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An Analytical Cross Sectional Assessment of Prevalence and Factors Associated with Preterm Births; A Health Facility-Based Retrospective Review

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Abstract

Introduction: Preterm birth (PTB) increases risk of adverse perinatal health outcomes. Its global prevalence increased from 1990 to 2010 and further resulted in 0.81 million perinatal deaths in 2015. This study analyzes and describes factors linked to PTB.

Methodology: A health facility-based retrospective analytical cross sectional approach was used to analyze and describe PTB prevalence and associated factors from data on singleton and multifetal live births, 2015 - 2020.

Results: PTB prevalence of 8.8% is proportionately characterized by 1.3% at 28-31 gestational weeks (GW) and 7.5% at 32-36 GW. Maternal age ≤ 20 years correlated with elevated prevalence of births at 28-36 GW and 50% reduced likelihood of birth at ≥ 39 GW. Primiparae recorded the highest PTB prevalence, a finding supported by observation of the lowest mean gravidity and parity (of 1.8±1.1 and 0.6±0.9 respectively) among births at 28-36 GW. PTB prevalence, (marginally higher among rural residents), was significantly likely to occur among primiparae [POR=1.5 (95% CI=1.03-2.3)]. While uninfluenced by ANC attendance, higher PTB prevalence was noted with maternal systolic blood pressure (SBP) ≥ 130mmHg and diastolic blood pressure (DBP) ≥ 90mmHg, phenotypic ABO blood group 'A', severe maternal anemia and male fetuses. Mean S- and DBP decreased with increasing pregnancy duration. Observable peak prevalence of PTB among multifetal pregnancies was remarkably associated with significantly increased risk of its occurrence [(POR=8.6 (95% CI=3.1-23.7)].

Conclusion: Maternal age ≤ 20 years, rural residence, primiparity, maternal S- and DBP (≥ 130 and ≥ 90mmHg respectively), multifetal pregnancy, severe maternal anemia, phenotypic ABO blood group 'A' and male fetuses may influence pregnancy duration.

Recommendations: Impact of maternal age, urban/rural residence, parity, blood pressure, hemoglobin concentration, ABO blood group and sex of fetus on pregnancy duration should remain a research priority.

Keywords: *Preterm; Premature; Birth; Pregnancy; Duration; Term*

Introduction

Preterm birth (PTB) or premature birth, defined as birth of a baby at < 37 gestational weeks (GW), distinctly includes extreme PTB (i.e. ≤ 28 GW), very early PTB or VEPTB (i.e. 28 - 31 GW), early PTB or EPTB (i.e. 32 - 33 GW) and late PTB or LPTB (i.e. 34 - 36 GW) [1-3].

LPTB account for 75% of all PTB [4]. Infants delivered preterm are at increased risk for cerebral palsy, developmental delays, hearing and sight problems [1]. Risk of PTB-associated complications are commensurately greater the earlier a baby is born [1]. Albeit typically cryptogenic, factors known to increase PTB risk include diabetes mellitus, high maternal blood pressure (BP), multifetal gestation, maternal obesity or underweight, certain vaginal infections, air pollution (including tobacco smoking) and psychological stress [5-7]. While medical reasons for early birth may include preeclampsia, recommendations, however, posit that labor should not be medically induced before 39 GW unless necessary for other medical reasons. This applies to cesarean deliveries as well [1,5,7]. PTB, (the most prevalent cause of perinatal mortality), account for birth of an estimated 15 million preterm babies each year (i.e. 5 to 18% of all births) [1,5]. The prevalence of PTB varies globally from about 7.9% in the United Kingdom to 12.3% in the United Sates [8,9]. Many countries observed a rising trend between 1990 and 2010 and PTB-associated complications further resulted in 0.81 million perinatal deaths in 2015 (a significant reduction from 1.57 million in 1990) [5,10,11].

Infants born preterm are overtly at high risk of perinatal mortality, apnea of prematurity, hypoxic-ischemic encephalopathy (HIE), retinopathy of prematurity (ROP), developmental disability, transient hyperammonemia of the newborn, cerebral palsy and intraventricular hemorrhage and respiratory distress syndrome (RDS or IRDS). Other PTB-associated adverse outcomes include gastrointestinal and metabolic problems (resulting from neonatal hypoglycemia, feeding difficulties, rickets of prematurity, hypocalcemia), inguinal hernia, necrotizing enterocolitis (NEC), hematologic complications (e.g. anemia of prematurity), thrombocytopenia, hyperbilirubinemia (that can lead to kernicterus), sepsis, pneumonia and urinary tract infections [1,12-14]. Multifactorial causes underlie PTB as labor comprises a complex process involving many factors [5-7]. Racial disparities are evidenced in varying prevalence of PTB among black women (of 15 - 18%) being double the prevalence observed among whites in the U.S. and the UK [15]. The PTB prevalence among Filipinos born in the U.S. at 11 - 15% is higher than observed among other Asians at 7.6% and among whites at 7.8%. Philippines notably remains the only non-African country ranked among the top 10 with regards to PTB [15,16].

PTB (characteristically defined by short and long-term complications), therefore constitutes an obstetric outcome of broad public health and clinical importance despite inadequate exploration in low income countries [17]. A study in Ghana points to a PTB prevalence of 4.6% at 28 GW, 15.9% between 29 - 31 GW and 79.5% at 32 - 36 GW [17]. Findings from studies conducted in high-income countries may not be generalizable in a low-income countries' context [17]. Published research on PTB in Ghana remains limited amidst practical challenges to the conduct of such research [17]. These challenges specifically include challenges to accurate gestational age (GA) estimation, capacity and support for research (e.g. funding) [17]. Local and international collaboration as well as access to effective health management information systems, among others, remain insufficient [18]. This study analyzes and describes factors linked to PTB in Kwaebibirem, Eastern Region of Ghana.

Methodology

Data on obstetric and newborn care services were abstracted from birth registers at the maternity/labor suit of the Kade Government hospital and analyzed using a health facility-based analytical cross sectional approach. The hospital, (a primary referral facility in Kwaebibirem), serves an estimated municipal population of 146,346 and an estimated 35, 123 women of fertility age. Data on a total 4,027 (singleton and multifetal live births), covering a five-year period, (i.e. 2015 to 2020), were abstracted from birth registers, (i.e. the registers for mandatory entry of particulars on all institutional births). Study variables were included in the study within the context of a retrospective data review through non-probability convenience sampling of available records on singleton and multifetal births. PTB was defined as birth at 28 - 36 GW consistently with specifications of the American College of Gynecologists (AOCG) [19]. PTB were analyzed along a clinical spectrum of very early PTB or VEPTB (i.e. 28 - 31 GW), early PTB or EPTB (i.e. 32 - 33 GW) and late PTB or LPTB (i.e. 34 - 36 GW) [1-3]. EPTB and LPTB were analyzed as one level of the PTB burden and were, (together with VEPTB), compared with characteristics of births occurring at ≥ 37 GW. The WHO categorization specifically defines PTB as extremely PTB (< 28 weeks), very early (28 to 31

weeks) and moderate to late PTB (32 to 36 weeks). Extreme PTB were not distinctly analyzed due to lack of evidence on survival in Ghana [5]. Term gestation was defined as birth at ≥ 37 GW per the ACOG specifications [by early term (i.e. 37 - 38 GW), full term (i.e. 39 - 40 GW), late term (i.e. 41 - 42 GW) and post term (i.e. ≥ 42 GW)] [19].

The birth register, (the primary data source), is arbitrarily divisible into four parts. It firstly contains parturients' personal information, (i.e. age, urban/peri-urban or rural community of residence, highest level of education attained and gravidity and parity). The second part records information on antenatal clinic-relevant indicators, (i.e. maternal hemoglobin (Hb) concentration, antenatal clinic (ANC) attendance, GA at birth, intermittent preventive therapy with sulfadoxine-pyrimethamine (IPTp-SP) doses during pregnancy and maternal ABO phenotypic blood groups). Additionally documented in this part of the register is information on maternal syphilis, hepatitis B and HIV infection status and maternal systolic and diastolic blood pressure (or maternal SBP and DBP).

The third part records information on assessed neonatal wellness at birth, (i.e. APGARS, fetal heart rate, fetal respiration within 30 minutes, fetal presentation and measures of fetal dimensions). The last part records information on complications following birth, (i.e. postpartum hemorrhage (PPH), antepartum hemorrhage (APH), obstructed labor etc). Births at ≤ 28 GW and births with extreme or missing values for GA were excluded irrespective of the documented survival status, birth weight or APGAR scores. Urban/peri-urban and rural communities were defined consistently with the conveniently used threshold population sizes for a locality's consideration as urban or rural [20]. Based on this convenience, Ghana defines urban areas to include all localities with ≥ 5,000 population [18]. Peri-urban communities comprise those adjoining urban areas, i.e. communities or settlements around urban areas whose social dynamics vary negligibly from that of the adjoined urban area.

Access to hospital data was approved by Eastern regional Health Directorate through the hospital's medical superintendent. All data were analyzed with epi info 3.5.4 based on the statistical assumption that births preceded by induction of labor comprised an insignificant proportion (of all births) whose exclusion did not therefore impact analyses. Baseline characteristics of GA at birth were statistically descriptively defined. Associations between hypothesized risk factors and PTB were examined using Yates corrected Chi-squared test (to avert risk for biased upwards adjustment of 2 x 2 contingency tables associated with Pearson's chi-square and McNemar's test [21]. Statistical significance of estimates of association was interpreted at the conventional significance level of ≤ 0.05, (i.e. 5% or 1 of 20) and the confidence level of 95%. Where the expected value of a cell was < 5 observations, the Fisher exact test value for significance of estimates of association was used. Prevalence odds ratios (POR) were analyzed as point estimates of primary interest and not as estimates of risk ratios (RR), odds ratios (OR) or prevalence ratios PR) [22,23].

Results

Births largely, (i.e. 91.2%), occurred at ≥ 37 GW while 8.8% occurred at 28-36 GW (with specifications by 1.3% at 28-31 GW and 7.5% at 32-36 GW). Parturients aged ≤ 20 years, (comprising the third highest parturient sub group), recorded the highest prevalence of births at 28-36 GW. This trend was sustained irrespective of urban/peri-urban or rural residence status. Births at 28-31 GW occurred in marginally higher proportions among parturients with established occupations as compared with those engaged in unestablished occupations who in turn recorded a comparatively higher prevalence of births at 32-36 GW. The observed decreasing prevalence of PTB with increasing parity was more pronounced among births at 28-31 GW as compared with births at 32-36 GW. Maternal Hb concentration ≤ 10.9g/dl accounted for a marginally higher prevalence of PTB. The prevalence of births at 28-31 GW remained notably high among parturients with Hb concentrations Hb ≤ 6.9g/dl. This observation was more pronounced among births at 28-32 GW as compared with births at 32-36 GW. Parturients with phenotypic maternal ABO blood group 'A' recorded higher prevalence of births at 28-36 GW (i.e. VEPTB, EPTB and LPTB). The prevalence of births at ≤ 36 GW generally remained higher among parturients with SBP ≥ 130mmHg and DBP ≥ 90mmHg. Births at 28-31 GW occurred in marginally higher proportions among female infant births while male infant births, in turn, occurred in

higher proportions at 32-36 GW. Multifetal pregnancies, (comprising a markedly low proportion of all births at 1.2%), were characterized by a remarkably high prevalence of births at 28-31 GW and a particularly high prevalence of births at 32-36 GW. The prevalence of PTB was unfettered by parturients' educational background (Table 1).

Characteristic	Characteristic - N	Prevalence - %	Term status at birth		
			Preterm - %		Term - %
			28 - 31 weeks	32 - 36 weeks	≥ 37 weeks
Age					
≤ 20 years	893	22.2	2.8	8.9	88.3
21-30 years	1862	46.3	1.0	7.5	91.5
31-40 years	1130	28.1	0.5	6.7	92.7
≥ 41 years	137	3.4	0.0	4.4	95.6
Residence					
Urban	1742	43.6	0.7	6.9	92.3
Rural	2254	56.4	1.5	8.1	90.4
Occupation					
Established	475	12.3	1.4	5.1	93.5
Unestablished	3390	87.7	1.0	7.5	91.5
Parity					
Para 1	1194	29.7	2.4	9.0	88.6
Para 2	820	20.4	1.2	5.9	93.0
≥ Para 3	2005	49.9	0.6	7.5	91.9
Antenatal clinic visits					
Yes	3218	80.1	1.2	7.6	91.1
No	800	19.9	1.3	7.2	91.5
Anemia					
Yes	2941	73.2	1.0	7.3	91.7
No	1077	26.8	0.9	4.9	94.2
Anemia severity					
10.0 - 10.9 g/dl	1494	45.8	1.1	7.2	91.8
7.0 - 9.9 g/dl	1696	52.0	0.3	7.4	92.3
≤ 6.9 g/dl	72	2.2	15.4	7.7	76.9
Phenotypic Blood group					
A	780	21.3	1.4	10.6	88.0
AB	132	3.6	0.0	2.7	97.3
B	677	18.5	0.6	5.6	93.9
O	2076	56.7	0.7	6.9	92.3
Systolic BP					
< 130 mmHg	2992	76.8	1.1	7.5	91.4

130 - 139 mmHg	456	11.7	0.7	9.4	89.9
≥ 140 mmHg	448	11.5	2.2	8.1	89.7
Diastolic BP					
< 80mmHg	2423	62.3	1.1	7.1	91.8
80-89mmHg	961	24.7	1.0	7.0	92.0
≥ 90mmHg	510	13.1	2.0	11.2	86.8
Sex					
Male	2131	53.1	1.0	8.1	90.8
Female	1878	46.8	1.3	6.7	92.9
Pregnancy type					
Single	3979	98.8	1.1	6.4	92.5
Multiple	48	1.2	6.3	37.5	56.3
Education					
≤ Junior High	3193	80.1	1.2	7.4	91.4
≥ Senior High	793	19.9	1.2	6.9	91.8

Table 1: *Prevalence of preterm births analyzed by maternal socio-economic, socio-demographic and other obstetrics-relevant indicators.*

Mean maternal age, gravidity and parity and Hb concentration, (characterized by marginally varied SD ±), were lowest among births at 28 - 31 GW and steadily increased with increasing GA at birth. Mean SBP and DBP, highest among births at 28 - 31 GW, decreased with increasing GA at birth. Parturients with higher ANC visits generally recorded higher mean birth weight (or BW) (Table 2).

Characteristic	Gestational age at birth							
	28 - 31 weeks		32 - 36 weeks		37 - 38 weeks		≥ 39 weeks	
	Mean	SD ±	Mean	SD ±	Mean	SD ±	Mean	SD ±
Age	23.5	6.9	26.1	7.3	26.2	7.0	27.9	6.9
Gravidity	1.8	1.1	3.2	2.1	3.0	2.0	3.4	2.0
Parity	0.6	0.9	1.7	1.8	1.5	1.6	1.9	1.7
Hb concentration	9.4	2.4	9.8	1.8	10.0	1.4	10.5	4.9
Systolic BP	125.0	27.7	119.9	21.0	120.5	19.2	119.0	16.9
Diastolic BP	78.8	21.7	75.8	16.1	75.3	12.1	75.7	30.9
Antenatal clinic	3.4	2.4	4.5	2.2	5.6	2.4	6.0	2.6

Table 2: *Prevalence of preterm births analyzed by mean maternal socio-economic, socio-demographic and other obstetrics-relevant indicators.*

Parturients aged ≤ 20 years had 64% and 50% significantly increased risk for birth at 28-36 GW and at 37-38 GW respectively. They were however significantly less likely to record births at ≥ 39 GW while parturients aged ≥ 31 years were about twice as likely to deliver at ≥ 39 GW. Births among parturients with established occupations were significantly likely to occur at early term, (i.e. at 37-38 GW) as compared with births among those with unestablished occupations which largely occurred at ≥ 39 GW. Primiparae had 50% and 40% increased risk for birth at 28-31 and 37-38 GW respectively but had a 40% reduced likelihood for birth at ≥ 39 GW. Para ≥ 3 parturients had

70% increased likelihood for birth at ≥ 39 GW. While phenotypic maternal ABO blood group 'A' was significantly associated with increased risk of births at 28-31 GW, group 'AB' was associated with increased likelihood for births at ≥ 37 GW. The estimated association between SBP and PTB did not attain statistical significance. Female infant births were significantly likely to occur at ≥ 37 GW as compared with male births which showed a tendency for occurrence at 28-36 GW. Births from multifetal pregnancies were about nine times as likely to occur at 28-36 GW as singleton births (Table 3).

Characteristic	Gestational age at delivery					
	28 - 36 weeks		37 - 38 weeks		≥ 39 weeks	
	POR (95% CI)	p-value	POR (95% CI)	p-value	POR (95% CI)	p-value
Age						
≤ 20 years	1.64 (1.07 - 2.5)	0.02	1.5 (1.15 - 2.0)	0.004	0.5 (0.4 - 0.7)	0.00006
21 - 30 years	0.9 (0.6 - 1.3)	0.8	0.9 (0.7 - 1.2)	0.94	1.04 (0.8 - 1.3)	0.7
≥ 31years	0.6 (0.4 - 1.0)	0.11	0.7 (0.5 - 0.9)	0.01	1.5 (1.1 - 1.9)	0.001
Residence						
Urban	0.7 (0.4 - 1.0)	0.10	0.9 (0.7 - 1.2)	0.98	1.1 (0.8 - 1.4)	0.30
Rural	1.4 (0.9 - 2.1)	0.09	0.9 (0.7 - 1.2)	0.97	0.8 (0.7 - 1.1)	0.33
Occupation						
Established	0.8 (0.4 - 1.6)	0.67	1.5 (1.05 - 2.2)	0.03	0.7 (0.5 - 1.0)	0.10
Unestablished	0.7 (0.5 - 1.2)	0.37	0.6 (0.4 - 0.8)	0.002	1.6 (1.2 - 2.1)	0.0007
Parity						
Primipara	1.5 (1.03 - 2.3)	0.04	1.4 (1.07 - 1.8)	0.01	0.6 (0.4 - 0.8)	0.0003
Bipara	0.7 (0.4 - 1.2)	0.32	1.4 (1.06 - 1.9)	0.02	0.7 (90.5 - 1.0)	0.11
≥ Multipara	0.8 (0.5 - 1.1)	0.34	0.5 (0.4 - 0.7)	0.00003	1.7 (1.3 - 2.2)	0.00005
Anemia						
Yes	0.8 (0.5 - 1.2)	0.43	1.0 (0.7 - 1.3)	0.93	1.0 (0.8 - 1.3)	0.74
No	0.6 (0.6 - 1.0)	0.12	1.0 (0.7 - 1.4)	0.95	1.1 (0.8 - 1.5)	0.36
Anemia severity						
Mild	0.9 (0.5 - 1.6)	0.95	0.7 (0.5 - 1.0)	0.16	1.2 (0.9 - 1.80	0.16
Moderate	0.8 (0.5 - 1.6)	0.83	1.2 (0.8 - 1.8)	0.26	0.8 (0.6 - 1.2)	0.41
Severe	3.2 (0.8 - 11.9)	0.17	1.6 (0.5 - 5.1)	0.53	0.3 (0.1 - 1.0)	0.10
Phenotypic ABO blood group						
A	1.8 (1.11 - 3.0)	0.02	0.6 (0.4 - 1.0)	0.06	1.0 (0.7 - 1.4)	0.77
AB	0.3 (0.04 - 2.2)	0.36	2.5 (1.2 - 4.9)	0.009	0.5 (0.2 - 1.0)	0.09
B	0.6 (0.6 - 1.2)	0.22	0.9 (0.6 - 1.3)	0.87	1.2 (0.8 - 1.7)	0.34
O	0.8 (0.5 - 1.4)	0.73	1.11 (0.8 - 1.5	0.51	0.9 (0.7 - 1.2)	0.74
Systolic BP						
< 130 mmHg	0.8 (0.5 - 1.3)	0.59	0.8 (0.6 - 1.1	0.45	1.1 (0.8 - 1.50	0.28
130 - 139 mmHg	1.0 (0.5 - 1.9)	0.94	0.9 (0.6 - 1.4)	0.94	1.0 (0.6 - 1.4)	0.93
≥ 140 mmHg	1.2 (0.6 - 2.1)	0.63	1.2 (0.8 - 1.9)	0.24	0.7 (0.5 - 1.0)	0.15

Diastolic BP						
< 80mmHg	0.8 (0.5 - 1.3)	0.64	0.9 (0.7 - 1.2)	0.89	1.0 (0.8 - 1.3)	0.64
80 - 89mmHg	0.8 (0.5 - 1.3)	0.54	1.0 (0.8 - 1.4)	0.59	0.9 (0.7 - 1.3)	0.96
≥ 90mmHg	1.5 (0.9 - 2.7)	0.11	0.9 (0.6 - 1.3)	0.70	0.8 (0.6 - 1.2)	0.61
Sex						
Male	1.1 (0.7 - 1.6)	0.56	0.7 (0.5 - 0.9)	0.01	1.2 (0.9 - 1.5)	0.07
Female	0.8 (0.5 - 1.2)	0.38	1.4 (1.1 - 1.8)	0.006	0.7 (0.6 - 0.9)	0.05
Pregnancy type						
Singleton	0.5 (0.3 - 0.8)	0.008	1.0 (0.7 - 1.4)	0.69	1.1 (0.9 - 1.5)	0.25
Multifetal	8.6 (3.1 - 23.7)	0.0006	1.0 (0.3 - 3.2)	0.57	0.2 (0.07 - 0.6)	0.005

Table 3: *Risk of preterm births assessed by maternal socio-economic, socio-demographic and other obstetrics-relevant indicators.*

Discussion

PTB comprises an obstetric outcome of broad public health and clinical concern characterized by short and long-term complications. Published research on PTB remains relatively pauce in Ghana and other low income countries [17]. Trends, patterns and factors underlying PTB were studied from a health facility-based perspective in Kwaebibirem, Eastern Ghana, and findings included the following. The prevalence of PTB remains high in Kwaebibirem at 8.8% (with specifications by 1.3% at 28 - 31 GW and 7.5% at 32 - 36 GW). This prevalence is consistent with global estimates that indicate that about 5 - 18% of all births globally occur preterm and further compares with United Kingdom's estimates of 7.9% [5]. It however remains lower than the 12.3% estimates of the United States [8,9]. Current evidence point to overall PTB rise in the United states to 13% [24]. The WHO preferably also tracks rates of LBW (i.e. BW < 2,500g) which characterizes about 16.5% of births in less developed regions and attributes about one third or 33 - 34% to PTB [24]. Attribution of LBW to myriads of other plausible causes, (despite established correlation between fetal weight and GA), poses a challenge to this approach to tracking PTB [24]. The observed marked global drop in PTB during the COVID-19 pandemic (of 20 - 90% in many countries) is without any universally accepted attributable cause [26]. A retrospective data review between 2010 and 2019 estimated a comparatively lower burden in Ghana at 4.7% but further pointed to an increasing trend in 2019 to 9% (a burden consistent with this study) [27].

Parturients aged ≤ 20 years generally recorded a significantly elevated burden of VEPTB, EPTB and LPTB as compared with older age groups. This age group had a 50% reduced likelihood for birth at ≥ 39 GW compared to a 50% increased likelihood for birth at ≥ 39 GW among parturients aged ≥ 31 years. Ferré C., *et al.* similarly reported typically varying PTB rates by maternal age and the youngest recording the highest prevalence [28]. Ferré C., *et al.* contrarily however, further identified a U-shaped relationship depicting increased PTB risk among parturients aged ≤ 20 years and ≥ 35 years [28]. The statistical relationship between increased PTB risk with reducing maternal age has been defined associative and not causal [28]. Fuchs F., *et al.* and Waldenström U., *et al.* contrarily to this study, reported a significantly higher prevalence among parturients ≥ 40 years and the lowest risk among the age group 30 - 34 years [29,30]. Despite an identified (descriptively) higher PTB prevalence among rural residents, confidence limits of their point estimates of association included the null value. This however compares with other studies that have reported significantly and consistently elevated PTB prevalence among rural residents [31,32]. Perez-Patron M., *et al.* specifically identified higher PTB rates among rural residents across all racial and ethnic groups especially among black women who generally record the highest PTB rates in the U.S [31]. Hillemeier M., *et al.* however indicated that Women residing in large rural city-focused areas had lower adjusted odds of both PTB and LBW [33]. Parturients' occupation did not impact the PTB burden in this study, a finding inconsistent with Casas M., *et al.* who reported lower PTB risk among women employed during pregnancy [34]. Lawson C., *et al.* implicated part-time work of ≤ 20 hours a week, (albeit not analyzed in this study), to lower risk

of PTB while working nights increased risk of EPTB but not LPTB [35]. Ondine S., *et al.* pointed to likely links between occupational exposures and underlying ethnic disparities [36].

Primiparae recorded the highest prevalence of VEPTB, EPTB and LPTB. This was evidenced in observation of the lowest mean gravidity and parity (of 1.8 ± 1.1 and 0.6 ± 0.9 respectively) among births at 28 - 36 GW. They notably had an increased likelihood for birth at 28 - 32 GW and 37-38 GW (of 50% and 40% respectively). Biparae recorded a 40% increased risk for birth at early term, (i.e. 37 - 38 GW). Births among multiparae largely occurred at ≥ 39 GW characterized by an estimated 70% increased likelihood. Bouchra K., *et al*, Kou-Huang C., *et al.* and Delnord M., *et al.* similarly reported independent associations between primiparity and spontaneous PTB [37-39]. A study, (aside increased risk for LBW/SGA births), contrarily identified no associations between primiparity and PTB [40]. PTB trends varied insignificantly between the significant minority of non-ANC attendant parturients and the strong majority of ANC attendants. Statistical relationships between higher GA at birth and commensurately higher ANC attendances in this study were assessed associative and not causal. A longer duration of pregnancy would be, logically, likely linked to higher absolute ANC attendances. While Pervin J., *et al.* posit that ANC attendance reduces PTB prevalence, Beeckman K., *et al.* emphasize the role of its content and timing other than absolute attendances [41,42]. Prevalence of VEPTB, EPTB and LPTB varied across the clinical spectrum of the severity of maternal anemia, (i.e. Hb concentration ≤ 10.9 g/dl). Parturients with Hb concentrations ≤ 6.9 g/dl, (i.e. severe anemia), recorded a comparatively higher burden of PTB. This is supportive of widely established associations between maternal anemia and PTB [43-45]. Descriptively elevated PTB prevalence with severe anemia needs further investigation as 95% confidence limits of the estimated association (of PTB and mild, moderate and severe anemia) included the null values.

Maternal phenotypic ABO blood group 'A' correlated with a notably high prevalence of VEPTB, EPTB and LPTB but only statistically significantly associated with VEPTB. Lurie S., *et al.* reported a higher prevalence of preterm premature rupture of membranes firstly among parturients with blood group 'B' and secondly, 'A' [46]. A study however contrarily further posits that maternal phenotypic ABO blood groups do not impact duration of pregnancy [47].

Maternal SBP ≥ 130 mmHg and DBP ≥ 90 mmHg correlated with a higher prevalence of VEPTB, EPTB and LPTB. Despite a descriptively notable decrease in mean maternal SBP and DBP on a gradient of increasing GA at birth, the 95% confidence limits of the estimated association included the null value. The descriptive findings however remain comparable to widely established associations between reduced pregnancy duration and higher maternal SBP and DBP [5-7]. Male infant births were characterized by a marginally higher prevalence of PTB. Further statistical analyses however further suggested that female infant births were about 40% likely to occur at early term, (i.e. at 37 - 38 GW). Epidemiologic studies, consistently with this study, point to higher PTB incidence in pregnancies carrying male fetuses [48,49]. Parturients' level of education did not impact pregnancy duration. Peak PTB prevalence, (i.e. VEPTB, EPTB and LPTB), was observed among parturients with multifetal pregnancies. The widest PTB prevalence disparity between multifetal and singleton births (of about 6:1) was observed among births at 32 - 36 GW as compared to births at 28 - 31 GW. Births at 28 - 36 GW were about nine times as likely to occur among multifetal pregnancies as singleton pregnancies. This is significantly supportive of extant evidence widely pointing to increased risk of PTB among women with multifetal pregnancies [31,38,50].

Conclusion

Prevalence of PTB remains high in Kwaebibirem at 8.8%. Its prevalence is higher among parturients aged ≤ 20 years who are about 50% less likely to have births at ≥ 39 GW. Maternal age ≥ 31 years has a 50% increased likelihood for birth at ≥ 39 GW. Rural residence correlates with a marginally elevated burden of PTB. Primiparity is linked to a higher prevalence of PTB. Mean gravidity and parity are notably lowest for parturients among whom births at 28 - 31 GW (or VEPTB) occurred. Maternal SBP ≥ 130 mmHg, DBP ≥ 90 mmHg, severe maternal anemia and maternal phenotypic ABO blood group 'A' correlated with a notably higher PTB prevalence. ABO blood group

'A' was associated with significantly increased risk for VEPTB. Mean S- and DBP decreased on a gradient of increasing GA at infant birth. Male infant birth accounts for a marginally higher burden of VEPTB while female infant birth is significantly likely to occur at 32 - 36 GW. Multifetal pregnancies generally remain most significantly associated with markedly increased risk for birth ≤ 36 GW.

Recommendations

Policy frameworks aimed to control adolescent pregnancy should be enhanced as this age group recorded the highest burden of PTB. Early detection of maternal anemia, preconception or during early pregnancy, (targeted for intervention), should remain a maternal health priority. This should be linked the enhancement of interventions targeted at elimination of anemia among women of reproductive age. Further research on the public health and clinical significance of correlations and statistical associations between PTB, (i.e. VEPTB, EPTB and LPTB), and maternal SBP ≥ 130 mmHg, DBP ≥ 90 mmHg, maternal anemia, ANC attendance, fetal sex and maternal phenotypic ABO blood groups should remain a research priority.

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