460	16.2	Ref.
Smoking during pregnancy					
Smoked	10	0.3	3	30.0	1.83 (0.71, 4.74)
Did not smoke	3092	99.7	506	16.4	Ref.

weight, BMI, and mid-arm circumference were each negatively associated with risk of pre-term birth (regression coefficients −0.022, −0.046, and −0.052 respectively; $P < 0.01$). When categorized into tertiles, women with BMI <19.8 had increased risk of pre-term birth (Table 1). Also, women with a mid-arm circumference of <28.6 cm had increased risk of preterm birth. During pregnancy, most women (92%) drank no alcohol. In contrast, almost two-thirds reported drinking a local non-alcoholic beverage (mahewu) which was associated with decreased risk of pre-term birth. Notably, although smoking was associated with a two-fold increase in risk of PTD, only 10 women smoked and the CI includes one.

Reproductive factors

Although the majority of women (87%) received prenatal care (Table 2), 43% of these women initiated care after 28 weeks of gestation with 10% initiating care after 37 weeks of gestation. As expected, lack of prenatal care was associated with a twofold increase in the risk of pre-term birth. Nearly 86% of women were referred to Harare Maternity Hospital for delivery, with 77% referred from Harare Municipal clinics. Referral was not associated with risk of pre-term birth (data not shown). Parity ranged from 0 to 9 with about half of the women having their first child. About 10.1% reported having a previous history of abortion, 6.4% a stillbirth, and 10.7% a low birthweight (LBW) birth. These women had a slightly increased risk of delivering a preterm birth, but the 95% confidence intervals include one.

Table 3 presents the adjusted relative risks (ARR) for demographic, reproductive, and nutritional characteristics. History of abortion or stillbirth still increased the odds of pre-term birth among livebirths by 50%, and cases were less likely to have booked for prenatal care. Drinking mahewu, the non-alcohol beverage also decreased the risk of pre-term birth and each centimetre increase in mid-arm circumference was associated with a 5% decrease in risk.

Medical factors and obstetric complications

Less than 1% of the women had had a diagnosis of diabetes, anaemia, eclampsia, cardiovascular disease, or placenta praevia, and less than 10% had a diagnosis of ante-partum haemorrhage or hypertension (Table 4). Anaemia was associated with a 3.5-fold increase in pre-term birth, while eclampsia, ante-partum haemorrhage and placenta praevia were all associated with about a more than 2.6-fold increase in risk. Among the 441 women, for whom we had information on haemoglobin, (mean = 10.9 mg %) increasing haemoglobin was negatively associated with the odds

Table 3 Adjusted[a,b] relative risks for pre-term live births, by reproductive and nutritive factors, at Harare Maternity Hospital March–June 1999

	Relative risk (95% CI)
Maternal age	0.99 (0.81, 1.22)
Antenatal care attendance	2.18 (1.68, 2.84)
Drinking home brew	0.75 (0.60, 0.93)
History of abortion or stillbirth	1.50 (1.06, 2.11)
Midarm circumference of mother	0.95 (0.92, 0.99)

[a] Adjusted for referral status, whether mother was referred to Harare Maternity Hospital or not.

[b] All risk factors were included in one model, estimates are adjusted for all these variables in the model.

Table 2 Crude relative risks for pre-term live births by reproductive characteristics for 3103 deliveries at Harare Maternity Hospital March–June 1999

	Total births		Pre-term births		Relative risk
	n	%	n	%	(95% CI)
Total	3103		509	16.4	
Antenatal care					
Received antenatal care	2670	87.3	387	14.5	Ref.
Did not receive antenatal care	390	12.7	113	28.9	2.00 (1.67, 2.39)
Parity					
0	1451	46.8	222	15.3	0.86 (0.72, 1.02)
1–2	1240	40.0	221	17.8	Ref.
>2	410	13.2	65	15.9	0.89 (0.69, 1.15)
History of abortion or stillbirth					
Yes	283	16.5	57	20.1	1.21 (0.93, 1.56)
No[a]	1430	90.8	239	16.7	Ref.
History of low birthweight					
Yes	136	10.7	28	20.6	1.29 (0.90, 1.84)
No[b]	1139	89.3	182	16.0	Ref.
Infant sex					
Male	1587	51.3	230	14.5	Ref.
Female	1505	48.7	276	18.3	1.27 (1.08, 1.49)

[a] Excludes mothers who were gravida = 1.

[b] Excludes mothers with parity = 0.

Table 4 Crude relative risks for pre-term live births by medical and obstetrical complications for 3103 deliveries at Harare Maternity Hospital March–June 1999[a]

	Total births		Pre-term births		Relative risk (95% CI)
	n	%	n	%	
Total	3103	100	509	16.4	
Medical conditions					
Diabetes					
Yes	15	0.5	2	13.3	0.88 (0.24, 3.19)
No	2758	99.5	420	15.2	Ref.
Hypertension					
Yes	197	7.1	30	15.2	1.01 (0.7, 1.42)
No	2566	92.9	387	15.1	Ref.
Anaemia					
Yes	13	0.5	7	53.9	3.54 (2.12, 5.89)
No	2877	99.5	438	15.2	Ref.
Cardiovascular disease					
Yes	19	0.7	3	15.8	1.04 (0.37, 2.90)
No	2749	99.3	416	15.1	Ref.
Obstetrical complications					
Pregnancy induced hypertension					
Yes	679	23.4	116	17.1	1.16 (0.95, 1.40)
No	2227	76.6	329	14.8	Ref.
Eclampsia					
Yes	17	0.6	7	41.2	2.70 (1.52, 4.80)
No	2875	99.4	438	15.2	Ref.
Ante-partum haemorrhage					
Yes	50	1.7	21	42.0	2.77 (1.98, 3.88)
No	2866	98.3	435	15.2	Ref.
Placenta praevia					
Yes	15	0.5	6	40.0	2.62 (1.40, 4.90
No	2876	99.5	439	15.3	Ref.

[a] Based on data obtained from the obstetric records.

of pre-term birth (regression coefficient = -0.191, $P < 0.01$). The frequency of pregnancy-induced hypertension was high (23%) but not associated with pre-term birth.

Infections during pregnancy

The frequency of women diagnosed with malaria during pregnancy or urinary tract infection was less than 3% in this urban population (Table 5). Nonetheless, both were associated with an increased risk of pre-term birth. Nearly 1% (n = 26) of the women were diagnosed with syphilis, but almost half (42%) were not tested.

Table 6 presents ARR for obstetric complications and history of infections after adjusting for relevant demographic, reproductive and nutritive factors. Although 95% CI were wide, obstetric factors remained significant factors for pre-term birth.

Discussion

Data on the incidence of prematurity is limited in developing countries, especially in Africa.[1–3] This paper estimated and examined risk factors for pre-term birth among mothers delivering live births at the largest referral centre in Harare, Zimbabwe. Our results suggest that the frequency of pre-term birth is high in this population, that nutritional factors remain important predictors of preterm birth, and that the customary late entry into prenatal care is a barrier to effective prenatal screening and treatment of conditions that contribute to prematurity. The incidence of prematurity among livebirths at Harare Maternity Hospital over a 3-month period of 164/1000 live births is slightly underestimated, but comparable with the 168/1000 live births observed at the same hospital,[10] based on delivery log data from the preceding year which included all stillbirths and twin deliveries at this hospital. No previous studies except from our group had evaluated frequency of preterm births in Zimbabwe.

In agreement with reports from several studies,[1,2,8,9,17] nutritional factors remain important determinants of pre-term birth in Zimbabwe. Poor nutrition, as measured through BMI and mid-arm circumference, was adversely associated with pre-term, as elsewhere.[8,9,18] Newer studies[19] suggest that

Table 5 Crude relative risks for pre-term live births for infections during pregnancy for 3103 deliveries at Harare Maternity Hospital March–June 1999

	Total births		Pre-term births		Relative risk (95% CI)
	n	%	n	%	
Total	3103		509	16.4	
History of malaria during pregnancy					
Yes	43	1.5	14	32.6	2.11 (1.36, 3.27)
No	2932	98.4	453	15.5	Ref.
Malaria treatment					
Yes	37	1.2	11	29.7	1.92 (1.16, 3.18)
No	6	0.2	3	50.0	3.24 (1.45, 7.24)
No malaria during pregnancy	2932	98.6	453	15.5	Ref.
History of urinary tract infection during pregnancy					
Yes	74	2.6	18	24.3	1.62 (1.07, 2.45)
No	2751	97.4	413	15.0	Ref.
Treated for urinary tract infection					
Yes	67	2.4	15	22.4	1.49 (0.95, 2.35)
No	7	0.2	3	42.9	2.85 (1.21, 6.75)
No urinary tract infection	2751	97.4	413	15.0	Ref.
Syphilis					
Tested positive	26	0.9	3	11.5	0.80 (0.27, 2.34)
Tested negative	1660	57.3	239	14.4	Ref.
Not tested	1212	41.8	206	17.0	1.18 (0.99, 1.40)

Table 6 Adjusted[a] relative risks for pre-term live births, by obstetrical complications and infections at Harare Maternity Hospital March–June 1999

	Relative risk (95% CI)
Pregnancy induced hypertension	1.12 (0.90, 1.41)
Eclampsia	3.57 (1.67, 7.63)
Anaemia	4.12 (1.80, 9.43)
Ante-partum haemorrhage	3.05 (1.86, 5.00)
Placenta praevia	3.30 (1.34, 8.14)
Malaria during pregnancy	2.93 (1.70, 5.04)
Urinary tract infection	1.53 (0.92, 2.53)

[a] Adjusted for maternal age, antenatal care attendance, drinking home brew during pregnancy, and history of abortion or stillbirth.

undernutrition in women at the time of conception results in a precocious fetal cortisol surge and preterm birth. In a population where chronic malnutrition of mothers is not uncommon, the adverse effects on birth outcomes cannot be negated.[10] Unlike some other populations,[20,21] few mothers in our study drank alcohol during pregnancy. However, about 60% drank mahewu, a nutritious drink that appears to have provided some protection against pre-term birth. Anaemia was associated pre-term birth in this population, a finding also reported by other studies.[22,23] Programmes aimed at improving women's health should target improving nutrition, and increased screening for anaemia during pregnancy is needed. Further exploration of the potential benefits of drinking mahewu is also warranted.

As would be expected, in a developing country setting,[24–27] lack of prenatal care was associated with pre-term birth as women who deliver prematurely often deliver before their intended date of initiating care.[28] Only 18.2% of women received prenatal care before 20 weeks gestation. A comparable proportion of unbooked mothers (10.5%) was reported by DHS[29] and Feresu and colleagues.[10] Effective interventions are likely to necessitate women entering into prenatal programmes by 20 weeks of pregnancy.

Obstetric complications of pregnancy, although relatively infrequent, remain important risk factors for pre-term birth in this and other[13,26,30] populations. Unlike in the US where African American women with essential hypertension[31,32] have been found to have an increased risk of pre-term birth, neither essential nor pregnancy-induced hypertension were associated with pre-term birth among live births in this population.

Although Harare is an urban setting, malaria appears to remain an important determinant of pre-term birth in this population as has been shown previously[33,34] especially in primigravidae.[35] In a setting were malaria is not endemic, women are not likely to be screened for parasites, raising a concern about missed cases, particularly among women arriving from rural endemic areas. Urinary tract (UTI) is not routinely screened for, but the few reported cases were associated with pre-term birth as has been shown in other studies.[36,37] Screening and management of UTI in pregnancy has been recommended as an important component of the WHO essential programme for prenatal care.[38]

In Zimbabwe, screening for syphilis during pregnancy is poor.[39,40] The relationship between human immunodeficiency

virus (HIV) and pre-term birth in Zimbabwe has yet to be evaluated, but HIV infection was poorly reported in obstetric records, and voluntary testing and counselling had not been initiated at the time of this study. Reports on the association between HIV infection and pre-term birth are conflicting and further research on this question is needed.[41–43] Reproductive tract infections were not consistently screened for, thus underdiagnosis and inadequate treatment for these conditions is likely. Focused studies to evaluate the role of infections and their association with pre-term birth in Zimbabwe are warranted.[9,44–47]

In this preliminary study we focused on live births. Excluding stillbirth and early neonatal deaths underestimates the true burden of pre-term delivery and may have biased our results towards the null. Using the obstetrician/midwife gestational age assessment, 62.8% of stillbirths, 61.5% of very ill babies, and 61.5% of infants who died within the first hour of life at Harare Maternity Hospital are born prematurely.[10] If we use this information to estimate the frequency of pre-term deliveries among all births during the study period, 20.2% of all births were pre-term, further emphasizing the need for more studies of the aetiology of PTD in Zimbabwe and the development of appropriate intervention programmes.

Some potential limitations in our study warrant consideration. Focusing solely on births within Harare Maternity Unit raises concerns about potential selection bias, however, the risk of pre-term birth did not differ between those referred and not referred, and referral status was controlled for in the final regression model. Nevertheless, this population may represent a high risk group and estimates may not be generalizable to the rest of Zimbabwe. Rural women may experience more preterm birth given that malnutrition is more frequent in that setting. Exclusion of twin deliveries and stillbirth underestimates the rate of preterm birth slightly at this hospital.[10] Lack of data on the number of prenatal care visits limited our ability to assess the adequacy of prenatal care.

Conclusion

This preliminary study is the first to evaluate risk factors for pre-term birth in Zimbabwe. We have shown that traditionally established risk factors including nutrition and medical conditions, as well as infections are important risk factors for pre-term birth in this urban Zimbabwean population. Increasing interest in pre-term delivery prevention programmes in developing countries provide an incentive to evaluate more thoroughly the potential risk factors identified here as well as other related conditions. Programmes aimed at improving women's health targeted at improving nutritional status of women remain of critical importance. Further evaluation of the nutritive value of mahewu is warranted and increased screening for anemia during pregnancy is needed. Perhaps most importantly for this population, evaluation of the role of infection, and HIV comorbidity is also warranted. Our results suggest that the practice of late booking for prenatal care limits the potential utility of prenatal care programmes to undertake early management of obstetric, medical, and infectious risk factors. More emphasis is needed on promoting early initiation of prenatal care in maternal and child health programmes. Intensified health education targeting early prenatal care followed by quality programmes to identify and treat conditions related to prematurity, and practical interventions with locally available nutritional foods for women of reproductive age, is likely to reduce perinatal mortality and morbidity in Zimbabwe.

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