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EDITORIAL

ASSISTED REPRODUCTIVE TECHNOLOGY (ART) - ROLE, CHALLENGES AND PROSPECTS IN MODERN GHANA

Assisted reproductive technology (ART) involves all interventions which use in-vitro handling of both human oocytes and sperm or embryos for purposes of reproduction. ART includes, but is not limited to, "in-vitro fertilization and embryo transfer" (IVF and ET), intra-cytoplasmic sperm injection (ICSI), embryo biopsy, preimplantation genetic testing (PGT), assisted hatching, gamete intra-fallopian transfer (GIFT), zygote intra-fallopian transfer (ZIFT), gamete and embryo cryopreservation, semen, oocyte and embryo donation, and gestational carrier cycles. Assisted insemination using sperm from either a woman's partner or a sperm donor is not included in ART (ICMART Glossary, 2017).

In a pro-natalist society like Ghana, infertility poses a major source of psychological, social and emotional burden to couples and their families. According to a recent 2017 data from the National Population Council, Ghana's total fertility rate (TFR), or the average number of children per woman, declined from 6.4 in 1988 to 4.0 in 2008. In 2015, Ghana's TFR was estimated at 3.73 and this figure is projected to reach 3.63 by the year 2020. Although the TFR in Ghana has been falling, its high rate continues to be a worrying reality for Ghana in terms of our population growth.

Infertility is currently defined as a disease where there is failure to establish a clinical pregnancy after 12 months of regular, unprotected sexual intercourse or due to an impairment of a person's capacity to reproduce either as an individual or with his/her partner (ICMART Glossary, 2017).

Role of ART- By helping to treat infertile couples with the delivery of babies, ART provides hope to the infertile couple in Ghana. It also helps with population growth thereby helping to replace the deceased. The role of ART in the area of economic growth is huge. It provides employment to the unemployed, and taxes on medicines, equipment and consumables for ART are increasingly becoming a major source of revenue for the government of Ghana as more ART centers are set-up.

Challenges facing ART in Ghana- It is very expensive to set-up an ART facility in Ghana. Due to the high cost of the set-up; and maintenance, the cost of treatment is understandably high as these inherent costs are passed on to the client. On the average, the cost of one cycle of IVF treatment in Ghana is about 26,852-42,963 GHC (5,000-8,000 USD) which is way beyond the reach of the average Ghanaian couple. Currently, there are no national guidelines or policies formulated to guide the practice of ART. Stakeholder meetings are ongoing to put together regulations on number of embryos one can transfer at a time, egg/sperm donation, surrogacy, et cetera. There is currently no postgraduate program to train residents for ART at both the Ghana College and the West African College of Surgeons. Most clinicians who practice ART got their training from India, Europe, USA or South Africa. Almost all ART centers in Ghana are privately-owned with no tertiary teaching facility equipped at the moment to provide this service. This is very unfortunate for the young ones who are in training and need to have hands-on training in ART before they pass out as gynaecologists. The expensive cost of medications and consumables for ART is a major challenge to both clinicians and clients. It is about time the Government of Ghana puts some tax waivers on ART medications and consumables to help lessen the economic burden on clients and service providers. There are also religious concerns and prohibitions on ART. Some people in Ghana believe that selecting which embryos to transfer, selective feticide, pre-implantation genetic screening leading to the preferential non-selection of some embryos with genetic defects such as sickle cell disease et cetera is an act of playing God which is against their beliefs.

Prospects of ART- The economic potential of ART cannot be over-emphasized with the increasing advancement in technology and the increasing population of the infertile couples in our society. ART offers clinicians enormous research potential and opportunity. The use of pre-implantation genetic diagnosis (PGD) or pre-implantation genetic screening (PGS) also present scientists in Ghana great opportunity to prevent or reduce the incidence of some congenital anomalies. Egg/sperm cryo-preservation will provide hope for people who develop cancer of the ovaries/testes or those who accidentally are about to lose their gonads. With more women and men delaying the age at childbirth until they have achieved their career goals, Ghana is likely to experience rising prevalence of infertility, with clients requiring assistance through the use of ART.

In conclusion, ART is an important consideration in the health, population growth and the socio-economic development of Ghana. In this regard, we need the support of all stakeholders including the government to take proactive steps to assist the growth of the ART service delivery in Ghana. The enormity of ethical, legal and religious issues inherent in some ART procedures require that sooner rather than later, a regulatory body backed by legislation, is established or mandated to deal with issues that would arise.

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ORIGINAL ARTICLES

FACTORS CONTRIBUTING TO NEONATAL ADMISSIONS AND OUTCOMES AT EFFIA NKWANTA REGIONAL HOSPITAL: JANUARY TO DECEMBER 2015

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Abstract

Objectives: To investigate factors contributing to neonatal admission outcomes at Effia Nkwanta Regional Hospital (ENRH)

Method: All neonatal admissions to the Neonatal & Intensive Care Unit (NICU) of the hospital that were entered into the DHIMS2 database were extracted and complemented with additional information from patients' folder review. The data from the two sources were merged and analysed using SPSS version 21. Univariate and multivariate regression analysis was performed to identify factors associated with admission outcomes, taking statistical significance as $p < 0.05$. ARC-GIS version 10.1 was used to describe the geospatial distribution of health facilities referring to ENRH.

Setting: Neonatal & Intensive Care Unit of ENRH

Participants: All neonates admitted to NICU between January and December 2015.

Intervention: None

Results: Nine Hundred and Ninety-Three out of the 1150 neonatal admissions were entered into DHIMS2. Fifty-two percent were males, 57.3% were delivered through Caesarean Section, 72% were admitted within 2 days of birth, and 56.8% had normal birth weight. Fifty-Eight percent of the neonates were delivered at the ENRH, whilst 39.9% were referred from health facilities located within Sekondi-Takoradi Metropolis. At 1 minute, only 14% of the neonates had normal Apgar score (8-10), and this improved to 50% at 5 minutes. The main causes of neonatal admission were birth asphyxia 21.0%, followed by prematurity 17.5%, neonatal jaundice 17.1% and neonatal sepsis 14.5%. The death rate was 18% with more than 80% of the deaths occurring during the early neonatal period. More than 80% of deaths were due to four admission diagnoses: birth asphyxia, prematurity, neonatal jaundice, neonatal sepsis. Factors associated with adverse admission outcome are: low birth weight, delivery by Caesarean Section and low Apgar score at 5 minutes.

Conclusions: The institution of appropriate interventions to reduce or manage the four major causes of adverse neonatal admission outcomes will significantly reduce neonatal mortality in the hospital.

Key Words: *neonatal, mortality, admission outcomes, Ghana*

Introduction

In spite of the recent global efforts and resources put into prevention and reduction of morbidity and mortality among children aged ≤ 5years, neonatal morbidity and mortality remains unacceptably high. In 2015, of the 5.9 million deaths that occurred globally among children aged ≤ 5years, 2.7 million (45%) were neonates.[1] Over two-thirds of the global neonatal deaths occur in developing countries, particularly in Asia and Africa.[2-3] Most of these deaths occur during the antepartum or intrapartum period, and the rest during the first week of life.[3]

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In the African region, under-five mortality decreased by 54% between 1990 and 2015, compared to 38% decrease in neonatal mortality within same period.[4] In Ghana, under-five mortality decreased from 80/1000 live births in 2008 to 60/1000 in 2014. However, neonatal mortality only declined from 30/1000 live births in 2008 to 29/1000 in 2014.[5-6]. In the Western Region (WR), under five mortality reduced from 65 to 56/ 1000 live births, while neonatal mortality reduced from 40 to 28/1000 live births.[5-6]

In 2014 institutional under five mortality in the WR was 10.1/1000 live births, compared with the national average of 8.4/1000 live births. Similarly, institutional neonatal mortality for the region was 6.7/1000 live births compared with the national average of 4.3/1000. WR was thus the second worst performing region in the country that year.[7]

Majority of the neonatal admissions and mortality in the WR occurred at the Effia Nkwanta Regional Hospital (ENRH), a secondary referral hospital with a

neonatal and intensive care unit (NICU). In 2014, 119 out of 394 (30.2%) neonatal mortality occurred in the NICU.[8]

The hospital initiated some interventions to reduce the morbidity and mortality. These interventions include training on neonatal resuscitation, infection prevention and control (IP&C), with emphasis on cord care, and Kangaroo Mother Care (KMC). In spite of these interventions, neonatal mortality continued to increase. In 2015, 179 out of 295 (60.7%) neonatal mortality in the region occurred at the NICU.[8]

This study therefore sought to find out the factors contributing to neonatal admission outcomes at ENRH so as to institute appropriate interventions to reverse the trend.

Methods

Study setting

The study was conducted at ENRH in the Western Region of Ghana. The ENRH is located in Sekondi and it is the largest and the only secondary health care facility in the region. The Hospital has a bed compliment of 308, with 21 in the NICU. The unit admits approximately 1007 patients annually. It serves as a major referral centre for the region and provides specialist care to patients referred from other health facilities.

Study type

The study was retrospective and cross-sectional in design and used routine health facility service data within the District Health Information System 2 (DHIMS2) platform of the Ghana Health Service. The DHIMS2 is developed on District Health Information System version 2 (DHIS2) application platform and it is a free open source software used to capture facility level aggregated service data for all service delivery in Ghana. Client based anonymous transactional data is also captured for inpatient morbidity and mortality, returns of deliveries and cause of death certificate data.

Data of all neonates admitted to the NICU of the hospital from January to December 2015 were extracted from the DHIMS2 database. In order to answer key research questions, additional data was extracted from the patients' folders to complement what was extracted from DHIMS2. The folders were retrieved using the patients' unique ID as entered in to DHIMS2.

The variables that were extracted from DHIMS2 were: date of admission or discharge; gender; principal and additional diagnoses; and outcomes of admission. The variables extracted from the patients' folders were: source of referral; Apgar scores; facility of delivery; mode of delivery and birth weight.

Data Processing and Analysis

The data from the two sources were merged and imported into Microsoft excel 2016 and analysed using Statistical Package for Social Sciences (SPSS) version 21.

Using accepted standard definitions and formats, various categorization of the data was done. Birth weight was categorized as follows: < 2500 grams as underweight, 2500 to 3999 grams as normal weight and > 4000 grams as overweight. Varied levels of underweight were also defined as follows :< 1000g as extremely low birth weight (ELBW); 1000 -1499g as very low birth weight (VLBW); and 1500 – 2499g as low birth weight (LBW). Apgar score at 1 and 5 minutes were also categorized as follows: 0-2 (severe); 3-5 (moderate); 6-7 (mild) and 8-10 (normal). The age on admission and discharge were also categorized as follows: 0-2; 3-7; 8-14; 15-28 days

Frequencies, percentages and graphical presentation were used to display findings. In order to identify the factors associated with admission outcomes, univariate and multivariate regression analysis was performed. Statistical significance was taken as $p < 0.05$.

ARC-GIS version 10.1 was used to describe the geospatial distribution of health facilities that referred the neonates to the NICU of the hospital

Study Limitations

Since secondary data was used, the accuracy and completeness of the data may not be optimum. The findings may also not be generalizable to the whole community and region as a whole since the data is health facility based.

Ethical Consideration

Ethical Clearance was given by the Ghana Health Service Ethics Review Committee with ID No. GHS-ERC: 23/09/15. Permission was also sought from the Western Regional Health Directorate and Effia-Nkwanta Regional Hospital for use of the data.

Results

Neonatal Characteristics

Between January and December 2015, the NICU of ENRH recorded 1150 admissions in the Admissions and Discharges (A&D) register, of which 993 were entered in DHIMS2. 519 (52.7%) were males. 869 (57.3%) were delivered through either elective or emergency Caesarean Section. The age on admission ranged between 0 to 28 days with a mean of 2.7 days. Majority 701(72%) were admitted within 2 days of birth.

The birth weight ranged from 405 to 7000 grams, with a mean of 2803.60grams. Majority 506 (56.8%) had normal birth weight (2500 – 3999g), whilst 295 (33.1%) had low birth weight (< 2500g) as shown in Table 1.

Apgar Scores at 1 and 5 minutes

Apgar score at one and five minutes was recorded for 834 (84.0%) of the neonates. The mean scores at one and five minutes were 5.34 and 6.82 respectively. The modal score was 7 at one minute and 8 at five minutes. At 1 minute, only 14% of the neonates had a normal Apgar score of 8-10 which improved to 50% at 5 minutes (Figure 1).

Place of delivery

Majority 581 (58.5%) of the neonates, were delivered at the ENRH (Figure 2).

Table 1: Characteristics of neonates admitted to the NICU of Effia-Nkwanta Regional Hospital (January-December, 2015**)**

Variable		Frequency	Percentage
Sex N=985	Male	519	52.7
	Female	466	47.3
Mode of Delivery N=993	Caesarean Section	869	57.3
	Spontaneous Vaginal Delivery	396	39.9
	Vacuum Extract	4	0.4
	Unknown	24	2.4
Age on Admission(days) N=973	0-2	701	72.0
	3-7	179	18.4
	8-14	52	5.3
	15-28	41	4.2
Birth Weight (g) N=891	0-999	19	2.1
	1000-1499	61	6.8
	1500-2499	215	24
	2500-3999	506	56.8
	≥4000	90	10.1

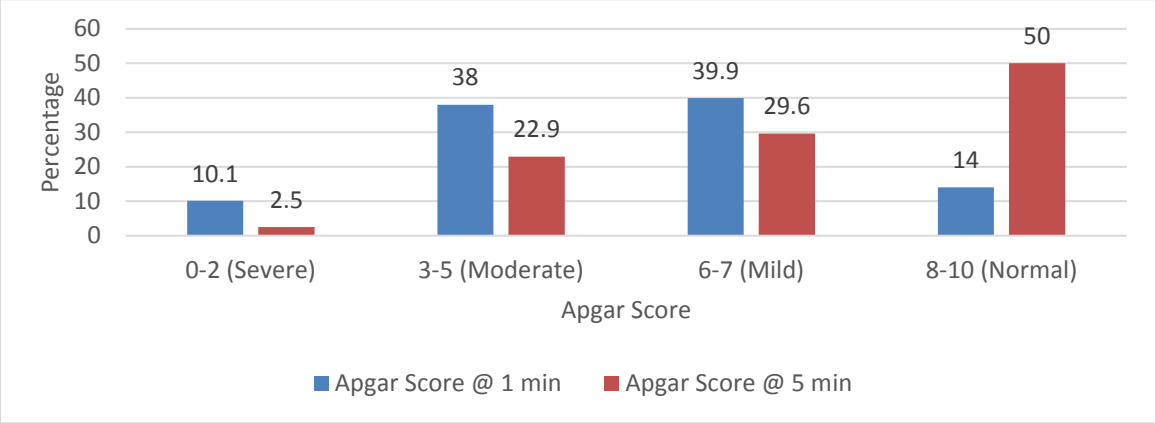


Fig 1: Comparison between Apgar scores at one and five minutes for neonates admitted to the NICU of ENRH, January to December 2015

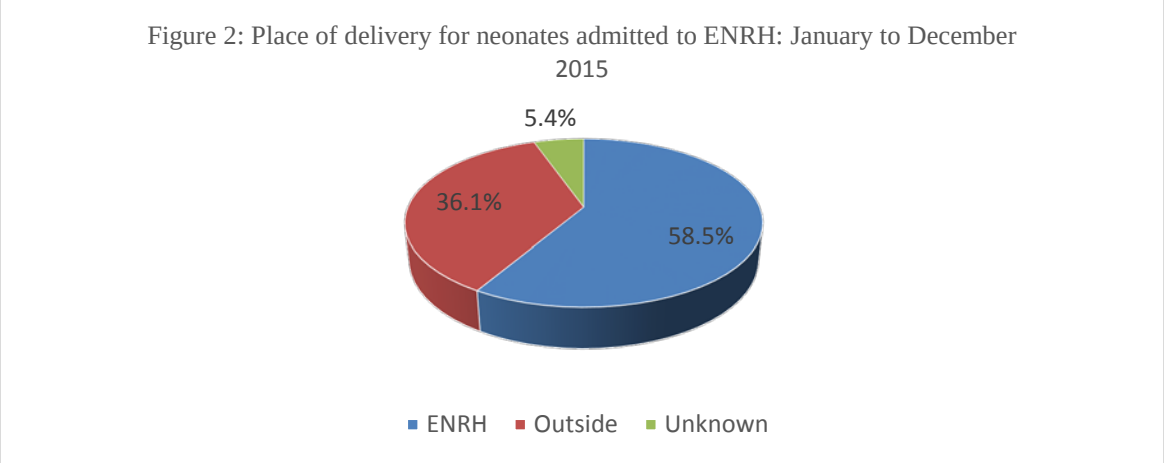


Fig 2: Place of delivery for neonates admitted to ENRH: January too December 2015

Level of facilities referring to ENRH

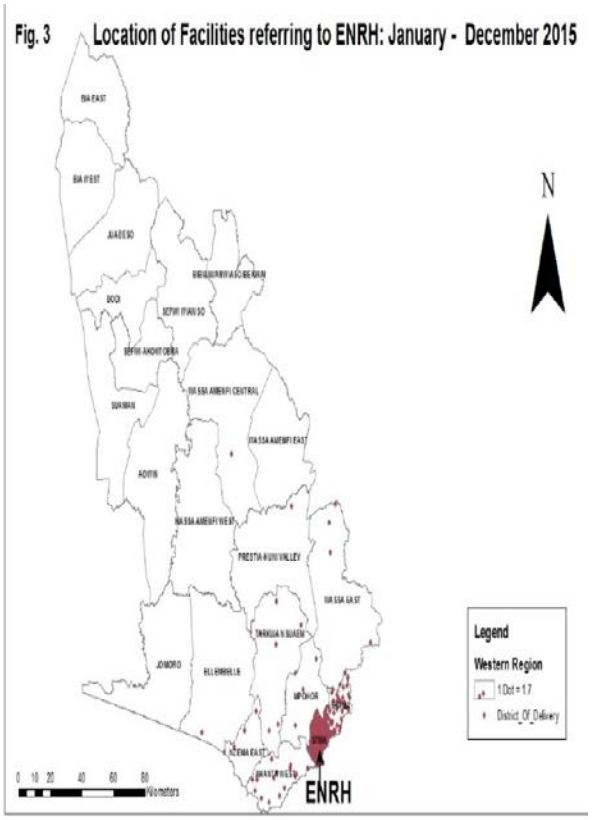
Of the 358 neonates that were referred from other health facilities, majority 220 (61.4%) were referred from various hospitals within the region. Forty-nine (13.7%) neonates were either delivered at home or by a TBA and later referred to the ENRH (Table 2).

Table 2: Level of facilities referring to the NICU of ENRH: January to December 2015

Facility	Number	Percentage
Hospital	220	61.5
Health Centre	56	15.6
Home/TBA	49	13.7
Clinic	22	6.1
Maternity Home/CHPS	11	3.1

Location of referring facilities

The health facilities that referred to the NICU of ENRH are located in ten different districts within the region, with the majority 143 (39.9%) located within Sekondi-Takoradi Metropolis (Figure 3).



Causes of neonatal admissions

Reasons for neonatal admissions were birth asphyxia 209 (21.0%), prematurity 174 (17.5%) and neonatal jaundice 170 (17.1%). (Table 3).

Table 3: Reasons for admission to the NICU of ENRH: January – December 2015

Reasons for admission	No.	%
Birth Asphyxia	209	21.0
Prematurity	174	17.5
Neonatal Jaundice	170	17.1
Neonatal Sepsis	144	14.5
Macrosomia	62	6.2
Congenital Abnormality	36	3.6
Respiratory Distress Syndrome	27	2.7
Neonatal Seizure	16	1.6
Emesis in Newborn	16	1.6
Meconium Aspiration Syndrome	13	1.3
Birth Trauma	13	1.3
Low Birth Weight	12	1.2
Ophthalmia Neonatorum	13	1.3
Suspected Neonatal Tetanus	4	0.4
Unspecified	45	4.5
Others	39	3.9
Total	993	100

Admission outcomes

Of the 993 neonates admitted, mortality was 179 (18%), comprising 144 (80.4%) early neonatal deaths (0-7days). More than 80% of the mortalities were due to four conditions: birth asphyxia 58 (32.4%), prematurity 47 (26.3%), neonatal jaundice 21 (11.7%) and neonatal sepsis 17 (9.5%). Fig 4).

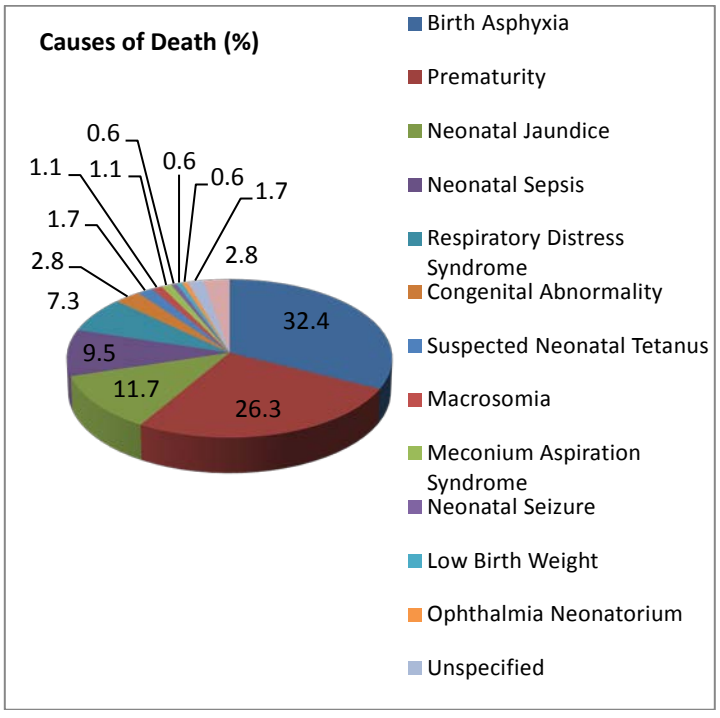


Fig 4: Causes of Death among neonates admitted to NICU of ENRH, January to December 2015

Factors associated with admission outcomes

Mortality is significantly associated with low birth weight, delivery by caesarean section and lower Apgar score at 5 minutes (p = 0.001, 0.001, and 0.001 respectively).

Neonates delivered outside ENRH, those referred from lower levels of health facility and those with lower Apgar score at 1 minute have a higher mortality, but this was not statistically significant during linear and multiple regression analyses (p = 0.54/0.71, 0.254/0.371 and 0.601/0.952 respectively).

There was no difference in admission outcomes among male and female neonates (p=0.382 and 0.359) respectively during linear and multiple regression analyses (Table 4).

Table 4: Factors Associated with neonatal admissions outcomes at the NICU of ENRH, January -December 2015

Variable	Discharged	Died	Total	Univariate P-Value (95% CI)	Multivariate P-Value (95% CI)
Sex (N=980)					
Male	427 (82.3%)	92 (17.7%)	519		
Female	379 (82.2%)	82 (17.8%)	461	0.382 (-.070 to 0.027)	0.358 (0.797 to 1.868)
Birth Weight (g) (N=887)					
<1000	1 (5.3%)	18 (94.7%)	19		
1000-1499	40 (65.6%)	21 (34.4%)	61		
1500-2499	176 (81.9%)	39 (18.1%)	215		
2500-3999	437 (86.7%)	67 (13.3%)	504		
4000 and above	83 (94.3%)	5 (5.7%)	88	0.001 (-.113 to -.051)	0.001 (1.411 to 2.323)
Mode of delivery (N=964)					
Caesarean section	426 (75.5%)	138 (25.5)	564		
Spontaneous Vaginal Delivery	358 (90.4%)	38 (9.6%)	396		
Vacuum	3 (75.0%)	1 (21.0%)	4	0.001 (-.133 to -.033)	0.001 (1.4 to 3.457)
Place of Delivery (N=988)					
ENRH	499 (86.3%)	79 (13.7%)	578		
Outside	260 (72.8%)	97 (27.2%)	352		
Unknown	50 (94.3)	3 (5.7%)	53	0.054 (-.001 to .175)	0.071 (.264 to 1.057)
Level of Facility of Delivery (N=988)					
ENRH	499 (86.3%)	79 (13.7%)	578		
Hospital	162 (74.0%)	57 (26.0%)	219		
Health Centre	42 (75.0%)	14 (25.0%)	56		
Home/TBA	32 (65.3%)	17 (34.7%)	49		
Clinic	13 (61.9%)	8 (38.1%)	21		
Maternity Home/CHPS	10 (90.91)	1 (9.09)	11		
Unknown	51 (94.4%)	3 (5.6)	54	0.254 (-.058 to .015)	0.371 (.850 to 1.546)
Apgar score 1 (N=831)					
0-2	42 (50%)	42 (50%)	84		
3-5	261 (82.6%)	55 (17.4%)	316		
6-7	282 (89.8%)	32 (10.2%)	314		
8-10	105 (89.7%)	12 (10.3%)	117	0.601 (-.033 to .058)	0.952 (.656 to 1.487)
Apgar score 5 (N=831)					
0-2	6 (28.6%)	15 (71.4%)	21		
3-5	124 (64.9%)	67 (35.1%)	191		
6-7	219 (89.8%)	25 (10.2%)	244		
8-10	341 (90.9%)	34 (9.1%)	375	0.001 (-.163 to -.072)	0.001 (1.563 to 3.405)

Discussion

This study sets out to examine the factors contributing to admission outcomes at the NICU of Effia Nkwanta Regional Hospital using the DHIMS2 platform. The DHIMS2 database offers a good platform for collection of data that can help to generate the necessary information needed to guide interventions aimed at addressing under five mortality, and by extension, neonatal mortality.

The study revealed that the majority of the neonates (72%) were admitted during the first two days of life and that more males were admitted than females. These findings have been reported in other settings.[9-11] However, whilst other studies found an increase survival rates among females compared to males,[12] this study did not find any significant difference in admission outcomes among males and females.

It was observed that the lower the birth weight, the higher the mortality. Similar results were reported in Pakistan and Ghana.[13-14] Low birth weight is usually associated with prematurity which predisposes them to feeding difficulties, poor temperature control, and increased susceptibility to infections. Thus, efforts to reduce mortality among such babies should focus on simple measures, such as improving warmth, good feeding practices and early treatment of infections.[15-16]

Majority (58.5%) of the neonatal admissions to the NICU were babies delivered at the ENRH while the rest were delivered in health facilities located in districts close to the regional hospital. This is consistent with findings from the University of Benin Teaching Hospital and Enugu State University Teaching hospital, where 84.6% and 54.4% of newborn admissions were in-born respectively[10, 17] ENRH being a referral centre, receives complicated obstetric cases which invariably result in neonatal morbidity and mortality.

Mortality among babies delivered by caesarean section was higher than those delivered by spontaneous vaginal delivery (57.3% vs. 39.9%), in contrast to studies in Namibia, where 58.6% of the new-born mortality were delivered by normal vaginal delivery and 23.3% by caesarean section.[18] The decision to do a caesarean section is usually made when adverse conditions are found in either the mother or the baby which contribute to the higher mortality among neonates delivered by caesarean section.

The Apgar score is a screening tool to evaluate a newborn's condition after initial resustitation[19]. In the study, at 1 minute, 48.1% of the neonates had severe to moderate asphyxia (Apgar score below 6) and this improved to 25.4% at 5 minutes. The lower the Apgar score, the higher the mortality. Mortality was 50% and 71.4% for neonates with severe asphyxia (Apgar Scores of 0-2) at 1 and 5 minutes respectively.

Birth asphyxia, prematurity, neonatal jaundice and neonatal sepsis were the main reasons for admission and mortality during the study period. Similar findings have been reported by other studies[11, 20]. We also found that more than 80% of the mortalities occurred in the first week of life as reported in other studies[3].

Conclusion and recommendations

In conclusion, the institution of appropriate interventions aimed at reducing or managing the four main causes of admission as reported in this study will significantly lead to reduction in neonatal mortality in the hospital. Such interventions should be simple, but effective approaches that have been proven to reduce neonatal morbidity and mortality. Prevention-based interventions such as, administration of antenatal steroids, early initiation of breastfeeding, newborn temperature management using KMC[16, 21-22] are cost effective measures to reduce newborn morbidity and mortality. Clean delivery practices, with strict observance of IPC practices, especially during cord care help reduce neonatal infection, sepsis, and hence mortality.

Treatment-based interventions such as newborn resuscitation and appropriate use of antibiotics are essential for reducing neonatal mortality[23-24]. In this regard, health staff involved in the provision of obstetric and newborn care should be trained in these preventive measures. Critical equipment for resuscitation of the newborn, management of preterm babies and neonatal jaundice should also be provided, routinely maintained and replaced as needed.

Acknowledgement

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SLEEP QUALITY AND NEW ONSET POSTPARTUM HYPERTENSION

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Abstract

***Background*:** Chronic sleep deficiency is a stressful situation which has an association with high blood pressure. After delivery, mothers have disrupted sleep due to frequent awakenings by their infants. What is not known is how significant this relationship is in women during the postpartum period as well as other factors that may affect their Sleep quality. Sleep quality is a measure of duration and disruption.

Aim and Objectives: Study is aimed at determining the relationship between Sleep quality and new onset postpartum hypertension. The specific objectives are; to determine the Sleep quality of mothers in the postpartum period using the Pittsburgh Sleep quality index (PSQI), identify factors that affect Sleep quality of mothers in the post-partum period and determine blood pressure patterns of mothers in the postpartum period.

***Materials and Methods*:** This was a longitudinal study. Using systematic random sampling, a sample size of 126 women were recruited between June and August 2016 in the Postnatal clinic of the 37 Military Hospital. Written consent was obtained from participants. Sitting blood pressure was checked and recorded and a modified form of the Pittsburgh Sleep quality index (PSQI) was used to assign a global score for Sleep quality. A global score of more than 5 indicated poor Sleep quality in that mother. Clients were first recruited at the 1st postnatal visit with follow-up at the 2nd routine postnatal visit (6weeks). Only mothers whose blood pressures were normal during pregnancy and upon discharge from hospital were included. For categorical data, Pearson's chi-square test was used for comparisons and logistic regression as used to determine significant factors that contribute to new onset hypertension in postpartum women. A P-value less than 0.05 was considered significant.

Results: Majority of mothers (92.1% and 90.5% at first and second visits respectively) had poor Sleep quality. Mothers who slept away from their babies at the sixth week visit had better sleep. Mean global Sleep quality scores had no significant association with new onset hypertension but mean scores of some Age , p=0.001, OR =1.20 (C.I: 1.09-1.32) and some sleep components sleep disturbance, p=0.041, OR =1.86(C.I: 1.02-3.37), and use of sleep medicine, p=0.031, OR =1.54 (C.I:1.04-2.29) were significantly associated with new onset postpartum hypertension.

***Conclusion*:** Global poor Sleep quality is not associated with increased odds of new onset hypertension but the Sleep quality components, sleep disturbance and increased use of sleep medicine, were significantly associated with new onset hypertension in mothers.

Key Words: *Sleep quality, sleep, postpartum, hypertension.*

Introduction

In Africa and most developing countries, awareness, control and treatment of the hypertension is suboptimal.[1] Knowledge of the epidemiology of the disease is important to devise intervention strategies. Anecdotal evidence suggests that normotensive women in pregnancy may come in the puerperium with high blood pressure. Some are picked up when they go to hospital for other reasons. These women are usually treated with antihypertensive medications as outpatients or in-patients as necessary. In some cases, the medications have to be increased over time to achieve control. Chronic sleep deficiency is a stressful situation which has an association with high blood pressure[2]. After delivery, mothers have disrupted sleep due to frequent awakenings by their infants. What is not known is how significant this relationship is in women during the postpartum period as well other factors that may affect their Sleep quality.

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Sleep deficiency is a state of inadequate or mistimed sleep unrelated to a primary sleep disorder and it is associated with biological, social, environmental and lifestyle factors[7]. It does not require medical attention but to promote good health, factors that lead to short sleep durations and circadian disruptions must be addressed. Sleep deficiency is associated with major health risks[7]. Short sleep duration (less or equal to 6 hours) with poor Sleep quality is associated with a greater risk of developing coronary heart disease and cardiovascular outcomes such as hypertension, stroke and heart disease[8]. It has also been found to increase the risk of obesity and type 2 diabetes mellitus. Other effects of lack of sleep in the general population include reduction of reaction time during driving increasing the risk of accidents, increased forgetfulness; increased risk of and worsening depression and increased aging of skin[9, 10]. This study aims to determine the relationship between Sleep quality and new onset postpartum hypertension. The sleep quality of postpartum women and factors affecting it as well as blood pressure patterns

of postpartum women and factors affecting blood pressure of postpartum women were determined.

Methods

This was a longitudinal descriptive study of mothers attending the postnatal clinic at the 37 Military Hospital, during the period of the study. The participants were mothers with normal blood pressure during pregnancy and upon discharge from the hospital. All mothers who had high blood pressure (140/90 mmHg or higher) before pregnancy, during pregnancy and or delivery and upon discharge from the hospital or had children with high needs, example: twins, and preterm babies were excluded. Written consent was obtained from all participants. Sitting blood pressure of the clients was checked using the Accoson mercury sphygmomanometer and recorded. To measure Sleep quality, a modified version of the Pittsburgh Sleep quality index (PSQI) was used[11]. The PSQI is a self-reported questionnaire that evaluates Sleep quality within the past month. For the purposes of the study, it was used to measure Sleep quality since delivery at the first postnatal visit; and Sleep quality since the first interview at the 6th week postnatal visit as a follow-up.

The PSQI consists of seven sleep components related to sleep habits including duration of sleep, sleep disturbance, latency, habitual sleep efficiency, and use of sleep medicine, daytime dysfunction and overall Sleep quality. The sleep components yield a score ranging from 0 to 3, with three indicating the greatest dysfunction. The sleep component scores were summed up to yield a total score ranging from 0 to 21. The higher total or global scores indicated poor Sleep quality. Participants with a global score greater than five are classified as poor sleepers and those with a score of five or less, classified as good sleepers[11]. Data pertaining to factors (obstetric, social and financial) that may affect Sleep quality were also collected.

Results

A total of 107 (84.9%) participants out of the 126 interviewed were between the ages of 22 to 43 with mean age of 31.1±4.2 years. Also 113 (89.6%) were married and 103(81.7%) had at least secondary education. Majority of participants had poor sleep at both visits. Single mothers had significantly better sleep (22.2%) than the married and cohabiting mothers, as shown in Table 1.

Table 1: Association between Sleep quality and sociodemographic characteristics

Sleep					**Quality**			
	First Visit				**Second Visit**			
	Good sleep n (%)	Poor sleep n (%)	Total	P value	Good sleep n (%)	Poor sleep n (%)	Total	P value
Age group 18-35 years >35 years Total	 8(7.5) 2(10.5) 10(7.9)	 99(92.5) 17(89.5) 116(92.1)	 107(100) 19(100) 126(100)	 0.650	 10(9.3) 2(10.5) 12(9.5)	 97(9.7) 17(89.5) 114(90.5)	 107(100) 19(100) 126(100)	 0.872
Marital status Married Single Co-habiting Widow Total	 7(6.2) 2(22.2) 0(0.0) 1(100) 10(7.9)	 106(93.8) 7(77.8) 3(100) 0(0.0) 116(92.1)	 113(100) 9(100) 3(100) 1(100) 126(100)	 **0.002**	 9(8.0) 2(22.2) 0(0.0) 1(100) 12(9.5)	 104(92.0) 7(77.7) 3(100) 0(0.0) 114(90.5)	 113(100) 9(100) 3(100) 1(100) 126(100)	 **0.008**
Educational level None Basic Secondary Tertiary Total	 0(0.0) 1(6.4) 4(8.2) 5(8.5) 10(8.0)	 2(100) 15(93.6) 45(91.8) 54(91.5) 116(92.0)	 2(100) 16(100) 49(100) 59(100) 126(100)	 0.967	 0(0.0) 1(6.4) 6(12.2) 5(9.5) 12(9.5)	 2(100) 15(93.6) 43(87.8) 54(91.5) 114(90.5)	 2(100) 16(100) 49(100) 59(100) 126(100)	 0.824

Out of the one hundred and twenty-six (126) mothers recruited for the study, 116 (92.1%) and 114 (90.5%) had poor Sleep quality at the first and sixth week visit respectively. The Sleep quality of mothers did not significantly change during the period as shown in Table 2.

The factors affecting Sleep quality of mothers were grouped into obstetric factors (parity), social support (house work, finance, and housing problems), baby care, and medications taken by mothers. Baby care at night, with respect to sleep arrangements was the only significant factor associated with sleep quality as shown in table 3.

Table. 2 Sleep quality of mothers at first and second visits

	Sleep Quality			
Visit	**Good sleep N (%)**	**Poor sleep N (%)**	**Total N (%)**	**P-value**
First visit	10 (7.9)	116(92.1)	126 (100)	
Second visit	12 (9.5)	114 (90.5)	126 (100)	0.655
Total	22 (8.7)	230(91.3)	252(100)	

Table. 3 Sleep Quality and baby care at night

	First Visit				Second Visit			
Factor	**Good sleep n (%)**	**Poor Sleep n (%)**	**Total n (%)**	**P-value**	**Good sleep n (%)**	**Poor sleep n (%)**	**Total n (%)**	**P-Value**
Sleeping arrangements								
Bedding-in	7(6.3)	104(93.7)	111(100)		8(7.3)	102(92.7)	110(100)	
Rooming-in	2(16.7)	10(83.3)	12(100)	0.116	4(25)	9(75)	12(100)	**0.013**
Separate rooms	1(33.3)	2(66.7)	3(100)		1(33.3)	2(66.7)	3(100)	
Total	10(8.0)	116(92.0)	126(100)		13(10.3)	113(89.7)	126(100)	

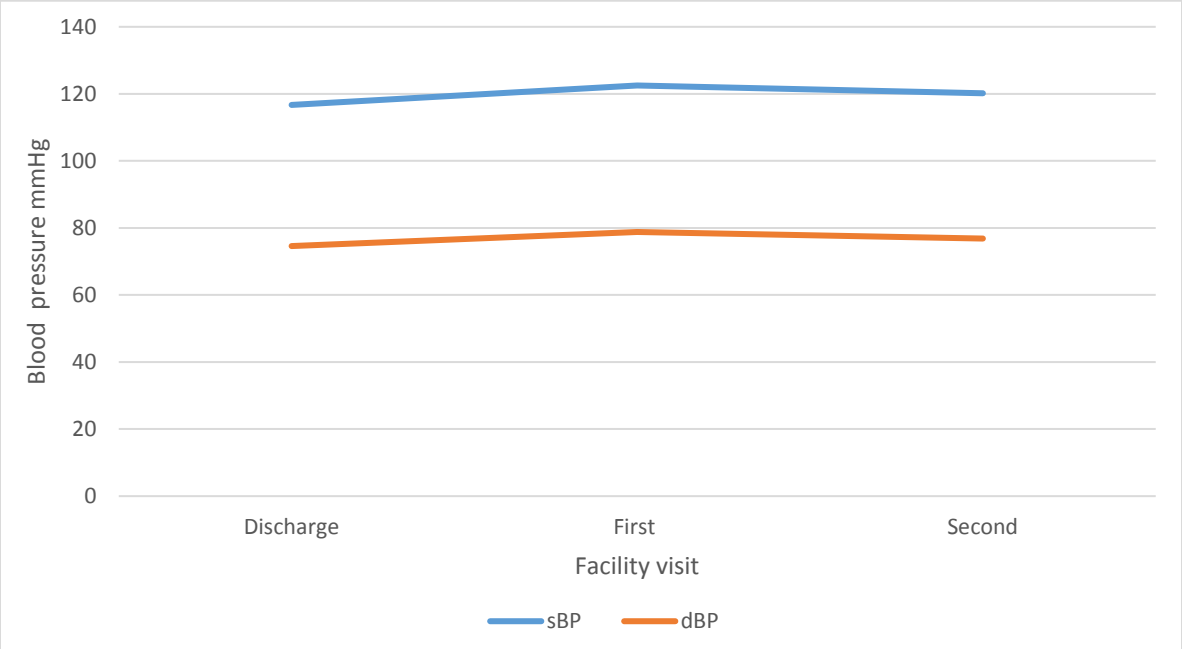

Fig-1 Blood pressure patterns in mothers in the postpartum period

Twenty-nine participants had new onset hypertension during the study period. There was no significant difference between the number of participants who had either systolic hypertension only,

Table 4 New onset hypertension in the postpartum period

Type of Hypertension	1st Visit N (%)	2nd Visit N (%)	P-value
Systolic Hypertension	21 (16.7)	18 (14.3)	0.8900
Diastolic Hypertension	28 (22.2)	21 (16.7)	
Combined Hypertension	15 (11.9)	14 (11.1)	

Of mothers with new onset hypertension, 12 and 19, had both systolic hypertension and diastolic hypertension increased respectively; whereas 16 and 9 were unchanged, respectively. 2 participants had a drop in either systolic hypertension or diastolic hypertension between the first and second visits as shown in table 5.

Table 5 Changes in blood pressures among new onset hypertensive participants from first to second visit.

Change in blood pressure	Participants with Systolic Hypertension	Participants with Diastolic Hypertension
Dropped	1	1
Increased	12	19
Unchanged	16	9
Total	29	29

The association between Sleep quality and new onset hypertension was significant between discharge and the first visit, p= 0.0346 but not between the first and second visit, p= 0.9393. Among clients with poor Sleep quality, majority (79.3%) stayed normotensive with 20.7% developing hypertension as shown in table 6.

There was no statistically significant difference in mean BP between mothers with good sleep and those with poor sleep and this did not change between the visits; p=0.199 and p=0.099 respectively. This is shown in table 7.

diastolic hypertension or combined systolic and diastolic hypertension at the first and second visits as shown in table 4, p=0.8900.

Table 6 Association between Sleep quality and new onset hypertension at first and second visit.

		Sleep quality			
Visit	**Blood pressure**	**Good sleep n (%)**	**Poor Sleep n (%)**	**Total N (%)**	**p-value**
First Visit	Normotensive	5 (50)	92 (79.3)	97 (77.0)	
	Hypertensive	5 (50)	24 (20.7)	29 (23.0)	0.0346
	Total	10 (100)	116 (100)	126 (100)	
Second Visit	Normotensive	10 (83.3)	94 (82.5)	104 (82.5)	
	Hypertensive	2 (16.7)	20 (17.5)	22 (17.5)	0.9393
	Total	12 (100)	114 (100)	126 (100)	

Table 7 Comparisons of mean blood pressures and Sleep quality at first and second visits**.**

Visits	Sleep quality	SBP (mmHg) Mean ± SD	DBP (mmHg) Mean ± SD	p-value
First visit	Good sleep (n=10)	123.6 ±13.4	77.1 ±4.0	
	Poor sleep (n=116)	122.4 ± 13.6	79.2 ± 9.9	0.199
	Total (N=126)	122.5 ± 13.5	79.0 ± 9.7	
Second visit	Good sleep (n=12)	121.3 ± 11.3	78.8 ± 8.3	
	Poor Sleep (n=114)	120.3 ± 14.0	76.9 ± 9.3	0.099
	Total (N=126)	120.3 ± 13.8	77.0 ± 9.2	

Mean age was significantly associated with high blood pressure at the second visit, p=0.001, as shown in table 8 below. The odds of hypertension among participants with a PSQI score of 6 or more total global points was no different from that of participants with 5 or fewer points. Thus, poor Sleep quality was not associated with increased odds of new onset hypertension, p=0.351. This is shown in table 8 below.

Table 8 Factors associated with new onset hypertension in mothers.

Factors	P value	Odds ratio (OR)	95% C.I. for OR
Age	**0.001**	1.22	1.09 -1.35
Parity	**0.001**	0.53	0.33-0.86
Period (1st Visit)	0.203	1.60	0.78- 3.29
Global Sleep quality (good sleep quality)	0.351	1.89	0.50 -7.13

When the effect of the components of Sleep quality on hypertension was used in the multivariate analysis, the results show that sleep duration, sleep disturbance and sleep medicine are all significantly associated with new onset hypertension (after accounting for confounders such as age and parity which were significantly associated with new onset hypertension). These sleep components are therefore independent associated factors. They are also independent of visits. This is shown below, table 9.

Table 9 Effect of components of Sleep quality, age and parity on new onset hypertension in postpartum women**.**

Factors	P-value	Odds Ratio (OR)	95% C.I. for OR
Age	**0.0001**	1.20	1.09-1.32
Parity	**0.007**	0.56	0.37-0.85
Subjective Sleep quality	0.531	0.86	0.54-1.38
Sleep latency	0.592	1.12	0.75-1.67
Sleep Duration	**0.012**	0.53	0.32-0.87
Habitual sleep efficiency	0.148	1.36	0.90-2.07
Sleep disturbance	**0.041**	1.86	1.02-3.37
Sleep medicine	**0.031**	1.54	1.04-2.29
Daytime dysfunction	0.834	1.05	0.66-1.67

Discussion

The sociodemographic characteristics of participants in this study is similar to that found by Klufio *et al* in a study of mothers who delivered at the Korle-bu Teaching hospital (KBTH) in Accra, Ghana. In this study 15.1% as against 10.8% were more than 35 years old, 1.6% as against 5.8% being grand multiparous and 0% as against 18% having no formal education when compared with the KBTH study[12].

Sleep quality of mothers was poor in the postpartum period at both the first and second visits from the study. Mother-infant co-sleeping represents the preferred and obligatory sleeping arrangements for most people in our socio-cultural environment. Under most circumstances, this arrangement continues to provide maximum protection and nutrition for the highly neurologically immature and slow developing infant and is believed to be the most favourable arrangement for optimal breast-milk production[13, 14]. However, sleeping separately from the baby at the second visit was the only factor found in the study to affect, positively, mothers sleep quality; p=0.013. This may be due to physiological factors that affect postpartum maternal sleep. High levels of oestrogen and progesterone occur in late pregnancy and have a sleep promoting effect (reduced sleep latency and increased sleep duration) and these decreases after delivery when the hormonal levels fall[15].This coupled with the infant's relatively immature circadian rhythm, leads to worsening sleep disturbance for the mother if she sleeps close to her baby.

Blood pressure patterns of Mothers in the postpartum period showed an initial rise since there is mobilization of extracellular fluid into the intravascular compartment and the administration of intravenous fluids during labor and delivery additionally causes increased intravascular volume.[16] High doses of nonsteroidal anti-inflammatory drugs (NSAIDs) for pain control also increases fluid retention and mean blood pressure by 5 to 6 mm Hg (through salt and fluid retention and vasoconstriction mediated via inhibition of prostaglandin synthesis).[17] Similar results was found in this study; a mean rise of 4.3 mmHg and 2.4 mmHg at the first and second visits respectively, Figure 1. Some 29 mothers (out of the 126 studied) developed hypertension with no significant difference between systolic only diastolic only or combined hypertension. Except in one client whose blood pressure dropped to normal at the second visit, all other newly diagnosed hypertensive mothers stayed same or had an increase within the study period. (Tables 4 and 5). The prevalence of new onset hypertension in Mothers at the first postnatal visit in this study was 23.0% and 17.5% at the second postnatal visit; the prevalence in participants with poor Sleep quality being 20.7% and 50 % in those with good Sleep quality (Table 6). This is lower than the prevalence of hypertension of 51.0% found in a Chinese rural population by Ru Qing et al in which participants with poor sleep had 66.7% and participants with good sleep had 44.4% prevalence of hypertension.[2] The lower prevalence in this study,

23%, may be due to the overall high prevalence of poor Sleep quality among participants, and the fact that we were dealing with hypertension of new onset (as against already hypertensive clients). On the whole however, mean blood pressure of Mothers stayed within normal range. Table 7.

Although Global sleep quality was not found to be associated with new onset hypertension, some sleep quality components, thus, sleep duration, sleep disturbance and use of sleep medicine were found to be significantly associated with new onset hypertension. In normotensive adults, short sleep duration has been found to be associated with an increased risk of hypertension incidence.[18] In this study however, the odds of sleep duration were less for hypertensive participants compared to normotensive clients, p=0.012, OR=0.53 (C.I: 0.32-0.87), (Table 9). This may be explained by the fact that Mothers tend to overestimate their nocturnal wake times. The lower risk of shorter sleep duration observed in this study is therefore likely to be due to the exaggerated responses of participants.[19] The inverse association of sleep duration on new onset hypertension in this study cannot be fully explained. Sleep disturbance (due to increased frequency of using the washroom at night and inability to sleep due to feeling hot or cold) was also found to be associated with an increased incidence of new onset hypertension as in other studies.[18] There is paucity of data regarding the use of sleep medicine and new onset hypertension, however the risk for hypertension in poor sleepers with poor sleep component scores (scores more than 0) in all of the elements is established.[2] And thus in this case if a new mother's Sleep quality was bad enough for her to use sleep medicine, then, she is at increased risk of developing new onset hypertension; p=0.031 (O.R= 1.54, (C.I: 1.04-2.29).

In this study, increasing age increases risk of new onset hypertension p=0.0001. O. R=1.20 (C.I.; 1.09-1.32) whereas increasing parity is protective p=0.007, O.R=0.56 (C.I.; 0.37-0.85). These results are similar to that of a study in Saudi Arabia done to determine the effect of age, obesity and parity on hypertension in non-pregnant women.[18] In that study, age increased the risk of hypertension; p<0.0001 for hypertension (OR=1.53, (C.I:1.1-1.2). Parity was however not significantly associated with hypertension, even though the effect on hypertension was negative too, p<0.1, (O.R=0.87 (C.I: 0.74-1.03).[18]The difference between the studies suggests that the negative (protective) effect of increasing parity on hypertension becomes less significant outside the postpartum period. Both results also show that nulliparity rather than multiparty is associated with risk of hypertension.[18]

Limitations of the study

Personal and family history of sleep disorders were excluded and Sleep evaluation based on a combination of polysomnography (the gold standard laboratory test of sleep quality) or wrist artigraphy and self-reported questionnaires may have provided a different result especially with regards to sleep duration.[20]

Conclusion

Global Sleep quality of mothers in the postpartum period is generally poor, however new onset hypertension in these mothers was associated with increasing maternal age, and maternal sleep disturbance and maternal use of sleep medicine. Also, increasing parity was significantly associated with lower risk of new onset hypertension in the postpartum period. Mothers who present with new onset hypertension may benefit from sleeping in very comfortable rooms away from their babies with less frequent use of washrooms during sleep.

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TRENDS IN CERVICAL PAP SMEAR CYTOLOGY IN A TERTIARY HOSPITAL: IMPLICATIONS FOR CERVICAL CANCER SCREENING IN LOW-INCOME COUNTRIES

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Abstract

Background: Screening rate for cervical cancer in Nigeria is low and not much is known about the changing trend in the premalignant stages of the disease.

Objective: To evaluate the trend of epithelial cell abnormality in the Pap smear in the past 10 years.

Methods: A 10-year review of cervical smear cytology (2008 -2017) at a tertiary institution in Nigeria using clinical and histopathological records. There were 5850 cervical smear cytology during the period.

Results: A total of 5212 (89.1%) were analyzed. The modal age ranged from 35 to 44years. Majority 4481 (85.9%) of the smears were negative (Negative intraepithelial lesion or malignancy). Smear unsatisfactory for interpretation accounted for 398(7.6%). The prevalence of abnormal Pap smear was 6.5% (CI 5.8% - 7.1%). ASCUS -3.5%, LSIL – 2.2%, HSIL – 0.4%, malignancy – 0.3% and ASC-H – o.1%.

The mean age of women with malignant smear was 51.2 ± 10.0years; compared to 42.4± 10.7 and 46.4± 13.4years for LSIL and HSIL respectively. There was moderate increase in LSIL in 2012 and 2013 with a decline in 2014. However, the rate of LSIL, in the last 4 years, increased from 3.5% to 17.9% ($p<0.0001$). HSIL increased from 15.8% in 2013 to 21.1% in 2015 but had a sharp decline afterwards. Malignant cytology rate fluctuated over the years without a specific pattern.

Conclusion: Given the increasing rate of LSIL in this setting and late commencement of cervical screening among our women, there is an urgent need to increase the awareness of the benefits of early detection of cervical cancer using Pap smear.

Key Words: Pap smear, abnormal epithelial cells, LSIL, HSIL

Introduction

Cervical cancer is the fourth most common malignancy among women worldwide[1, 2]. It is the second most common cause of cancer-related deaths in women in developing countries[1, 3]. According to GLOBOCAN, 569,847 new cases and 311,365 deaths were recorded in 2018[1, 4] and about 14,943 new cervical cancer cases are diagnosed annually and about 10,403 cervical cancer deaths occur annually in Nigeria (GLOBOCAN 2018)[4]. Cervical cancer (CC) screening by Pap smears has led to a decrease in the incidence of CC worldwide. However, the screening rate for cervical cancer in Nigeria is low and not much is known about the changing trends in the premalignant stages of the disease.

Cervical cancer is considered preventable, as the premalignant stages can be detected by exfoliative cytology like a Papanicolaou (Pap) smear examination[5]. The Papanicolaou (Pap) test is a screening test performed using the cells from the uterine cervix.

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This test was introduced by George Papanicolaou as a cervical pathology screening test in 1941[6]. It involves exfoliating cells from the transformation zone of the cervix to enable examination of these cells microscopically for detection of cancerous or precancerous lesions.

Screening with Pap smear has been seen to be accompanied by a dramatic reduction in the incidence of invasive cervical cancer in different countries of the world. To date two types of Pap tests are in use: conventional and liquid-based cytology. Even as the liquid-based test is popular in the developed countries, in low resource settings, a conventional Pap test is the mainstay screening system[7].

Various studies reveal that a majority of the cervical cancer mortality of the world comes from developing countries[2,8,9]. According to the World Health Organization (WHO), the highest burden of cervical cancer occurs in developing nations where there is a lack of effective screening programs and low uptake of Pap smear or pelvic examination[5]. This may be attributed to the absence of an efficient cervical cancer screening system. Well-organized cervical cancer screening programmes have reduced the mortality from cervical cancer by up to 50% in the developed world[10]. Therefore, it is important to know the prevalence and trend of epithelial cell abnormality in the Pap smear cytology and highlight the implication of cervical cancer screening in a developing country like Nigeria.

Subjects and Methods

This retrospective study was designed to review cervical cytology reports performed in the Pathology laboratory of National Hospital Abuja, Nigeria over a 10-year period from January 2008 to December 2017 using clinical and Pathology records. All cases of Cervical Pap Smear carried out within the study period were included. There were 5850 cervical smear cytology during the period.

The Cervical Pap Smear was done using conventional smears (PAP Smear) and Revised Bethesda System of 2001 was used in reporting. Smears were categorized as "satisfactory" when an adequate number of epithelial cells were clearly visualized, as per the guidelines of the Bethesda system.

The following categories were used: Negative for intraepithelial lesion or malignancy (NILM), atypical squamous cells (ASC) includes ASC-US (ASC of undetermined significance) and ASC-H (ASC, cannot exclude high grade squamous intraepithelial lesions), Low-grade squamous intraepithelial lesions (LSILs), High-grade squamous intraepithelial lesions (HSILs), and carcinomas. Epithelial cell abnormalities comprising of ASCs, LSILs, HSILs and atypical glandular cells (AGC) were considered as cervical precursor lesions.

Data management, analysis and graphical presentation were completed using the Statistical Package for the Social Sciences (SPSS), Version 18 (IBM Corp., Chicago, Illinois, USA). Descriptive statistics were presented as numbers, percentages and means ± standard deviations. The normal Z-test was used to test the difference in proportions and the Chi-squared test was used to determine if there was any trend in the proportion of cases over the 10-year period. The two-tailed probability value P <0.05 was considered statistically significant.

The study was conducted after obtaining approval from National Hospital Research and Ethics Committee/Board.

Results

The trend of cervical smear cytology was reviewed over a period of 10 years. There were 5850 cervical smear cytology during the period.

Due to cases of inadequate documentation and incomplete/missing results 638 (10.9%), only 5212 (89.1%) were analyzed for the study.

Table 1 showed that the mean age of participants for the different years under study ranges from 40.6± 9.5years to 44.1±10.0years. The variations of the mean age at different years were statistically significant (F= 7.136, P <0.0001). The most frequent age range was found to be 35-44yrs accounting for 39.6% followed by 45 to 54yrs (27.1%) only 21.8% were below 35yrs. (Fig 1)

Table 2 shows the pattern of cytology results between 2008 – 2017. Highest number of Pap smear was carried in 2008. Subsequently, there was a steady decline in the number of smears done over the years. Majority 4484 (86.0%) of the smears were negative (Negative Intraepithelial Lesion and Malignancy). Smear unsatisfactory for interpretation accounted for 398(7.6%) followed by ASCUS -180(3.4%), LSIL-113(2.2%), HSIL-19(0.4%), malignancy – 16(0.3%), ASC-H – 5(0.1). (Table 3)

As shown in table 4, the prevalence of abnormal PAP Smear was found to be 6.5% (CI 5.8% - 7.1%). ASCUS accounted for the highest abnormal epithelial cells -180(54.1%) followed by LSIL (33.9%), HSIL – 19(5.7%), malignancy – 16(4.8%) and ASC-H – 5(1.5%). Out of the 16 malignant cases recorded, 14(87.5%) were squamous cell carcinoma while only 2(12.5%) were Adenocarcinoma. (Table 5)

The highest rate of abnormal cells was recorded in 2008 accounting for about 62.7% of the total smears reviewed in 2008 after which a steady decline was noticed in successive 3 years. However, there was moderate increase in LSIL in 2012 and 2013. In the last 4 years, the rate of LSIL increased from 3.5% to 17.9% (p<0.0001). HSIL increased from 15.8% in 2013 to 21.1% in 2015 but had a sharp decline afterwards. Malignant cytology rate fluctuated over the years without a specific pattern

The mean age women with malignant smear was 51.2 ± 10.0years; compared to 42.4± 10.7 and 46.4± 13.4years for LSIL and HSIL respectively.

Table 1: Mean and Median ages of participants (2008-2017)

Year	Mean age (years)	Median age (years)	N	Std. Deviation	Minimum age (years)	Maximum age (years)	ANOVA (F); P
2008	40.6	40.0	879	9.5	27.0	75.0	
2009	42.1	41.0	700	9.7	28.0	70.0	
2010	42.0	41.5	620	9.8	28.0	77.0	
2011	41.7	41.0	506	10.1	25.0	77.0	
2012	42.8	42.0	471	10.5	25.0	71.0	
2013	42.4	42.0	480	9.6	23.0	72.0	
2014	43.9	44.0	341	10.0	25.0	73.0	
2015	44.1	44.0	424	10.0	24.0	73.0	
2016	44.0	43.0	391	10.2	23.0	77.0	
2017	42.9	42.5	400	9.7	25.0	62.0	
Total	**42.386**	**42.000**	**5212**	**9.9**	**21.0**	**77.0**	**7.136; <0.0001**

Table 2: Pattern of cytology procedure from 2008- 2017

Year	NILM N (%)	LSIL N (%)	HSIL N (%)	Malignant N (%)	ASCUS N (%)	ASC-H N (%)	Smear unsatisfactory for interpretation N (%)	Total
08	717 (16.0)	24 (21.2)	2(10.5)	3(18.8)	22(12.2)	0 (0.0)	111 (27.9)	879 (16.9)
09	593 (13.2)	16 (14.2)	1 (5.3)	2(25.0)	14 (7.8)	0 (0.0)	72 (18.1)	700 (13.4)
10	581 (13.0)	3 (2.7)	1 (5.3)	1 (6.2)	13 (7.2)	0 (0.0)	21 (5.3)	620 (11.9)
11	455 (10.2)	7 (6.2)	2(10.5)	0 (0.0)	11 (6.1)	0 (0.0)	31 (7.8)	506 (9.7)
12	383 (8.5)	12 (10.6)	2(10.5)	4(25.0)	23(12.8)	0 (0.0)	47 (11.8)	471 (9.0)
13	386 (8.6)	17 (15.0)	3(15.8)	0 (0.0)	40(22.2)	0 (0.0)	34 (8.5)	480 (9.2)
14	290 (6.5)	4 (3.5)	3(15.8)	0 (0.0)	27(15.0)	0 (0.0)	15 (3.8)	341 (6.5)
15	365 (8.1)	5 (4.4)	4(21.1)	3(18.8)	14 (7.8)	2 (40.0)	30 (7.5)	424 (8.1)
16	361 (8.1)	5 (4.4)	1 (5.3)	1 (6.2)	6 (3.3)	3 (60.0)	17 (4.3)	391 (7.5)
17	350 (7.8)	20 (17.7)	0 (0.0)	0 (0.0)	10 (5.6)	0 (0.0)	20 (5.0)	400 (7.7)
Total	**4481(100.0)**	**113(100.0)**	**19(100.0)**	**16(100.0)**	**180(100.0)**	**5(100.0)**	**398(100.0)**	**5212(100.0)**

Table 3: Mean and Median ages of participants by Pap smear test result (2008-2017)

Diagnosis	Mean age (years)	Median age (years)	N (%)	Std. Dev.	Min age (years)	Max age (years)	ANOVA (F); P
NILM	42.3	42.0	4481 (86.0)	9.9	25.0	69.0	
LSIL	42.4	40.0	113 (2.2)	10.7	21.0	75.0	
HSIL	46.4	46.0	19 (0.4)	13.4	29.0	77.0	
Malignant	51.2	51.0	16 (0.3)	10.0	34.0	69.0	
ASC-H	41.4	43.0	5 (0.1)	10.1	25.0	82.0	
ASCUS	44.1	43.5	180 (3.5)	10.1	20.0	73.0	
Cervical smear: unsatisfactory for interpretation	42.2	41.0	398 (7.6)	9.7	30.0	72.0	
Total	**42.4**	**42.0**	**5212 (100.0)**	**9.9**	**21.0**	**82.0**	**3.733; 0.001**

Table 4: Prevalence of abnormal epithelial cells (2008-2017)

Types of abnormality	Group frequency n=333	Group %	95% Confidence Interval	Overall percentage (95%CI) n=5212
LSIL	113	33.9%	29.5% -39.2%	2.2% (1.8%-2.6%)
HSIL	19	5.7%	3.7%-8.7%	0.4% (0.3%-0.6%)
Malignancy	16	4.8%	3.0%-7.7%	0.3% (0.1% -0.4%)
ASCUS	180	54.1%	48.7%-59.3%	3.4% (3.0%- 4.0%)
ASC-H	5	1.5%	1.5% 0.6%-3.5%	0.1% (0.04%-0.023%)
Total	**333**	**100.0%**		**6.4% (5.8% -7.1%)**

Table 5: Types of Malignancy

Types of Malignancy	Frequency	Percentage	95%Confidence Interval
Squamous cell carcinoma	14	87.5%	64.0% - 96.5%
Adeno Carcinoma	2	12.5%	3.5% - 36.2%
Total	16	100%	

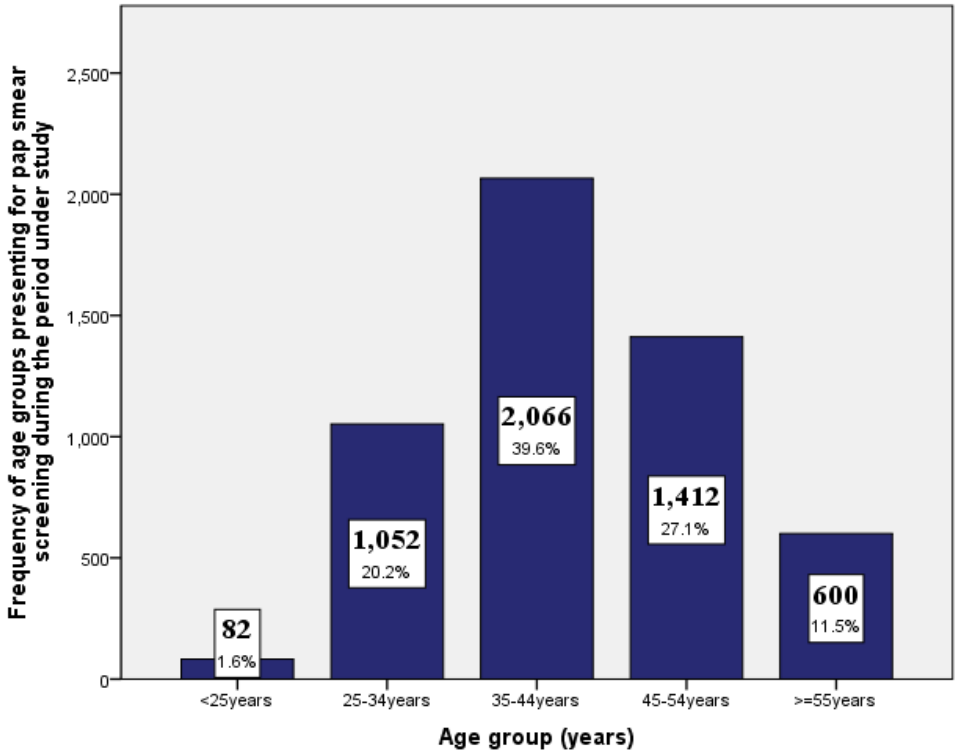

Fig 1: Presentation for screening vs. age group (years)

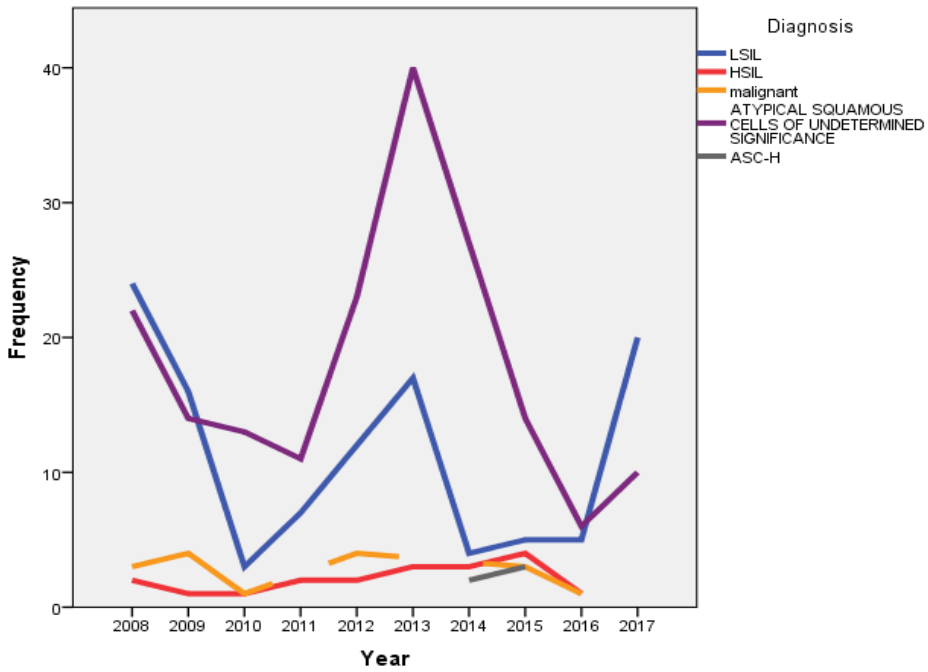

Fig 2: Pattern of abnormality at different years

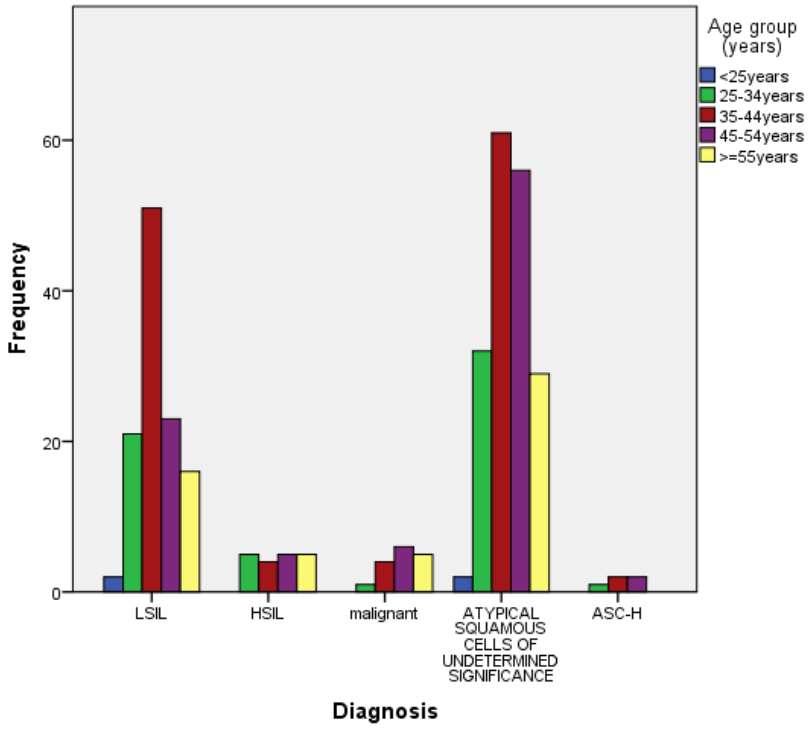

Fig 3: Distribution of diagnosis vs. age group

Discussion

In this study, the mean age of participants for the different years was 40.6± 9.5years to 44.1±10.0years. This showed that mostly women in their late reproductive years present for cervical cancer screening in our Center. Unfortunately, only 21.8% of the study population were below 35yrs, implying a gross under-utilization of Pap smear screening among the young reproductive age group. There is need for increased awareness of benefits of early detection of cervical premalignant stage through Pap smear.

Majority 4484 (86.0%) of the smears were negative (Negative for intraepithelial lesion or malignancy). Prevalence of abnormal epithelial cells were found to be 6.4% (CI 5.7% - 7.0%). This is similar to a study carried out in Sokoto where 6.8% (39/577) of the cytology results were positive for intraepithelial lesions[7]. In studies done in Kuwait and India, the rate of epithelial cells abnormalities were 4.43%, 3.22% and 5.46% respectively.[11,12,13] However, while the Kuwait study used both convention PAP smear and thin Prep (Liquid based cytology), in India studies, only conventional Pap smear was used. Studies have shown that liquid based cytology (LBC) reduces the rate of unsatisfactory smear when compare with conventional Pap smear however, its superiority over conventional Pap smear in detection of premalignant and malignant cervical tumour is still controversial.[13,14,15,16,17,18] In our study, conventional Pap smear was used as in most developing countries.

In the present report, ASCUS accounted for the highest among the abnormal epithelial cells. This is similar to other reports[11, 12]. In one report from Saudi Arabia, the most common abnormality presenting in all age groups was ASCUS (65%), followed by LSIL (20%) [19]. In our report, however, follow up information was lacking.

Despite the decline in the number of smears in the last 4 year, there was a steady increase in the number of LSIL from 3.6% to 17.9% ($p<0.0001$). This is similar to a report from Norway in which patterns in the incidence of CIN2, CIN3 and AIS was analyzed by age and histology during the period 1992–2016. That report showed an increasing trend in the incidence of all precancerous lesions in most age groups[20]. A similar increase in precancerous lesions were also reported in Denmark[21].

Changing sexual practice is exposing more young girls to HPV infection which is a known causative agent of cervical cancer[1, 22]. Age at first sexual intercourse has decreased, while number of lifetime sexual partners has increased, leading to higher exposure to sexually transmitted infections, including HPV[20, 23]. Furthermore, a report from sub-Saharan Africa has shown that cervical cancer trends are on the rise in the past two decades because of HIV, resulting in an increase in cervical cancer cases among young women[24]. The urgent need for HPV vaccine cannot be overemphasized. Despite the high prevalence of cervical cancer in Nigeria, there is neither an organized national HPV vaccine immunization programme nor government subsidized cost intervention to provide for primary prevention of the disease. There is need for urgent intervention in low income countries like ours where HPV vaccine is expensive. There's reported marked reduction in the incidence of precancerous lesion in areas with efficient screening programme and good vaccination coverage. Studies in the United States have shown marked reduction in the incidence of precancerous lesions[25, 26, 27]. However, in a report from Kuwait, the distribution of epithelial cells abnormalities (ECAs) in 140,404 cervical cytology smears analyzed over a 21-year period did not show any significant change in LSIL, HSIL or carcinoma cases[11].

The mean age of women with malignant smear over the 10-year study period was 51.2± 10.0years compared to 42.4± 10.7 and 46.4± 13.4years for LSIL and HSIL respectively. In reports from India, the incidence of cervical cancer was noticed to significantly rise around the age of 45 years and peaks at 55 years of age[12, 13]. In Ethiopia, women aged 40–49 years had 2.4-fold higher odds of precancerous lesions compared to those aged 30–39 (Adjusted Odds Ratio = 2.4, 95% Confidence Interval: 1.27–4.54)[28]. However, in a report from Norway, the highest incidence of CIN2, CIN3 and AIS was observed in the age group 25–29 years[20].

In the present report, out of the 16 malignant cases recorded, 14(87.5%) were squamous cell carcinoma and 2(12.5%) Adenocarcinoma. Squamous cell carcinoma has always been the dominant lesion in cancer of the cervix. In recent times, there are reports of increasing incidence of adenocarcinoma. This has been attributed to efficient cervical screening. In a report from Denmark, the incidence of SCC was reported to have decreased significantly, especially in women aged ≥45 years [EAPC: −3.1 % (95 % CI −4.3 to −2.5)] due to efficient Danish screening program. Whereas the incidence of adenocarcinoma increased significantly, from 2.4 to 3.1/100,000 primarily due to increases in women aged ≤44 years[21]. In low income countries like ours where there is almost no organized screening program, the predominant lesion is still Squamous cell carcinoma.

Some potential limitations of this study should be considered. The study is a one-center study. There is need for a well-organized nation-wide study on the trends of epithelial cell abnormalities on Pap smear. Also, the management and outcome of the patients with abnormal epithelial cells were not included in the study. Documentation on patient's follow-up is very important. Thus, the need for proper training of staff on data management cannot be overemphasized.

Conclusion

Given the increasing rate of LSIL in this setting and late commencement of cervical screening among our women, there is an urgent need to increase the awareness of the benefits of early detection of cervical cancer using pap smear. There is also need for a well-organized cervical screening program supplemented by larger

national studies on the pattern of cervical abnormalities in this country.

Author Contributions

All the authors contributed to the conception and design of the study, literature review, collection, analysis and interpretation of data and revising the manuscript. All authors approved the final manuscript.

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Conflicts of interest

The authors have no conflict of interest

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DETERMINANTS OF MATERNAL DEATHS IN THE EASTERN REGION OF GHANA, 2011 – 2016

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Abstract

Introduction: An estimated 99% of largely preventable maternal deaths occur across developing regions characterized by a cascade of well-established delays at all levels. Data on community deaths remains scanty hence a wide reliance on institutional data. Target 3.1 of the SDG aims to attain a global reduction of less than 70/100000 live births by 2030. Ghana's MMR of 350/100000 live births is accounted for by commensurately high MMR across its 10 administrative regions. The MMR of the Eastern region, ranked among the top 5 by MMR, has exceeded the national average since 2011. Studies are largely cross sectional, not computing individual risk. This study aimed to (1) identify trends of institutional maternal deaths, (2) estimate magnitudes of individual risk with exposure to specific factors and (3) recommend preventive strategies.

Methodology: Records on 479 maternal deaths were compared with 616 records on obstetric clients over the same period that did not die from 2011 - 2016 using an unmatched case control study design. Data were analyzed with epi info 3.5.4.

Results: Maternal deaths were mainly direct. Controls were largely urban residents, with traceable addresses, engaged in formal occupations, of higher educational backgrounds and ANC attendants. Leading cause of death was obstetric hemorrhage. Most abortions, mainly cases, were unsafe. Mean maternal age was higher for cases. Maternal age of 11 - 20 and ≥ 35, rural residence, underlying medical conditions, informal occupations, multi- and grand multiparity increased risk of maternal deaths, while, ≥ SHS education and ANC ≥ 4 reduced risk of death.

Recommendations: Health policies to address concerns of fertility control for adolescents and clients ≥ 35, inequitable access to CEmONC services, quality ANC, low literacy and awareness on the abortion law should be prioritized.

Key Words: *Maternal mortality, maternal death, Case Control, Causes*

Introduction

Maternal death, defined (by WHO and ICD-10) as death of a woman while pregnant or within 42 days after termination of pregnancy irrespective of the site or duration of the pregnancy from causes related to or aggravated by the pregnancy or its management but not from accidental or incidental causes[1], is a sensitive index of the strength of Health Service Delivery and socioeconomic development of state[2]. They are subdivided into *direct* (from obstetric complications of the pregnant state, interventions, omissions, incorrect treatment and/or from a chain of events resulting from any of the above) and *indirect* (from previously existing morbidity, or morbidity developing during pregnancy, not attributed to direct obstetric causes but aggravated by physiologic effects of pregnancy)[2]. MMR is of immense public health importance and comprises a key maternal health performance indicator[3] *with the largest disparities between developed and developing countries*[4]. An estimated 99% occur in developing regions of the world where an estimated 98% are deemed preventable[5]; Southern Asia and Sub-Saharan African countries account for an estimated 85% of the global burden[3]. Increased access to family planning (FP), skilled birth attendance and **Emergency Obstetric Care (EOC)** have contributed to global reductions from 380 in 1990 to 210 per 100,000 live births in 2013[3]. Categorized causative factors include socio-economic, socio-cultural, socio-demographic and medical explanatory factors[6].

While accurate estimates remain difficult due to data paucity in varying proportions[7], data on institutional deaths remains the only readily available data source. Ghana is globally ranked 32nd with an estimated MMR of 350/100000 live births[8]. MMR in Eastern Region has exceeded the national average since 2011. Studies in Ghana have largely been cross sectional while studies to estimation individual risk of maternal death with exposure to specific risk factors (to advance causality consistently with Sir Austin Bradford Hills's criteria) remains scarce. This study aimed to (1) identify trends of institutional maternal deaths, (2) estimate magnitudes of individual risk with exposure specific factors and (3) make recommendations for prevention.

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Materials and Methods

The study was completed through a record review of all institutional maternal deaths in the Eastern Region from 2011 – 2016. Cases comprised institutional maternal deaths 2011 - 2016 selected through non-

probability sampling. A total 479 deaths were selected from 526 records through non-probability sampling. Deaths that occurred on the way to health facilities were excluded. Referred cases whose demise occurred prior to arrival to the referral health facility were included (i.e. deemed cases of the referral facilities). Controls were patients who sought obstetric services from the same health facilities (where cases occurred) but did not die. They were traced through admission and discharge registers on maternity wards and further traced through the health records units for retrieval of their folders for data abstraction. Two patients who sought obstetric care and were managed as inpatients on the day of the demise of cases were selected as controls if their folders could be traced and retrieved; one control was selected if other folders could not be traced. A total 616 controls were included as controls. Causes of death were classified in accordance with coding guidelines of ICD-10 MM for deaths during pregnancy, childbirth and the puerperium. Data were analyzed with Epi info 3.5.4.

Results

An estimated 71.5% of the maternal deaths were direct. Mean maternal age of cases was higher and showed a higher variance than controls. See table 1.

Table 1. Maternal Age Characteristics of Cases and Controls

Characteristic	Cases	Control
Mean Maternal Age	29.43	27.6
Median	29.5	27
Standard Deviation	7.2296	4.3606
Variance	52.2673	19.0147

Controls were largely urban residents with traceable addresses, engaged in formal occupations and had partners/spouses also engaged in formal occupation types. See table 2.

Table 2. Residence, Address Traceability and Occupations of Cases and Controls

Characteristic	Cases	Control
	N (%)	N (%)
Area of Residence		
Urban	165 (42.9)	190 (66.4)
Rural	220 (57.1)	96 (33.6)
Address Traceability		
Traceable	283 (60.3)	243 (82.7)
Not Traceable	186 (39.7)	48 (17.3)
Clients' Occupation Types		
Formal	27 (6.4)	30 (12.7)
Informal	394 (93.6)	207 (87.3)
Partners' Occupation Types		
Formal	16 (9.4)	34 (14.2)
Informal	154 (90.6)	205 (85.8)

Comparatively more maternal deaths occurred among clients with no prior exposure to formal education, primary and Junior High School (JHS) educational backgrounds. See table 3.0.

Table 3. Educational Backgrounds for Cases and Controls

Highest Education Attained	Cases	Control
	N (%)	N (%)
Nil	92 (20.77)	6 (2.4)
Primary	93 (20.9)	12 (4.7)
JHS	208 (46.7)	166 (65.6)
SHS	31 (7)	38 (15)
Tertiary	21 (4.7)	31 (12.3)

More controls than cases had had normal vaginal deliveries i.e. 73.1% and 30.6% respectively. An estimated 31.7% of cases delivered by cesarean section (CS) compared with 22.2% of controls who delivered by CS. While 10.4% of cases had abortive pregnancy outcomes, about 4.7% abortions were observed among controls. An estimated 27.2% of cases however died without expulsion of the conceptus i.e. died with *conceptus in utero*.

More maternal deaths were marginally observed to have occurred before 07:00 GMT and/or after 18:00 GMT. See fig. 1.

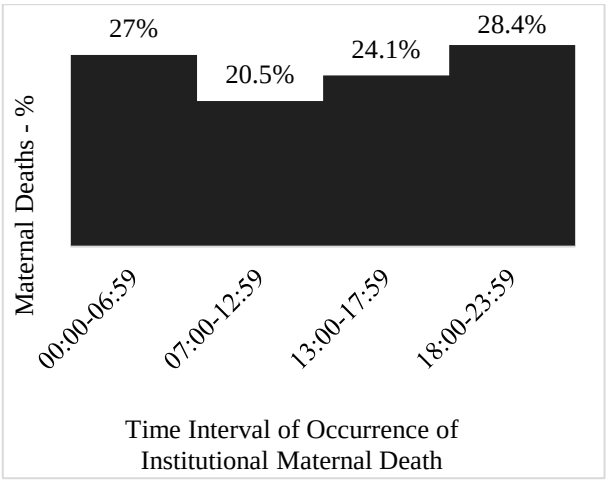

Fig. 1. General Times of Occurrence of Maternal Deaths in the Eastern Region

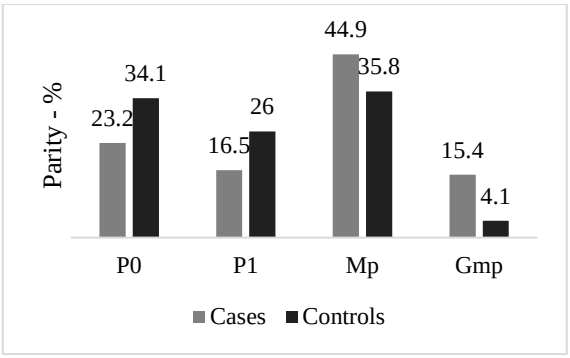

Fig. 1. Parity Patterns of Cases and Controls
P0 – nulliparous, P1 – uniparous, Mp – multiparity, Gmp – grand multiparity

Mean gravidity was comparatively higher for cases; more deaths were observed among multiparous and grand multiparous women. See fig. 2.

Unsafe abortions among cases accounted for 50% of adverse pregnancy outcomes for clients 11 – 15 years, 41.2% of clients 16 – 20 years and 100% of patients 41 – 49 years before 28 completed weeks of gestation.

Bivariate analyses suggested that clients aged 11 – 15 years had a marginally increased risk of maternal death; the 95% CI was significant towards the null. Risk of maternal death significantly increased for females 16 – 20 years while clients 21 – 35 years had significantly reduced risk of all-cause maternal death. See table 4.0.

Urban residents, who largely had traceable addresses and clients of formal occupation types had significantly reduced risk of maternal deaths. See table 5. Patients with no exposure to formal education and patients of primary school educational background had

Table 4. Risk of Maternal Death Analysed by Maternal Ages of Cases and Controls

Maternal Age Group	Cases (N=479) N (Col %)	Controls (N=616) N (Col %)	OR (95% CI)	P-value
11 – 15				
Yes	8 (80)	2 (20)	5.2 (1.1 – 24.8)	0.02
No	468 (43.3)	614 (56.7)		
16 – 20			2.3 (1.4 – 3.7)	
Yes	49 (62.8)	29 (37.2)		0.0005
No	427 (42.1)	587 (57.9)		
21-25				
Yes	98 (35.9)	175 (64.1)	0.6 (0.4 – 0.8)	0.004
No	378 (46.2)	441 (53.8)		
26-30				
Yes	115 (32.5)	239 (67.5)	0.5 (0.3 – 0.6)	0.0001
No	266 (54.3)	224 (45.7)		
31-35				
Yes	95 (38.3)	153 (61.7)	0.7 (0.5 – 0.9)	0.07
No	318 (45.1)	463 (54.9)		
36-40				
Yes	87 (86.1)	14 (13.9)	9.6 (5.3 – 17.7)	0.0001
No	389 (39.3)	602 (60.7)		
41-45				
Yes	3 (75)	1 (25)	9.4 (2.1 - 31)	0.0002
No	473 (43.5)	615 (56.5)		

Table 5. Risk of Maternal Death Analyzed by Area of Residence, Address Traceability, Marital Status and Occupations

Variable	Cases (N=479) N (Col %)	Controls (N=616) N (Col %)	OR (95% CI)	P-value
Area of Residence				
Urban	165 (42.9)	190 (66.4)	0.4 (0.3 – 0.5)	0.00001
Rural	220 (57.1)	96 (33.6)		
Patient's Occupation				
Formal	27 (6.4)	30 (12.7)	0.5 (0.3 – 0.8)	0.001
Informal	394 (93.6)	207 (87.3)		
Partner's Occupation				
Formal	16 (9.4)	34 (14.2)	0.6 (0.3 – 1.2)	0.2
Informal	154 (90.6)	205 (85.8)		
Marital Status				
Single/unclear	100 (71.9)	39 (28.1)	1.6 (1.09 – 2.4)	0.02
Married/Cohab.	371 (61)	237 (39)		

significantly increased risk of maternal death. Risk of maternal death however reduced significantly with exposure to JHS, SHS and Tertiary educational backgrounds. See table 6.0. ANC attendance, irrespective of number of attendances, marginally reduced risk of maternal death. ANC of ≥ 4 attendances however significantly reduced risk of death. See table 7.0 below. Multiparity and grand multiparty status increased the risk of maternal death. See table 8.0.

Table 6: Risk of Maternal Deaths by Clients' Highest Education Attained

Highest Education Attained	Cases (N=479) N (Col %)	Controls (N=616) N (Col %)	OR (95% CI)	P-value
Nil				
Yes	92 (88.5)	12 (11.5)	5.3 (2.8 - 10)	0.0000001
No	353 (57.2)	264 (42.8)		
Primary				
Yes	93 (76.2)	29 (23.8)	2.2 (1.4 – 3.5)	0.0004
No	352 (58.8)	247 (41.2)		
JHS				
Yes	208 (55.6)	166 (44.4)	0.5 (0.4 – 0.7)	0.0006
No	237 (68.3)	110 (31.7)		
SHS				
Yes	31 (44.9)	38 (55.1)	0.4 (0.2 – 0.7)	0.0003
No	414 (63.5)	238 (36.5)		
Tertiary				
Yes	21 (40.4)	31 (59.6)	0.3 (0.2 – 0.6)	0.001
No	424 (63.4)	245 (36.6)		

Table 7: Risk of Maternal Deaths by Antenatal Clinic Attendance Status

ANC Status	Cases (N=479) N (Col %)	Controls (N=616) N (Col %)	OR (95% CI)	P-value
ANC Status				
Yes	362 (58.9)	253 (41.1)	0.2 (0.11 – 0.3)	0.002
No	92 (87.6)	13 (12.4)		
ANC ≥ 4				
Yes	211 (48.3)	226 (51.7)	0.13 (0.07 – 0.2)	0.0000001
No	134 (87.6)	19 (12.4)		

Table 8: Risk of Maternal Deaths by Patients' Parity

Parity	Cases (N=479) N (Col %)	Controls (N=616) N (Col %)	OR (95% CI)	P-value
Para 0				
Yes	107 (56)	84 (44)	0.5 (0.4 – 0.8)	0.002
No	354 (68.6)	162 (31.4)		
Para 1				
Yes	76 (54.3)	64 (45.7)	0.5 (0.3 – 0.8)	0.003
No	385 (67.9)	182 (32.1)		
Multip.				
Yes	207 (70.2)	88 (29.8)	1.4 (1.06 – 2.0)	0.02
No	254 (61.7)	158 (38.3)		
G - Multip.				
Yes	71 (87.7)	10 (12.3)	4.2 (2.1 – 8.4)	0.00001
No	390 (62.3)	236 (37.7)		

Emergency caesarean sections increased the risk of maternal death, OR - 3.4 (95% CI = 2.5 - 4.6), while elective caesarean sections were associated with significantly reduced risk of death, OR - 0.25 (95% CI = 0.12 - 0.5). All underlying medical conditions or pre-existing history of other illnesses i.e. medical explanatory factors documented in audit forms as causes of death were associated with significantly increased risk of maternal deaths. They included the following: malaria OR - 4 (95% CI = 1.6 - 10), anaemia OR – 3.9 (95% CI = 2.3 -4.3), HPT disease of pregnancy OR - 5 (95% CI = 3.3 - 7.4), PPH - SCD OR - 35 (95% CI = 4.8 - 257), unsafe abortion OR - 2 (95% CI = 1.4 - 4.7), sepsis OR - 24 (95% CI = 9 - 60), HIV/AIDS OR - 3 (95% CI = 1.6 - 7.1), APH OR - 4 (95% CI = 1.5 - 11), IUFD OR - 13 (95% CI = 4 - 44), gestational diabetes OR - 5 (95% CI = 1.1 - 24) and ectopic gestation OR – 0.8 (95% CI = 0.3 – 1.9).

Discussion

Maternal death, a largely preventable statistically rare health outcome, [9, 10] continues to occur despite several preventive interventions[11, 12, and 13]. Institutional maternal deaths were largely direct, consistent with findings of extant evidence base on Sub Saharan Africa and Southern Asia [9, 10, 11, 12, 14, 15, 16, 17 and 18]. Mean maternal age was higher of cases and had wider SD. Clients of 11 - 20 and 36 - 49 years had a significantly increased risk of death during pregnancy consistent with findings of existence evidence base[19, 20]. Few studies however make contrary statements concluding that risk of adolescence is exaggerated though focus on reducing adolescent pregnancy (central to promotion of women's social, educational and economic development)[21] should to be maintained. Available evidence link established associations between rural residence and increased risk of deaths to adverse socio-cultural factors, poor access to quality ANC, poor referral systems and inadequate staff capacity for early problem detection and intervention.[22] A formal occupation for clients and their partners predicted favourable pregnancy outcomes for both mother and baby; this was interpreted as a remote indicator of the importance of individual socio-economic status for maternal health.[22] WHO indicates that majority of maternal deaths occur in low-resource settings[22]. Links between higher education and better health outcomes are established in extant evidence. Increasing education commensurately reduced the risk of maternal deaths, consistent with current evidence that the right to health is interdependently enhanced by the right to education.[23] Observation of higher proportions of CS among cases needs to be interpreted within the context of obstetric complications that necessitated them (and their severity thereof) to prevent categorization of CS as an independent death causal factor. Most maternal deaths occurred in advanced pregnancy consistent with findings of the Ghana maternal health survey, 2007[19].

Though the use of institutional data may have skewed maternal death occurrence towards late pregnancy, the Ghana Maternal Health Survey indicates most maternal deaths occur shortly before labour, during labour and within the first 24 hours after delivery.[19]More deaths occurred in the evening and at dawn.

ANC of ≥4 visits improved maternal survival despite few contrary findings suggesting certain urban areas with high ANC and skilled delivery have high mortality ratios.[6] Geographical location of ANC services however has direct impact on patronage of any particular service.[6] ANC helps prevent mortality through prevention, identification and management of maternal morbidity.[24]Mean gravidity and parity were generally higher for cases and risk of maternal death increased commensurately with increasing parity. Risk of gravidity and parity needs to be interpreted carefully as they may not be independent risk factors. Records on gravidity and parity remained inaccurate in the available documentation - ANC booklets displayed inconsistent information on gravidity and parity for the same patients. Health worker knowledge on gravidity and parity should be prioritize for research. Obstetric haemorrhage remains the leading cause of maternal deaths across other developing countries[19]. HPT disorders of pregnancy are second in this series. Abortions, observed mainly among cases, were largely unsafe and mainly occurred among adolescents and clients of advanced maternal age contrary to findings of Ghana Maternal Health Survey[19]. Induced abortion evokes passion and controversy bordering on religion, culture, ethics and morality[13] and is largely frowned upon in some cultural and religious contexts therefore being resorted to clandestinely.[13] Only 4% of women in Ghana think that abortion is legal.[19] The 1985 amendment of Ghana's 1960 criminal code allowed abortion for rape, incest, defilement of the female idiot," where there is high risk that the child would suffer serious deformity and if the pregnancy threatens the woman's physical or mental health.[19].

Conclusion

An estimated 71.5% of the maternal deaths were direct. Mean age of cases was higher than controls. Risk of maternal death was higher for adolescents and clients of advanced maternal age than clients of other age categories. Urban residence, formal occupations, marriage/cohabitation with partners of formal occupations, ANC of ≥ 4 visits and education of ≥ SHS background significantly reduced risk of death during pregnancy or delivery. Abortions mainly occurred among cases; majority were consistent with unsafe abortion procedures. Comparatively more maternal deaths occurred between 06:59 GMT and after 18:00 GMT. Multiparity and grand multiparity increased risk of maternal death. Obstetric haemorrhage was the leading cause of maternal death while second and third in this series were HPT disorders of pregnancy and pregnancies with abortive outcomes.

Recommendations

Health policies aimed at increasing FP and sex education targeting sexually active adolescents coupled with intensified campaigns for adolescent sexual abstinence should be prioritized. Clients of advanced maternal age should be a priority group for long term FP methods towards prevention of unwanted, unplanned and mistimed pregnancies. ANC services in Ghana are accessible at community clinics (CHPS) with midwives, health centres and district hospitals. *B- & CEmONC* services needed to avert mortality are however only available at district hospitals and few polyclinics. Health policy should therefore aim to eliminate all inequalities in access to *B- & CEmONC* services for rural and urban residents. The National Health Insurance Scheme was rolled out to universally eliminate financial barriers to health care. Findings indicating reduced risk of death with formal occupation point to existence of socio-economic barriers other than what NHIA aimed to eliminate; this should be a research priority. The impact of the free SHS educational Policy, 2017 (aimed to universally eliminate all financial barriers to SHS education) on maternal health should be a research priority after 3 - 4 years of its implementation as education reduced risk of death in this study. Despite their statistically insignificant associations, findings descriptively suggesting marginally more deaths occurred after 18:00 GMT and before 06:00 GMT should be further hypothesized and tested as the statistically insignificant associations do not confer on us the liberty to ignore what descriptive analyses suggest. Factors inhibiting ≥ 4 ANC visits should be investigated and ameliorated within program frameworks. Efforts to increase proportions of women currently using FP methods should intensified – Ghana has FP coverage of 21%. Capacities of peripheral health facilities, largely serving rural residents, to avert mortality through *B- and CEmONC* services should be reviewed and enhanced.

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SPORTS INJURIES IN SECOND-CYCLE INSTITUTIONS: THE BURDEN ON, AND RISK FACTORS ASSOCIATED WITH STUDENT HEALTH

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Abstract

***Introduction*:** Adolescent engagement in sport and other recreational activities has been increasingly embraced worldwide due to its benefits. Notwithstanding, it also remains one of the major contributors to injury burden translating into half of the global injury rate. Yet not much is known about the prevalence of sports-related injuries and the associated risk factors among second-cycle institution athletes in Ghana. This study sought to estimate prevalence and identify the risk factors associated with sport injuries among athletes in Second-cycle institutions in the Kumasi Metropolitan area.

Method: A cross-sectional design was carried out with 600 athletes from 16 out of the 24 public schools in the Kumasi metropolis through a two-stage cluster sampling. A smartphone interviewer-administered questionnaire was used to collect data from the athletes. Data were summarized in tables and figures. Bivariate and multivariate logistic regression were performed to identify independent predictors of injury. Data were analyzed with STATA version 14.0.

Result: The overall injury prevalence estimated was thirty-eight percent. Dislocations and sprains (46.7%) and closed wounds (1.5%) were the common and least injury types recorded. Likewise, ankle and elbow were the most and least body region to be affected respectively. Individual factors such as nature of sports and years of playing experience were the identified predictors of adolescent injuries.

***Conclusion*:** Adolescent sports injury prevalence is high in Kumasi metropolis among second-cycle institution. Dislocation and sprains were the most common injuries. These were mostly associated with contact sports.

Key Words: *Prevalence, Injury, Senior high school, Athletes, Sportsmen*

Introduction

The importance and benefits of participation in sports and other physical activities are well known and documented globally. Both youth and adult participation in sports is widespread due to the physical, psychological and social importance attached to the field[1–3]. Participating in sports regularly is associated with the reduction of an individual's risk to certain health conditions, and it improves cardiovascular functions[4] and their overall quality of life[5]. The individual's body is strengthened through the uptake of various sporting activities while improving stamina, mental well-being, and self-esteem[6,7]. Moreover, frequent engagement in rigorous sports like running and football tends to improve metabolic fitness, muscular performance, postural balance, cardiac function and bone mineral density, making it critical for everyone [8,9]. Whereas physical inactivity is associated with obesity and other coronary-related morbidities[10].

The promotion of children and adolescent participation in sporting activities is becoming common worldwide, especially in the develop world. This is due to the belief that early involvement in sports enhances the individual success in the field. This factor which accounts for early engagement by majority of children before they reach puberty age. These children in some cases train up to twenty hours a week in their field of play in order to qualify for selection[11,12].

Despite the numerous benefits of active engagement in sporting activities, individual participants are at the peril of morbidity and bear the risk of injuries[11]. The physiological and physical growth processes of young people make them more susceptible to injuries. For instance Maffulli & Caine (2005) reported that nonlinearity of growth, limited thermoregulatory capacity and maturity associated

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variation are the unique risk susceptibility factors associate with injury in young athletes who are usually focused on high performance.

Sporting events in schools in Ghana are encouraged for the known benefits previously mentioned. However, it is usually popular in second-cycle institutions because it is at this stage that most young athletes are identified, groomed and absorbed into the various national teams. High achievers and performers are those who usually earn places in these teams. Supervisors are therefore compelled to increase the intensity and seriousness attached to the rigorous training and grooming among the players, especially those in the second-cycle institutions[13]. The individual's participation in regular sporting activity whether for recreation or competition increases susceptibility to injuries irrespective of age. These sportsmen throughout childhood to youthful ages experience greater amount of injuries such as soft tissue, bone, ligament and nerve injury usually due to repetitive stress and direct trauma associated with rigorous training[14–16].

Aside the pain and trauma to the individual, the society is also burdened with potential loss of talents, cost of treatment, rehabilitation, lost productivity, time and injury related disability, either temporal or permanent[17-18]. Recent data suggest that adolescent sports injuries are high and constitute a public health burden among nations. Sport and recreational-related injuries constitute 19% to 59% of all global injuries sustained by adolescent within the ages 11 to 15[20].

The magnitude of this burden in adolescent sports is alarming, which requires urgent attention and answers. Indeed, coming out with an investigation into the risk of injury among sportsmen, would be of great value to sports administration in second cycle institutions in Ghana. Availability of such information would not only be valuable to sports managers, but also to parents, supervisors, clinicians and the athletes themselves in their decision to participation and self-protection in their chosen field of play. The foregoing rationale underscores the need for a study to estimate the injury burden and identify the kind of injuries occurring to sports men and women in second cycle institutions.

Methods

Study Design

A cross-sectional study was conducted among second-cycle institution within the Kumasi metropolis from March, 2018 to July 2018. Quantitative techniques were used to solicit for information on sport injuries. Ashanti region has about 94 public and 24 private second-cycle institutions. The study was restricted to schools in the regional capital, Kumasi. Some of the public schools are mixed (boys and girls) whiles others are only single gender. The private schools are mainly mixed schools.

Study Population

The study population consisted of active sportsmen in second-cycle institutions. The study included sporting activities such as football, volleyball, athletics, basketball, badminton and hockey. Information was gathered retrospectively on all sporting activities and injuries attributed to them within the study period. A sports injury was operationalized as any physical damage caused by an accident during sports activities in the school, both organized and non-organized.

Inclusion Criteria

Those recruited were active athletes who had participated in a school sporting event, have consistently trained with any of the school team and considered to be a member of at least one team. Both sports organized by either the school or Ghana Education Service were considered as well as other informal sporting events.

Exclusion Criteria

Students who were not considered to have participate in any sports were excluded from the study.

Sampling procedure and sample size

The study adopted a multi-stage cluster sampling technique. In the first phase, a sampling frame of all eligible schools that had participate regularly in the second-cycle inter-school sports festival or had participated at least twice in the last two years was created. Simple random sampling was used to select 16 out of the 24 public second-cycle institutions in the Kumasi metropolis for the study. In the second phase, a comprehensive list of sports girls and boys was obtained from the school sports masters. The students were assigned unique numbers and excel random generator was used to select respondents for interviewing. Simple random sampling was employed to select participants for interviewing. With prevalence of 0.16, margin of error 0.037 and design effect of 1.5, an estimated sample size of 600 was used for the study.

Data collection

A structured questionnaire was designed to measure the burden of injury among Second-cycle Sportsmen. The questionnaire was program and uploaded into a mobile phone using the Open data kit (ODK) software designed for Android operating system (OS). Each trained research assistant (RA) was provided with a basic smartphone with good functionality in Android OS (version 7.1). The smartphone was uploaded with the questionnaire template and used to capture the information from respondents. Information collected was saved on the phone once the interview was complete and later submitted to the server. The ODK was password-protected for data safety and confidentiality.

Pre-testing

The questionnaire was piloted in Ghana my Secondary School which shares similar characteristics with schools that participated in the actual study. This was done to ensure the validity and reliability of the data collection instruments.

Ethics Approval

Ethical approval for the study was sought from the Kwame Nkrumah University of Science and Technology and the Komfo Anokye Teaching Hospital Committee of Human Research Publication Ethics (CHRPE). Administrative approval was also obtained from Ghana Education Service (GES). Each participant signed a written informed consent, after the RA had explained the purpose of the study before proceeding with interviewed. Confidentiality of their identity was assured and respondents were free to withdraw from the study or refuse to answer any questions they so deemed. Personal identity characteristics such as names were not collected.

Data management

Data were captured electronically using a mobile phone with an open data kit (ODK) software uploaded with questionnaire template. Data collected was submitted to ONA server and downloaded into a personal desktop computer as excel csv format with access to the investigators only. The data were checked daily for completeness and consistency using pre-determine program. Errors were checked daily as the data were being downloaded from the server. The data on the cloud server were deleted after the completion of data collection.

Statistical analysis

Data cleaning and analysis were performed using STATA version 14.0 statistical software. Categorical variable and continuous variable were summarized using proportion and means, respectively.

Univariate and multivariable logistic regression were performed to determine independent risk factors for sustaining an injury among athletes in second-cycle institutions. The multivariable logistic regression model incorporated variables that were independently significant in the univariate analysis ($p \leq 0.05$) as well as variables that were considered to be important or potentially confounding. The non-significant but important characteristics were controlled for in the backward regression model. The fit of the model was assessed using the log maximum likelihood test, significance level of 0.05 was considered with a 95% confidence interval.

Results

The mean age of the athletes sampled was 17.21±1.3 years, with a range of 14-20 years. More than half (62.8%) of the respondents were male and a little over seventy percent (70.5%) attended mixed schools. Half of the students (50.2%) had been actively engaged in sporting activity for two years or more (Table 1). About 37.9% of the athletes were footballers while badminton (4.9%) was the least participated sport.

About 41.2% of the students in the injured group were aged between 14-16 years, while the least were in age 14-16 years. Similarly, male students (39.9%) and mixed schools (40.6%) constituted greater part of the injured population (Table 1).

More than half of the athletes playing handball (53.3%) and hockey (60.0%) were in the injury group, while fewer badminton players (20.0%) also experienced injuries.

The prevalence and types of sports injuries

More than thirty-eight percent 195 (38.5%) of the athletes had experienced at least an injury in the last 12 months prior to the study. Dislocation and sprains (46.6%) were the most experienced injury among the athletes sampled for the study. Closed wound and fracture were the least reported injury. A little over twenty-eight percent of the athletes suffered superficial injuries and there were twelve percent of unspecified injuries reported as well (Table 2)

The majority of the body regions affected in the injury episodes were the lower extremities, with twenty percent reporting ankle injuries, while eighteen percent also have their knees affected. The elbow (1.5%) and the waist (2.5%) were the least body regions to suffer from injuries (fig. 1). Other body regions like the head (7.1%), shoulders (10.7%) and finger (5.5%) also suffered some form of injury (*Fig 1*).

Half (50.5%) of the athletes who engaged in the contact sports had dislocation and sprains. while sixty percent experienced concussion. More than 3-in-4 of the contact sports athletes experienced superficial injuries (76.7%) while majority of them (83.3%) also had some form of fractures. The least injuries were recorded among those who engaged in non-contact sports. Twenty-nine percent suffered from other non-specified injuries (Table 3).

Treatment mechanism and outcome.

Majority of the injured athletes were treated and discharged same day (98.4%). Majority of treatment duration (83.5%) lasted less than a month. A handful (1.5%) of the injuries lasted for over three months before the athlete recovered. An average of a week (7.9 days) of student's academic life was lost. Forty-five percent of the injured athletes lost 6-14 days of academic activities in school while eleven percent of the athletes lost up to 30 days. due to injury (Table 2).

The predictors of sports injuries among athletes in second cycle institutions.

The effects of the risk factors due to injury occurrence were examined and has been summarized in Table 4.

In the univariate analysis, nature of sports and years of experience in sport were significantly associated with injury occurrences, while other factors such as age, gender and type of school were not significant. In the multivariable analysis, athletes in contact sports were at higher risk of sustaining injury [aOR=4.50; 95% CI= 2.35-8.63] compared with those in non-contact sports. Consequently, athlete with two years or more sporting experience were twice at risk of injury [aOR=2.08; 95% CI= 1.09-3.96] compared with those with lesser years of experience [aOR=0.26; 95% CI= 0.09-0.71].

Table 1: Socio demographic characteristics of student athletes

Variables		**Injuries**		
		No n=351(%)	Yes n=143(%)	Overall (%)
Age group				
	14-16	94 (68.1)	44 (31.8)	138 (27.3)
	17-19	207 (58.8)	145 (41.2)	352 (69.6)
	20+	10 (62.5)	6 (37.5)	16 (3.2)
	Mean (SD)	17.21±1.3		
Sex				
	Female	120 (63.8)	68 (36.2)	188(37. 2)
	Male	191 (60.1)	127 (39.9)	318(62.9)
School type				
	Mixed	212(59.4)	145(40.6)	357(70.6)
	Single	99 (66.4)	50 (33.6)	149(29.5)
Sporting experience (Years)				
	Less than a year	84(68.9)	38(31.2)	122 (24.1)
	1 year	86(66.2)	44(33.9)	130(25.7)
	2 years or more	141(55.5)	113(44.5)	254(50.2)
Type of sport				
	Athletics	78(61.9)	48(38.1)	126(24.9)
	Badminton	20(80.0)	5 (20.0)	25(4.9)
	Football	125(65.1)	67 (34.9)	192(37.9)
	Basketball	23(65.7)	12(34.3)	35(6.9)
	Handball	14 (46.7)	16(53.3)	30(5.9)
	Hockey	18(40.0)	27(60.0)	45(8.9)
	Volleyball	33(62.3)	20(37.7)	53(10.5)

Table 2 Injury Burden and treatment outcome among student athletes

Variable		Frequency *(n=506)*	Percentage (%)
Injury experience			
	Non-injured	311	61.5
	injured	195	38.5
Injury type			
	Concussion	15	7.7
	Fracture	6	3.1
	Superficial injury	56	28.7
	Dislocation and Sprain	91	46.7
	Closed wound	3	1.5
	Other Unspecified	24	12.3
Treatment outcome			
	Treated and discharged same day	192	98.5
	Hospitalized	3	1.5
Treatment duration			
	Less than a month	163	83.6
	1-2month	29	14.9
	Above 3 months	3	1.5
Lost school days			
	1-5days	23	43.4
	6-14 days	24	45.3
	15-30 days	6	11.3
Mean (SD)	7.90 (7.66)		

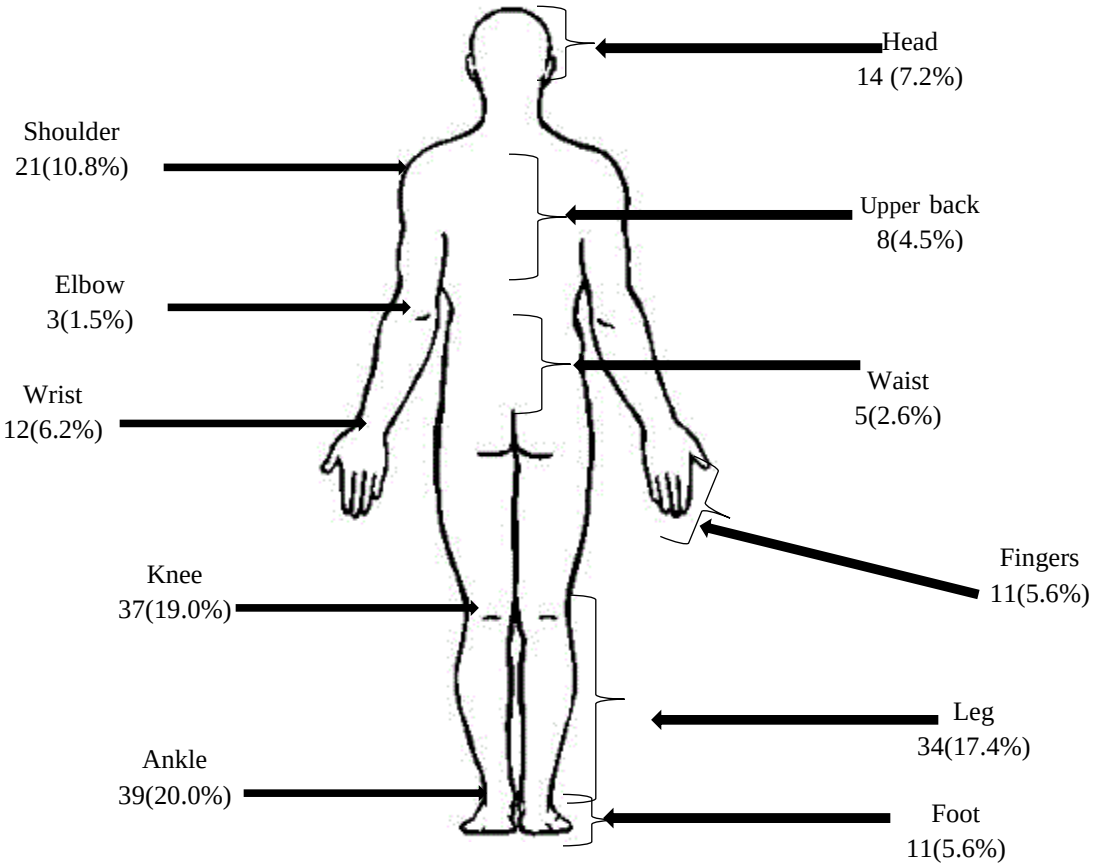

Fig 1. Body region affected by injury

Table 3: Injury burden by nature of sports of student athletes

Nature of sport	Injury Type					
	Dislocation and Sprain *n* (%)	**Concussion *n* (%)**	**Fracture *n* (%)**	**Superficial injury *n* (%)**	**Closed wounds *n* (%)**	**Unspecified Injuries *n* (%)**
ǂ **Contact sports**	46 (50.5)	9 (60.0)	5(83.3)	43(76.7)	2(66.6)	17(70.8)
ǂǂ **Non-contact**	45 (49.4)	6 (40.0)	1(16.6)	13(23.2)	1(16.6)	7(29.1)
Total	91 (100.0)	15 (100.0)	6 (100.0)	56 (100.0)	3(100.0)	24(100.0)

ǂ Football; basketball; hockey; handball

ǂǂ Athletics; volleyball; table tennis; badminton

Table 4 Univariate and multivariate analysis of risk factors for sports injuries among student athletes

	Univariate logistics regression		**Multivariate logistics regression**	
Variables	**Crude Odds ratio (OR; 95% C.I)**	**P-value**	**Adjusted Odds ratio (AOR; 95% CI)**	**P-value**
Age				
14-16	1.69(0.57-4.97)	0.34	-	-
17-19	1.77(0.58-5.40)	0.31	-	-
20+ (ref)	1			
Gender				
Female (ref)	1			
Male	1.09(0.74-1.57)	0.67	-	-
School type				
Mixed (ref)	1			
Single	1.24(0.83-1.83)	0.28	-	-
Nature of sport				
Non-contact (ref)	1			
Contact sport	4.94 (2.61, 9.34)	**0.001***	4.50(2.35-8.63)	**0.001**
Experience in discipline				
Less than a year (ref)	1			
1year	0.23(0.88-0.63)	**0.004***	0.26(0.09-0.71)	**0.009**
2 years and more	2.05(1.08-3.87)	**0.027***	2.08(1.09-3.96)	**0.026**

Discussion

There has been a growing concern about adolescent participation in active sports and their susceptibility to injury. Anecdotal evidence suggest that adolescent athletes are exposed to more health risk than older ones in their field of play[20].

This study sought to estimate injury burden among athletes in second cycle institutions and explore the risk factors of sports injuries on the health of these athletes in the Kumasi metropolis of Ghana. The study found out that more than a third of athletes (38.5%) suffered from injuries such as superficial injury, concussion, dislocation and sprains. Lower extremities were the most anatomical parts to be affected, and on average, an athlete is rendered incapacitated for a week. The major risk factors identified to affect injury were engagement in contact sports and longer years of experience in sports participation.

The burden was estimated using self-reported injury episodes among the students in their field of play either at trainings or competitions. The potential risk factors were predicted using independent variables such as student's age, gender, school type, years of sporting experience and the type of sports engaged in.

The prevalence of injury in this study appears to be higher when compared to previous estimates elsewhere[20,21]. Even though there has not been any national representative data on the extent of injury sustained by young athletes, the current prevalence equates figures reported by Pickett et al. (2005) from 32 countries[20]. Likewise, the prevalence of injury among the athletes in this study is 1.1 times higher than the incidence in Spain, Malta and USA[21,22]. The wide variation between current study and previous reports could be attributed to reasons that, rates from the present study was estimated from self-reported incidents against hospital records related injuries in other studies. The present study demonstrates a high burden of injuries among adolescent athletes. This confirms the perspective from injury experts who classify adolescent

sports as one of the leading causes of injury burden worldwide[22].

Consequently, superficial injury, concussion, dislocation and sprains were the common injuries recorded by the athletes in this study. More than a third reported dislocation and sprains as the frequently occurring conditions they face. These injury types recorded could be attributed to the nature of sporting activities mostly engaged in by these students. The individual's limbs and joints are the frequently used body parts of athletes in contact sports and are usually stressed. For instance, the percentage of dislocations and sprains were more than half for athletes who are engaged in contact sports compared to those in non-contact sports in our study. According to Powell et al, (1999)[23], the legs, knee and ankle are the most reported anatomic part of athletes to be hurt in sports like hockey, wrestling, basketball and soccer/football. Sprains and strains constitute 20% to 31% of the main injury types that affect the lower limbs and subsequently affecting the knee, thigh and ankle respectively in adolescent sports[24]. This could be due to the rigorous nature and the energy exerted in these sports.

Likewise, our study showed that the lower extremity was the body part to be affected with greater percentage of injury. The legs, which comprises of the knee, ankle and foot were mostly affected. This is an indication that these body parts are the most frequently used as recorded in similar studies in other parts of the world. Their frequent usage in sports places greater stress on them especially during the critical period they are still developing making them susceptible to injury. The affected part recorded in this study confirms earlier studies on high school sports injuries [22,24,25]. These studies reported that knee, ankle and shoulders are the commonest body sites to be injured in adolescent sports in descending order.

Despite the pain and trauma that is associated with sports injuries, the athlete is also burdened with other forms of disabilities whether temporary or permanent. Engagement in sporting activities comes with its own price. Majority of adolescent athletes are rendered incapacitated for close to a month, due to sport-related disabilities. Similarly, forty-three percent of the athletes in the current study had an injury resulting in 5 days lost time of academic work, while a little over forty-five percent lost up to 14 days. Given the nature of the academic work in high schools in Ghana, this means that an athlete may have lost valuable lesson hours. These lost times may be difficult to regain unless a special arrangement is made for them, which comes with extra cost burden. Similar trends have been reported in various studies. On average, one to four weeks of activity of the athlete's time is lost in participation and other activities during their engagements in various sports worldwide[21–26].

In the multivariate analysis, after adjusting for the effects of covariates, nature of sports and the years of sporting experience were identified as extrinsic predisposing risk factors of sports-related injury among adolescents. Most of the students played football, which is a contact type of sport. Our study revealed that athletes in contact sports had four times increased risk of injury compared with those in non-contact sports. The rate of collision, sprinting and general body contact in these types of sports are often high and increases the risk of injury. Football, basketball, hockey and handball are disciplines that require a lot of energy and force. Therefore, there is the possibility of body collisions during games. For instance, Darrow et al. (2009)[21] and Emery et al. (2005)[27] reported in sperate studies that contact with another player was the most general mechanism associated with 69.3% and 46.2% of severe injuries respectively. The current finding indicates that athletes in contact sports are at greater risk of injuries, and this requires a policy intervention.

The continuous engagement in sporting activities is meant to build athletes stamina among other things; however, findings from the present study indicate that individuals with long years in sports are twice at risk of injuries compared with those with less practicing years. Consistently playing one sport for a long period places the athlete at a greater risk of injury because the repetitive nature of the sporting event places more stress on the body parts leading to overuse injury. The risk is even higher in young bodies as they are still developing[24]. The tendency of an athlete with previous injury history developing a new one is high compared with those who have never experienced any [27]. Even though our study did not record injuries that were older than one academic year, there could be a likelihood that athletes with injury episodes may have had earlier injuries. This finding has been affirmed by sport injury experts that previous injury experience is a risk factor and exposes athletes to two-threefold greater risk of another injury[28,29].

The individual predisposing characteristics such as age and gender were not significant risk factors of sport injuries among the athletes. Contrary to our finding, it has been widely reported across majority of sports disciplines that, gender plays a lead role in injury occurrence with girls being more susceptible to injuries compared to boys[12,21,30].

Similarly, age has been cited as non-modifiable risk factor to adolescent sports injury in other studies[27,31] but it was not significant in the present study. Generally, risk is believed to be greater among older boys compared with younger persons due to their biological make up, swiftness, and ability to exert more energy on contact with object or opponent in the field of play[23,27,29,32].

Limitation

This study has some limitations regarding the scope, participants, and data collection processes. The study involved only athletes within the Kumasi metropolis, without taking the perspective of health workers and other actors. The study recruited 600 athletes from 16 senior high schools to represent the entire athletes in the metropolis. The injury episodes reported by the athletes were limited to one academic

year. Therefore, there is a tendency of recall bias as participant may not recall injuries experienced in the previous term. Despite these limitations, this is the first study to look at injuries among athletes in second-cycle institution, and which warrants further study.

Conclusion

The study estimated the injury prevalence and identified the risk factors among athletes in second-cycle schools in the Kumasi metropolis. The injury prevalence was estimated to be 38.5%. Dislocation and sprains were the most common injuries, affecting mostly the lower extremities. The nature of sport discipline and the number of years engaged in sporting activities were identified risk factors of injury among the athletes. Developing a policy aimed at checking injury protection and management in Second-cycle schools could help improve health outcomes among adolescent athletes in Senior high schools.

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CORRELATION BETWEEN COLPOSCOPIC IMPRESSION AND HISTOLOGIC DIAGNOSIS OF PREMALIGNANT LESIONS OF THE CERVIX

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Abstract

Background: Cervical cancer is the commonest cancer in sub-Saharan African with majority of the women presenting with an advanced disease stage. This is largely due to the unavailability of an established cervical cancer screening programme in most countries. This also includes the use of colposcopy which is still not available to many gynaecologists practicing in Nigeria.

Aim: To review reports of colposcopy carried out at the University of Abuja Teaching Hospital, Abuja, Nigeria and to determine the degree of concurrence between colposcopic impression and histologic diagnosis.

Methods: A retrospective analysis of the colposcopic findings of 84 patients was done. Subsequent correlation with histopathology report was carried out in 53 patients who had colposcopically directed biopsies between March 2012 and February 2014.

Results: The commonest impression made on colposcopy was high grade CIN in 40(47.6%) patients. The concurrence rate between colposcopic findings and histology diagnosis was 64.2% (34/53) {K =0.302, 95%CI= -0.010-0.436}. The concurrence rate was higher for high grade CIN 29/40(72.5%) than for low grade CIN 5/12 (41.7 %). There was an overestimation of colposcopic diagnosis in 13(24.5%) patients and an underestimation in 6(11.3%) patients. The sensitivity of colposcopy for detecting high grade lesions or more was 32/36(88.9%) while the specificity was 8/17(47.1%). False positive rate for high grade lesions was 9/17(52.9%) and false negative rates for low grade lesions was 4/36(11.1%). Positive predictive value (PPV) of high grade colposcopic diagnosis or more was 32/41(78.04%) while the negative predictive value (NPV) was 8/12(66.73%).

Conclusion: The strength of agreement between colposcopic diagnosis and cervical pathology was fair and colposcopy performs better in the detection of high grade lesions.

Key Words: *Cervical cancer, Premalignant lesions, Colposcopy, Histopathology, Nigeria*

Introduction

Cervical cancer is the second most common cause of cancer related morbidity and mortality in developing countries and this disparity has been attributed to a reduction in the incidence of invasive cancer in developed countries following implementation of

It has been established that premalignant and malignant diseases of the cervix evolve very slowly, over a significant time frame and it is for this reason that cervical cancer has been said to be preventable and curable especially when there is early detection and effective treatment of these lesions [4]. Methods for early detection of pre-invasive lesions of the cervix include the Papanicolaou (Pap) smear, HPV DNA testing, visual inspection with acetic acid (VIA) and visual inspection with Lugols's iodine (VILI). Colposcopy on the other hand is used for verification of the reports of all these screening procedures[5].

The Pap smear is usually employed in resource rich settings due to affordability of resources required and availability of expertise. The latter two which are visual screening methods require fewer resources and expertise and as such, are being advocated for use in resource poor settings[6].

As far back as the early 70's, treatment for abnormal pap smear results was a cone biopsy and specimen obtained were then examined. The histology results however revealed a significant number of false positives. This tendency for overtreatment became a source of concern especially with regard to the cost of treatment and complications associated with cone biopsy and subsequently led to a quick introduction of colposcopy as a method of screening and identifying women who have abnormal results and truly need treatment for their disease[7]. Its use has also led to the reduction in unnecessary cone biopsies as a result of its ability to delineate lesions, thereby making them more amenable to other forms of conservative therapy[8, 9, 10]. This indispensable facility unfortunately is available only in a few tertiary institutions like ours.

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The outcome of colposcopy depends on the experience of the colposcopists and this has led to scrutiny of the ability of the colposcopist to determine accurately the severity of intraepithelial lesions and even to diagnose early invasion[11, 12]. Some older studies showed a low perfect agreement between the colposcopic impression and histologic diagnosis within the range of 32% −37%, with a weighted kappa strength of agreement of only 0.20-0.26 while the agreement within one grade was reported to be only 75% −77% [10, 13]. Reports of more recent studies however have shown some improvement with perfect agreement rates of 57-65% and agreement within one grade being reported to be as high as 94-98%[14, 15, 16]. These differences in reported rates of agreement by various studies has made the subject of optimization of accuracy of colposcopy and biopsy specimen in the detection of premalignant lesions one of the leading concerns in the entire cervical screening process. One of the efforts made in achieving this is the development and publication of a new system of terminology by the International Federation for Cervical Pathology and Colposcopy (IFCPC) in 2011[17]. Adoption of this system by most researchers is likely to go a long way in providing uniformity in reporting colposcopy findings and by so doing, provide justification for comparison of results.

In addition to unavailability of equipment, other challenges encountered in the management of women with cervical pathology in low resource settings like ours border on ignorance, accessibility and cost. A study done in southeastern Nigeria reported a high rate of refusal of colposcopy and with only few institutions in Nigeria offering colposcopic services, many women having to travel long distances to access this service[18]. This and also their inability to meet the expenses subsequently leads to a high rate of loss of patient to follow up. There is therefore an urgent need to educate the women on the importance of colposcopy and the need to make the service more accessible and more affordable.

Conservative surgical management of cervical intraepithelial neoplasia include excisional or ablative procedures. Excisional procedures comprise of laser conization, cold-knife conization, and electrosurgical loop excision (Loop Electrosurgical Excision Procedure). The excisional method is preferred since its allows for histological diagnosis and provides treatment at the first visit. Cure rates of more than 90% have been recorded after one treatment[2, 19]. Consequently, the "see and treat" approach in which loop excision is performed at initial colposcopy is an acceptable option for high-risk, adult patients who present with high-grade cytology and corresponding colposcopic abnormalities. A prospective study using this approach found that 84 percent of patients had cervical intraepithelial lesion (CIN) 2 or 3 within the excisional biopsy specimen[19].

Due to availability of the colposcope in the University of Abuja Teaching Hospital (UATH), Abuja, Nigeria, this study set out to review reports of colposcopy, determine the degree of concurrence between colposcopic impression and histologic diagnosis and evaluate the positive predictive value (PPV) and the negative predictive value (NPV) of the high grade lesions on colposcopy.

Methodology

Study design

A two-year retrospective study of patients seen in the colposcopy clinic of the University of Abuja Teaching hospital (UATH), Abuja between 1st March 2012 to 28th Feb 2014. The list was obtained from the register in the colposcopy clinic and subsequently used to retrieve the patient's folders so as to obtain relevant information. Data obtained with the aid of a structured proformas include: age, parity, indications for colposcopy/pap smear reports, colposcopy reports, histology reports of biopsy specimen and treatment offered.

Study Area/ Protocol

Colposcopy in UATH is performed every Monday and Wednesday by two consultant gynaecologists trained to perform colposcopy. It is done on an out-patient basis, following the standard procedure with 5% acetic acid. Multiple colposcopically directed biopsies are taken from suspicious lesions using the punch biopsy forceps. Biopsy fragments are processed and read in the Pathology Laboratory of the UATH. The colposcopic findings and histological diagnosis were reported as normal, benign, low grade lesion, high grade lesion, microinvasive cancer (MIC) and invasive cancer. Patients whose histology reports confirmed high grade lesions were treated with loop electrosurgical excision procedure (LEEP) or cryotherapy. Patients whose histology confirmed invasive cancer were managed as per standard protocol.

Data analyses

This was done with the aid of Statistical Package for the Social Sciences (SPSS) version 20. Categorical variables were represented as percentages while continuous variables were reported as mean and standard deviation. The agreement between colposcopic diagnosis and cervical pathology was determined using weighted Kappa statistics. Sensitivity, specificity, PPV, NPV, false positive rate and false negative rate were used to compare colposcopic diagnosis and cervical pathology.

Results

There were 106 women seen over the period of 2 years however only 84 folders could be retrieved for analysis. This gave a retrieval rate of 79%. Biopsies were not taken from the non-malignant category for histologic examination. The mean age of the patients was 41.7 ± 9.9years (Range 22-66 years).

Table 1 shows the age and parity distribution of the patients. The age group with the highest number of women 30(35.7%) was the 40-49year group while the least number, 8(9.5%) were in the 20-29year group.

Most of the patients were multiparous, with only 12(14.3%) of them being nulliparous.

Table 1: Age and Parity distribution of patients.

Age	n=84	Percentage (%)
Age group		
<20	0	0.0
20-29	8	9.5
30-39	27	32.1
40-49	30	35.7
>49	19	22.6
Parity		
0	12	14.3
1-4	50	59.5
≥5	22	26.2

The most common indication for colposcopy was an abnormal pap smear which was either a persistent low grade squamous intraepithelial lesions (LGSIL) in 20(23.8%) of cases or high grade squamous intraepithelial lesions (HGSIL) in another 20(23.8%). The least common indications were adenocarcinoma in-situ (AIS) and atypical squamous cells of undetermined significance (ASCUS) on cytology, seen in 1(1.2%) patient each (Table 2).

Table 2: Indications for colposcopy.

Pap smear report	Frequency	Percent (%)
Persistent inflammatory changes on cytology	11	13.0
ASCUS on cytology	1	1.2
AGC on cytology	2	2.4
AIS on cytology	1	1.2
Persistent LGSIL on cytology	20	23.8
HGSIL on cytology	20	23.8
Invasive cancer on cytology	3	3.6
Persistent unsatisfactory quality on cytology	5	6.0
Post coital bleeding	3	3.6
Suspicious cervix	18	21.4
Total	**84**	**100**

HPV: Human Papillomavirus, ASCUS: Atypical squamous cells of undetermined significance, AGC: Atypical glandular cells, AIS: Adenocarcinoma insitu, LGSIL: Low grade squamous intraepithelial lesion, HGSIL: High grade squamous intraepithelial lesion.

Table 3 illustrates the frequency of various colposcopic impressions of the patients.

The commonest impression made was high grade CIN, seen in
40(47.6%) of patients while the least impression made was micro-invasive cancer, seen in 1(1.2%) patient. An impression of low grade CIN was made in 12(14.3%) of patients.

Table 3: Colposcopic impressions of the patients

Findings	Frequency (n)	Percentage (%)
Normal	17	20.2
Benign	14	16.7
Low grade CIN	12	14.3
High grade CIN	40	47.6
MIC/Invasive cancer	1	1.2
Total	84	100

CIN-Cervical intraepithelial neoplasia, MIC-microinvasive cancer

Table 4 shows the age distribution of patients with premalignant and micro-invasive/invasive lesions on colposcopy. Sixteen (40%) patients with high grade lesions were within the 30-49year age group while 6(50%) of patients with low grade lesions were in the age group 40-49 years. The only patient with micro-invasive disease was also in the 30-39year age group. Analysis of parity distribution shows that nulliparous women had the lowest frequency of premalignant lesions 6(11.3%) while women with parity between 1-4 had the highest frequency, 32(60.4%) (Table 5).

Agreement between colposcopic impression and cervical biopsy pathologic diagnosis is shown in table 6. The percentage (%) concurrence between colposcopic findings and histologic diagnosis was 64.2% (34/53) {K =0.302, 95%CI= -0.010-0.436}. The concurrence rate was higher for high grade CIN 29/40(72.5%) than low grade CIN 5/12(41.7 %.). There was an overestimation of colposcopic diagnosis in 13 patients (24.5%) and an underestimation in 6 patients (11.3%).

Table 7 shows agreement between colposcopic impression and histologic diagnosis of cervical biopsy specimen for low grade and high grade lesions. The sensitivity of colposcopy for detecting high grade lesions or more is 32/36(88.9%) while the specificity is 8/17(47.1%). False positive rate for high grade lesions is 9/17(52.9%) and false negative rates for low grade lesions is 4/36(11.1%). Positive predictive value (PPV) of high grade colposcopic diagnosis or more was 32/41(78.04%) while the negative predictive value (NPV) was 8/12(66.73%).

Concerning treatment modalities offered to patients, majority of the patients, 29(61.7%) had loop electrosurgical excision procedure (LEEP), 13 (27.7%) had hysterectomy and 4(8.5%) had cryotherapy. One of the patients with invasive cervical cancer on histology was referred, based on request for further management (Not shown in table).

Table 4: Age distribution of patients with premalignant and microinvasive/invasive lesions on colposcopy.

Age(years)	Low grade lesion	High grade lesion	MIC/Invasive cancer	Total
<20	0	0	0	0
20-29	0	3	0	3
30-39	4	16	1	21
40-49	6	11	0	17
>49	2	10	0	12
Total	**12**	**40**	**1**	**53**

Table 5: Parity distribution of patients with premalignant and microinvasive/invasive lesions on colposcopy.

Parity	Low grade CIN	High grade CIN	MIC/Invasive cancer	Total (%)
0	3	3	0	6 (11.3)
1-4	8	23	1	32 (60.4)
≥5	1	14	0	15 (28.3)
Total	12	40	1	53 (100)

Table 6. Comparison of Colposcopic Impression and Histologic Diagnosis

Colposcopic Diagnosis	Cervical biopsy Pathology				
	Normal/Benign	***CINI***	***CINII/III***	***Microinvasive/Invasive cancer***	**Total**
Benign	0	0	0	0	0
CINI	3	5*	4	0	12
CINII/III	0	9	29*	2	40
Invasive cancer	0	0	1	0	1
Total	3	14	34	2	53

*Concurrence

Table 7. Agreement between Colposcopic Impression and Histologic Diagnosis of Low Grade and High Grade Lesions

Colposcopic Diagnosis	Cervical biopsy pathology		
	Normal/Benign/CINI	***CINII/III* /Cancer**	**Total**
Normal/Benign/LGSIL	8	4	12
HGSIL/Cancer	9	32	41
Total	17	36	53

Discussion

Early detection can prevent death from cervical cancer, but success is dependent on women with abnormal cytology attending follow-up procedures, including colposcopy. Since there are no organized screening programs in Nigeria, opportunistic cervical cancer screening with Pap smear is offered to women attending the gynaecological clinic of the University of Abuja Teaching Hospital (UATH), with subsequent referral for colposcopy within the hospital when indicated. Most of the patients seen were within the 30-49year age group and were also multiparous.

There were several indications for this examination and an abnormal Pap smear test is usually the most frequent indication for colposcopy followed by a suspicious looking cervix [4, 20]. This was the finding in this study where 69% were referred for colposcopy due to an abnormal cervical cytology. Women with a low grade lesion can be followed up with cytology in 6 months and those with persistent or progressive disease are referred for colposcopy [2, 18]. This is what is practiced in UATH. However, in centres with facilities for HPV DNA test, co testing could be carried out and those with a positive high risk HPV test are referred for colposcopy. A study done by Cecchini et al [21] suggested that screening by colposcopy when compared to conventional cytology screening is more sensitive and therefore maybe more feasible and cost effective on the long run. However, the major drawback of primary colposcopy is its low specificity with the consequence of false-positive rate and over-treatment in a substantial number of cases [22].

In this study the perfect agreement between colposcopic impression and histologic diagnosis was 64.2%. This result is lower than reports by Mousavi et al.[23] and Durdi et al.[24] but similar to the findings by Li

et al.[15] and Fan et al.[16] even though the strength of agreement in their study was moderate at a Kappa value of 0.436-0.494 while ours was fair at 0.302. It is important to note that these similar results were obtained despite use of different criteria in reporting the colposcopic findings. Take for instance, Fan et al.[16] and Li et al.[15] used the 2011 IFCPC criteria but in our study, diagnosis was based on identification of well-defined characteristics or use of the Reids Colposcopic index (RCI) [25], depending on the consultants preference. Mousavi et al.[23] and Durdi et al.[24] had employed the use of Reids Colposcopic index (RCI). Although this maybe a drawback in the comparison of the results of the various researches, results obtained seem to explain why there is still some controversy surrounding the use of any one set criteria in the practice of colposcopy. It is possible that the skill and experience of the colposcopist may be more significant than the application of a set of criteria, an example can be seen in the study done by Massad et al.[10] where colposcopy carried out by resident doctors reported a much lower perfect agreement rate of 37%.

Non correlation between colposcopy and histology could result from colposcopic findings not apparent to the examiner, visualized lesions not included in biopsy specimens, lesions not included in the sections of paraffin embedded tissue or the pathologists inability to identify the lesion within the submitted specimens. Multiple biopsies have been said to increase colposcopy and histology correlation [4,13]. Training and retraining of colposcopists with constant practice to maintain proficiency should therefore be encouraged as there is still great inter-observer differences with colposcopic diagnosis especially low grade CIN even among expert colposcopists.

In our study, colposcopy recorded a higher frequency of overestimate (24.5%) compared to underestimate (11.3%) and this was reflected by a high rate of false positive reports of high grade lesions (52.9%). Overestimation in colposcopy leads to overtreatment while underestimation has the danger of failure to identify patients at risk therefore, with this understanding, it is imperative that the practice of colposcopy be done in line with best practices so as to ensure accuracy of results.

Studies have revealed that the positive predictive value of colposcopy is better with an increase in the severity of the cervical lesion and considerably so when biopsies are taken. However, the positive predictive rate for microinvasive disease is poor probably due to the absence of characteristic features [4]. This was seen in this study in which there was a 100% downgrade for microinvasive disease. In our study also, the sensitivity for diagnosing high grade or higher lesions by colposcopy was 88.9% and this performance is higher than 56% reported by Massad et al.[10] but similar to 64-71% reported by Li et al. [15] and Fan et al. [16]. The specificity of the high grade lesions in our study (47.1%) was however lower than values reported these researchers [15, 16] who got values as high as 98% and 97% respectively. These authors had used the 2011 IFCPC terminology and this evidence seems to support the argument for the need for application of this terminology in ruling out high grade disease. It is also important in terms of subsequent patient management as it helps to prevent over treatment.

Our study found a similar PPV for HGSIL+ (78%) when compared to other studies [14, 15, 16]. However, the negative predictive value for these high grade lesions was 66.1% and this was lower than the value reported by Li et al.[15] and Durdi et al.[24]. Since the focus of the entire process therefore is detection and treatment of high-grade disease with the aim of reducing the incidence of cervical cancer, we therefore recommend that going forward, a more structured approach to colposcopy be employed as the practice of colposcopy increases in our environment.

This study also noted that with the increase in the practice of colposcopy, especially in tertiary centers like ours, conservative management approaches are also increasing as evidenced by 61.7% of patients who were managed with the loop electrosurgical procedure. Overall however, a systematic review on cervical cancer prevention and treatment in Africa has shown that challenges are still significant in low resource settings in terms of availability of infrastructure, expertise, cost and patient compliance [26].

The limitations of this study include its retrospective nature and the non-use of a single and definite criteria which may make colposcopic assessment more subjective.

Conclusion

In conclusion, the strength of agreement between colposcopic diagnosis and cervical pathology was fair and colposcopy performs better in the detection of high grade lesions. More research aimed at assessing the practice and improving the diagnostic accuracy of colposcopy is needed in our environment.

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Conflicts of Interest

There are no conflicts of interest

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INDICATIONS AND OUTCOMES OF TRACHEOSTOMY IN NORTHERN GHANA

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Abstract

Objective: Tracheostomy is a common surgical procedure done to maintain a patent airway. We conducted a review of patients managed with tracheostomy at the Ear, Nose and Throat (ENT) Department of Tamale Teaching Hospital (TTH), Tamale, Ghana.

***Materials and Methods*:** This was a descriptive retrospective study of all patients managed with tracheostomy at the ENT Unit, TTH from January 2013 to June 2018. The data collected included the age, sex, indication for tracheostomy, primary diagnosis, type of tracheostomy and outcome of management. Statistical analysis was done with SPSS version 20.

Results: Fifty-four patients were managed with tracheostomies made up of 36 males and 18 females with a ratio of 2:1. The age ranged from 17 months to 79 years with a mean age of 41.6 years. Four-tracheostomies were performed as emergencies on account of upper airway obstruction. The most common underlying cause for the emergency tracheostomies were laryngeal cancers 17 (31.5%), deep neck space abscesses 15 (27.8%) and head and neck trauma 7 (13). Elective tracheostomies were performed for prolonged intubation for mechanical ventilation and as prophylaxis for oro-maxillofacial surgery.

Conclusion: The most common indications for tracheostomy in Northern Ghana were upper airway obstruction secondary to laryngeal cancers and complicated deep neck space abscesses.

Key Words: *Tracheostomy, Indications, Northern, Ghana*

Introduction

The art of making an incision in the wind pipe to relieve airway obstruction has been described centuries ago with several books and ancient tablets referencing tracheotomy[1,2].

Tracheostomy is an important surgical procedure in maintaining a patent airway in the patient requiring an alternate airway. It involves a deliberate surgical opening of the anterior wall of the trachea and maintaining this with a tracheostomy tube[3,4]. It remains one of the most important procedure for airway emergency management, particularly in developing countries when patient's present late with acute airway obstruction[4–6]. Despite the availability of other airway interventions such as endotracheal intubation, percutaneous dilatational tracheostomy (PDT) or cricothyroidotomy, the decision to perform a surgical tracheostomy must not be unduly delayed[6–8].

Indication for the placement of a tracheostomy tube falls in 2 main categories; for upper airway obstruction and long-term airway support in place of endotracheal tube as it provides improved comfort and mobility[9].

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Other indications exist including airway protection, weaning failure and bronchopulmonary toileting. Traditionally, however, upper airway obstruction, trachea-bronchial toileting, airway protection and prolonged mechanical ventilation have been known to be the four main indications for tracheostomy[5,8,10].

Recent publications, however, have shown a drastic change in the trends with trauma and prolonged intubation replacing upper airway obstruction due to acute infections as the most common indications for tracheostomy[4–6,8–12]). The reason for this is the changes in epidemiology of infectious diseases due to early diagnosis, adequate use of antibiotics and the improvement in medical care[13].

Complication rate following tracheostomy vary and are most common in emergency compared to elective procedures with reported mortality rate less than 2%[4].

Even though tracheostomies are commonly performed in our center, there are no published studies on tracheostomy. This study is to highlight our own experiences with tracheostomy, outlining the common indications and outcomes of patients with tracheostomy and compare our results with other centers.

Methods

A retrospective review of the medical and surgical records of all patients who had tracheostomy performed at the ENT Department, Tamale Teaching Hospital during a five- and half-year period from January 2013 to June 2018.

The Tamale Teaching Hospital is the only tertiary health facility in the Northern part of Ghana with a current bed capacity of 495 and provides specialist care for a population of approximately 4.3 million. It is also a teaching hospital affiliated to the School of Medicine and Health Sciences, University for Development Studies.

Patients requiring specific airway management were admitted for care via the Accident and Emergency Department, Paediatric Emergency Unit, General Out Patient Department (OPD) as well as the ENT OPD clinic. The medical records of patients who underwent tracheostomy were retrieved from theatre records book. Data on age, sex, indication for tracheostomy, primary diagnosis, type of tracheostomy and outcome of management were obtained and analysed. Patients who had incomplete or missing records were excluded from the study.

All the procedures were performed by consultant ENT surgeons with a transverse skin crease incision used in all the patients. A plastic cuff tracheostomy tube was placed in all the cases with the cuff deflated in the immediate postoperative period when patients were fully conscious. A suction machine was kept at the patient's bedside and humidification provided via a wet gauze over the tracheostoma.

Postoperative care was done by ENT specialist nurses on the ward. Tracheostomy decannulation was done depending on the resolution of the etiology and satisfactory maintenance of the airway. All decannulation were done in the clinic or on the ward and the patients were observed for at least 24 hours before discharge home. Patient follow-ups were achieved through weekly or monthly reviews at the outpatient clinic for a minimum of six months, depending on the patient's condition.

Ethical approval for this study was obtained from the Ethical Review Board of TTH. Statistical analysis was done with SPSS software version 20 (Chicago, IBM 2010).

Results

Patients

A total of fifty-four patients who underwent tracheostomies during the study period had complete data for analysis. The age range was 17 months to 79 years with a mean age of 41.6 years with the peak age incidence occurring within the fourth decade of life. There were 36 (66.7%) males and 18 (33.3%) females with a male to female ratio of 2:1 (Table 1).

Procedure

All tracheostomies were done exclusively by open procedures. Forty-nine (90.7%) tracheostomies were carried out as emergencies while the remaining five (9.3%) were elective procedures.

Table 1: Age distribution of patients with tracheostomy

Age Group (in years)	Frequency	Percentage (%)
0-10	**7**	13.0
11-20	0	0.0
21-30	9	16.7
31-40	14	25.9
41-50	6	11.1
51-60	5	9.3
61-70	6	11.1
71-80	7	13.0
Total	**54**	**100**

Table 2: Primary diagnosis and indications of tracheostomized patients

Diagnosis	Frequency	Percentage
UPPER AIRWAY OBSTRUCTION **A. Infections:**		
Acute epiglottitis	2	3.7
Deep Neck Space Abscesses	15	27.8
Total	**17**	**31.5**
B. Neoplasm		
Laryngeal cancers	17	31.5
Nasopharyngeal tumour	1	1.9
Neck mass	1	1.9
Palatal tumour	1	1.9
Submandibular tumour (advanced)	1	1.9
Thyroid cancer	1	1.9
Total	**22**	**40.7**
C. Neurological		
Vocal cord paralysis	3	5.6
Total	**3**	**5.6**
D. Trauma		
Cut throat	2	3.7
Extensive facial trauma	1	1.9
Foreign body aspiration	1	1.9
Laryngeal edema (battery ingestion)	1	1.9
Laryngotracheal injury	2	3.7
Total	**7**	**13.0**
PROLONGED INTUBATION		
For mechanical ventilation	3	5.6
Total	**3**	**5.6**
ROUTE FOR ANAESTHESIA		
Mandibulectomy for Ameloblastoma	2	3.7
Total	**2**	**3.7**
Grand total	**54**	**100**

Indication

The primary diagnosis of tracheostomized patients are highlighted in Table 2.

The indications for tracheostomy in decreasing order of frequency in our study were upper airway obstruction 49 (90.7%), prolonged intubation 3 (5.6%) and route for anaesthesia ventilation 2(3.7%) (Figure 1).

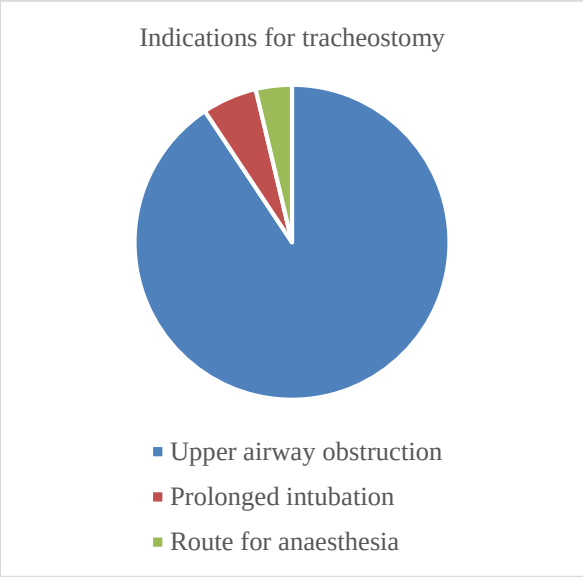

Fig 1: Indications for tracheostomy

Table 2 shows that, among the different causes of upper airway obstruction requiring tracheostomy, neoplasm represented the majority (40.7%) followed closely by infections (31.5%). Neurological cause of upper airway obstruction was the least class of indications for tracheostomy secondary to upper airway obstruction. With regards to specific conditions, 17 (31.5%) patients with laryngeal cancers received the most tracheostomies followed by patients with deep neck space abscesses 15 (27.8%). Trauma represented 13% of cases.

Complications

The main complication occurring post-procedure was hemorrhage accounting for 4 (7.4%) patients. We recorded one (1.9%) death during the entire study period.

Discussion

As ancient as it is, tracheostomy remains one of the most important and standard procedures for emergency airway management especially in developing countries where late presentations are encountered[6].

In this study, majority of the patients were males and the peak incidence was in the fourth decade, which is similar in comparison to other studies despite varying backgrounds of the studies[6,7,11,13–15]. The peak incidence, however had some disparities; it was similar to studies in developing countries like Nigeria and Tanzania[7,14]; where peak incidences were between the 3rd and 5th decades) but varied with findings in other studies elsewhere[5,6,11,13]. The latter variation may probably be due to the different sociocultural backgrounds of the study populations.

Tracheostomies are performed as either emergency or elective procedures. The former is usually on account of acute upper airway obstruction whilst the latter is usually carried out as an alternative to endotracheal tubing for long-term airway management or used to provide route for anaesthesia ventilation in major head and neck surgeries[5,6,9].

In our study, majority (94.4%) of the tracheostomies were carried out as emergencies secondary to acute upper airway obstruction. This was consistent with several other studies[7,15–17].

There are other series that had higher cases of elective tracheostomies but the study population of these studies were mainly patients in the intensive care unit (ICU) or paediatric intensive care unit (PICU) who needed long-term intubation[14,18].

Indications for tracheostomies recorded in literature has varied over the years. Upper airway obstruction has been shown by several studies to be the leading indication for tracheostomy[7,15–17]. This finding is similar to what we found (90.7%) in our retrospective study.

Early studies also reported acute airway obstruction due to acute infections as the main indication for tracheostomies but this has seen a decline in incidence due to early presentation, antibiotic use, proper management of infections and vaccination that curb these infections in the first place[19–25].

In this study, head and neck tumours (especially laryngeal tumors) were the leading causes of upper airway obstruction (40.7% of patients) needing tracheostomy. This finding is consistent with other studies in the last decade[6,7,26].

Deep neck space infections were the second highest (27.8%) cause of upper airway obstruction followed by trauma (13.0%) similar to a study published in Portugal[26]. Other studies showed a higher incidence of traumatic indications[6,7]. This trend observed in our setting may be due to the health seeking behavior of the population of study; most patients try using herbal medications to treat throat and dental infections at home and therefore present late to the hospital with complications. Secondly there is a strong cultural belief in the study population that any abscess treated by surgical drainage would lead to the death of the patient and so most patients only present when they start experiencing complications of acute upper airway obstruction.

Early presentation of these patients could have led to the avoidance of tracheostomy. This calls for a change in the health-seeking behaviors of the people which could be achieved via increase in public awareness, health education and advocacy campaigns. Also access to improved dental care in the community would reduce the incidence of deep neck space infections.

Although airway obstruction is reported as the main indication for tracheostomy, the incidence of tracheostomy for prolonged ventilation, especially in the paediatric population has increased over the years in many high income countries[21,24,25]. This rise,

particularly in the paediatric patients, may be due to advances in critical care management of preterm babies and younger children. The same is not the case for low-middle income countries (LMICs) and this is apparent from our study, where only three (3) patients underwent tracheostomy on account of long-term ventilation. This trend seen in LMICs could be due to the lack of resources for long-term airway management in these settings.

Haemorrhage was mainly the complication following tracheostomy in this study and were managed with either cauterization or a tie. The complication rate of this current study was found to be lower compared to other studies[7,8] within the West African region. The death recorded in this study was due severe sepsis from complicated deep neck space abscess and not directly related to the tracheostomy procedure.

Our study carries the disadvantages similar to retrospective studies where we did not evaluate the duration of the tracheostomy tubes nor decannulation rate of the tubes due to poor documentation.

Conclusion

Majority of the tracheostomy patients were males with peak incidence occurring within the fourth decade of life. Tracheostomies were performed as an emergency procedure in majority of the patients with upper airway obstruction secondary to laryngeal cancers and deep neck spaces abscesses being the most common indications.

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A RETROSPECTIVE STUDY OF LOWER LIMB CELLULITIS IN A REGIONAL HOSPITAL IN GHANA

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Abstract

***Background*:** Cellulitis is a non-necrotizing inflammation of the dermis of skin and subcutaneous tissues. Lower limb cellulitis is a common cause of hospitalization in Ghana but scarcely reported.

Objective: To document management and outcomes of lower limb cellulitis at the Ashanti Regional Hospital in Ghana**.**

***Materials and Methods*:** Retrospective review of patients admitted to the Ashanti Regional Hospital with a diagnosis of lower limb cellulitis from November 2016 to October 2018.

We reviewed patients' clinical records for data on patient demographics, risk factors, clinical presentation, treatment modality and outcome of cellulitis. A p-value of less than 0.05 was considered to be statistically significant.

Results: Eighty two (82) patients with lower limb cellulitis were admitted over the study period. There were 47 (57.3%) females and 35 (42.7%) males. The mean age of patients was 38.8 years (standard deviation 21.6065). Among females, the majority, 10 (21.3%) were in the 6th decade whilst the majority, 9 (25.7%) of males were in the 4th decade.

All the patients presented with swelling of the lower limb involving the left lower limb in 38(46.3%) and right in 44(53.7%) cases. The leg was the most common location involved 60 (73%).

The mean duration of swelling prior to admission was 5. 2 days (SD 3.196). Antibiotics treatment resulted in complete resolution in 29 (35.4%) cases and complications in 53 (54.5%), cases requiring surgical treatment in 31(58.5%) patients.

Conclusion: Lower limb cellulitis had a high complication rate influenced by duration of symptoms prior to hospitalization and antibiotic therapy.

Key Words: *Cellulitis, lower limb, patients, Debridement, Ghana*

Introduction

Cellulitis is a non-necrotizing inflammation of the dermis of skin and subcutaneous tissues, mostly from acute bacterial infection. It can occur in many locations of the body but the lower limb is the most common location involved, with reported rates of 58-98%.[1–3]

The incidence of lower limb cellulitis is high and increases significantly with age,[4–7] usually occurring in individuals above 45 years. However, the sex of individuals has no influence on the incidence of cellulitis.[4] Socioeconomic factors may however be associated with the incidence of cellulitis[8].

Even though cellulitis is usually non-fatal with case fatality rate less than 1% worldwide,[9] high mortality rates have been reported in Africa[3]. It is a common cause of hospitalization with high morbidity, costs and economic loss[10–12]. Delay in reporting is known to account for the frequent hospital admission leading to delay diagnosis and serious complications[8], and this late reporting behaviour is common among patients in Africa.

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A recent publication by the Lancet Commission On Global Surgery indicates that over 5 billion people worldwide lack access to safe , timely and affordable surgical care when needed, with the greatest burden in low and middle income countries[13]. This burden will greatly increase when a preventable disease like cellulitis continues to be a reason for admission to hospitals.

There is scarcity of literature on cellulitis in Africa[5]. Although lower limb cellulitis is a common cause of hospital admissions in Ghana, we found no reported studies on lower limb cellulitis in the country. A review of literature however shows reports on orofacial infections, orbital cellulitis and diabetic soft tissue or foot infections.

The goal of this study was to describe the demographic characteristics of patients admitted with cellulitis of the lower limb, document the clinical presentation, mode of treatment and determine the treatment outcomes of cellulitis

Methods

Study Design

This was a retrospective review of all patients admitted to the medical, surgical and pediatric wards of Ashanti Regional Hospital with a diagnosis of lower limb cellulitis from November 2016 to October 2018.

Study Area

Ashanti Regional Hospital, formerly Kumasi South Hospital is located in the Asokwa Sub metro, one of the five Sub Metros in the Kumasi metropolis. The hospital has a bed capacity of 126 and accredited for training of House officers and residents in family Medicine.

Ashanti Regional Hospital is the only public hospital in the sub metro; it is centrally situated at the boundaries of three towns i.e. Atonsu, Agogo and Chirapatre, hence occupying lands belonging to all the towns. The Ashanti Regional Hospital, has developed from the former Kumasi South Urban Health Centre, built in 1976 to a District hospital, Kumasi South Hospital and finally upgraded into a Regional Hospital for the Ashanti Region in 2002

The sub metro in which the facility is located is made up of both urban and rural dwellers. The rural dwellers are mostly peasant farmers, petty traders, and others earn their living through constructional work.

Data Collection

We identified all cases of Cellulitis admitted to the various wards from the admission and discharge books. Clinical records were then retrieved using Biostatistics Index Cards and electronic data entered at the records department. All patients with a discharge diagnosis of lower limb cellulitis were included in the study. Patients with cellulitis of other regions apart from the lower limb were excluded from the study. We reviewed patient history, physical examination as well as laboratory records and obtained data on patient demographics, risk factors, clinical presentation, treatment modality and outcome of cellulitis using a data abstraction form.

Data Processing and Analysis

Data obtained was entered into a Microsoft access database and analyzed using PASW Statistics for Windows, Version 18.0. Chicago: SPSS Inc. The result of data analysis was reported as proportions using frequencies and percentages. Pearson Chi square test was used to determine the degree of significant relationship between some variables. A p-value of less than 0.05 was considered to be statistically significant Results

Ethical Consideration

Permission was obtained from the hospital's research and ethics committee to collect secondary data for the study. There was no direct contact or intervention with any patient

Results

Eighty two (82) patients with lower limb cellulitis were admitted over the study period. There were 47 (57.3%) females and 35 (42.7%) males giving a female to male ratio of 1.3: 1.

The mean age was 38.8 years and a median of 39 years. Among females, the majority, 10 (21.3%) were in the 6th decade whilst the majority, 9 (25.7%) of males were in the 4th decade. Figure 1 shows the age and gender distribution of patients.

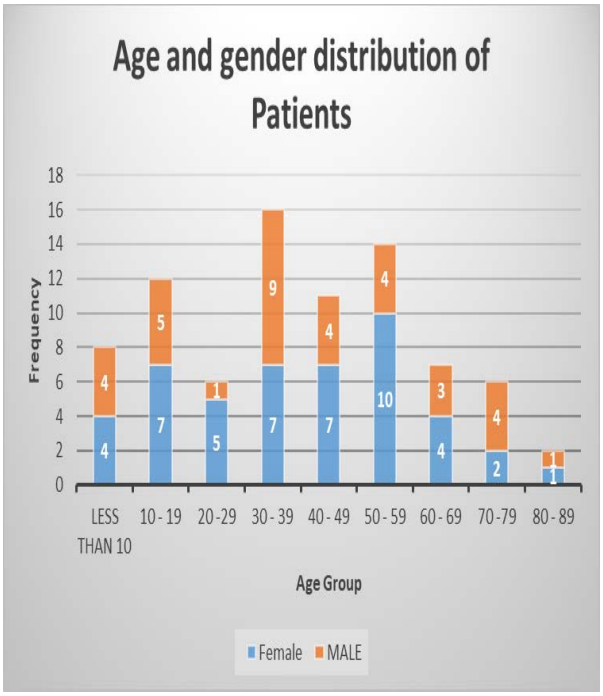

Fig 1. Age and Gender Distribution of Patients

Table 1. Sociodemographic Characteristics

Variable n = 82	Frequency	Percentage (%)
Occupation		
Artisan	14	17.1
Farming	8	9.8
Teacher	1	1.2
Trading	23	28
Students	15	18.3
Unemployed	9	11
Pensioners	2	2.5
Others	10	12.2
Educational background		
None	27	32.9
Others(infants)	6	6.1
Basic	34	23.2
Secondary	13	17.1
Tertiary	2	2.5
Marital Status		
Divorced	3	3.7
Married	41	50.0
Single	16	19.5
Widowed	2	2.4
Others (children)	20	24.4

The majority, 23 (28.0%) of the patients were traders and only 8 (9.8%) were farmers as shown in Table 1.

Forty one (50.0%) patients were married and there were 20(24.4%) children below the legal marriage age of 18 years. The marital status of patients is shown in Table 1.

Almost one third (32.9%) of the patients had no formal education and only 2 (2.4%) had tertiary education as shown in Table 1.

Clinical Presentation

All the patients presented with swelling of the lower limb involving the left lower limb in 38(46.3%) and right in 44 (53.7%) cases. The commonest region of the lower limb involved was the leg in 60 (73%) followed by the foot in 21 (25.6) and only one in the thigh.

All the patients had pain in the affected lower limb. Fifty seven (69.5%) of the patients presented with redness but was absent in 25 patients. This is shown in table 2.

Table 2. Clinical Presentation of cellulitis

Characteristics n= 82	Frequency	Percentage (%)
Leg Swelling		
Yes	82	100
No	0	0
Laterality		
Left	38	46.3
Right	44	53.7
Part of lower limb		
Thigh	1	1.2
Leg	60	73.2
Foot	21	25.6
Pain		
Present	82	100
Absent	0	0
Redness		
Present	57	69.5
Absent	25	30.5
Loss of function		
Yes	57	69.5
No	25	30.5
Duration of Symptoms (Days)		
1-5	60	73.2
6-10	15	18.3
11-15	4	4.9
16 - 20	1	1.2
21 -25	2	2.4
Mode of Entry		
Cut	28	34.2
Insect bite	2	2.4
Ruptured blister	15	18.3
Scratch	23	28.0
Spontaneous	6	7.3
Others	8	9.8
RBS (mmol/L) n = 62		
<11	56	90.3
11.1- 21	**2**	**3.2**
>21.1	**4**	**6.5**

The mean duration of swelling prior to admission was 5. 2(SD 3.196) days. Sixty patients (73%) presented within 1 to 5 days of noticing swelling of the lower limb, 15 (18.3%) patients presented between 6 to 10 days of noticing swelling. Seven (8.5%) patients presented to the hospital after ten days of noticing symptoms.

Fifty seven (69.5%) could not walk on the affected limb whilst 25 of them could use the affected limb.

The commonest risk factor for developing cellulitis was a breach in the integrity of the skin from trauma. Amongst these were cuts, 28 (34.1%), scratch 23 (28.0%), and ruptured blisters 15 (18.3%).

Only 9 (11.0%) patients had cellulitis spontaneously without any identifiable local risk factor.

Ten of the patients were known diabetics. Random blood sugar (RBS) levels were tested on 62 patients whilst on admission and table 4 shows that the majority 56 (90.3%) of patients had RBS less than 11mmol/l.

Treatment and Outcomes

The commonest antibiotic used in the treatment of cellulitis was Clindamycin in 53 cases and Amoxycillin /Clavulinic acid in 26 cases with or without Metronidazole. A combination of Cefuroxime and Gentamycin and Penicillin and Gentamycin was used in a patient each. This result is presented in table 4.

On treatment with antibiotics, 29 (35.4%) cases resolved completely without any complication whiles 53 (54.5%) had complications. Highest amongst the complications were ulceration 25(47.1%), followed by tissue necrosis or gangrene 20 (37.7%), and abscess in 8 (15%) of cases, as presented in Table 3

Surgical treatment was carried out in 31(58.5%) patients who had complications whilst the rest resolved with dressing alone or with enzymatic or autogenous debridement, as seen in table 4. The surgeries carried out included debridement 21(67.7%), incision and drainage 8(25.8) and minor (Ray) amputations 2(6.5%). Gangrene is one of the complications of cellulitis which was observed in two patients who underwent Ray amputation of the 2nd and 4th toes of the left foot respectively.

The mean length of hospital was 7.52 days (SD 5.029).

Table 3: Duration of symptoms versus educational background, treatment outcomes and complications

	Duration of Symptoms (Days)					
Variable	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	
Educational background						Total
None	19	4	2	1	1	27
Others	6	0	0	0	0	6
Basic	22	10	1	0	1	34
Secondary	12	0	1	0	0	13
Tertiary	1	1	0	0	0	2
Treatment outcome						
Recovered	27	1	1	0	0	29
Recovered with complications	33	14	3	1	2	53
Complications						
No complications	27	1	1	0	0	29
Abscess	4	2	1	1	0	8
Tissue necrosis/gangrene	13	4	2	0	1	20
Ulcer	16	8	0	0	1	25

Table 4. Treatment and Outcome

Antibiotic treatment	**Recovered**	**Recovered with complications**	**Total**
Amoxycillin/clavulinic acid	10	5	15
Amoxycillin/clavulinic acid + Metronidazole	0	11	11
Cefuroxime/Gentamycin	1	1	2
Clindamycin	18	35	53
Penicillin/gentamycin	0	1	1
total	29	53	82
Treatment of complications			
Surgical	31	58.5	
Non-Surgical	22	41.5	
Total	**53**	**100**	
Type of surgical treatment			
Incision and drainage	8	25.8	
Debridement	21	67.7	
Minor Amputations(Ray)	2	6.5	

Table 5. Relationship between duration of symptoms and educational background, treatment outcome, complications (chi square)

Variable	**Pearson Chi Square**	**p-value**
Educational Background	12.779a	0.887
Treatment Outcome	9.671a	0.046
Complications	23.231	0.026

Discussion

Cellulitis is a non-necrotizing infection of the skin and subcutaneous tissues. It is commonest in the lower limbs and usually affects older people with the incidence significantly increasing with age[1, 6, 10, 14]. However, in Sub Sahara Africa, it affects relatively young patients[15–17]. In this study, the commonest age group with lower limb cellulitis was 30-39 years with a mean age of 38.8 years. The relatively young age of patients in this study is similar to the findings from other parts of sub Saharan Africa[15-17].

In contrast with findings from Sierra Leone[18], the majority of patients in this study either had basic education or no formal education at all. People of low socio economic status tend to present late to hospital as was observed in this study and this usually results in high complication rates.

All the patients in this study presented with unilateral swelling of the lower limb, over half of them on the right. The leg was the most common location of the lower limb with cellulitis similar to findings by Kenche et al in rural India[19].

Break in skin barrier has been identified as the most important local risk factor for developing cellulitis[2, 16]. Similarly, in this study only 9.8 % of patients had no identifiable break in skin barrier. The average duration of noticing symptoms to presentation at the hospital was 5.2(SD 3.916) days and over a quarter of patients (26.8%) reported after 5 days of noticing symptoms. Late presentation is a major reason for high complication rate and a cause of frequent hospital admission. Outpatient management of cellulitis is less expensive and preferred by patients[9], and this outpatient management has been advocated for in some studies[7,9]. However, this can only be possible if patients report early and there is prompt treatment.

Indications for admission and parenteral therapy with antibiotics include patients with associated Systemic Inflammatory Response Syndrome (SIRS), haemodynamic instability, changes in mental status, poor compliance and failure to respond to oral antibiotics[20]. Parenteral Clindamycin was the most common antibiotic used in the treatment of cellulitis in this study whilst Amoxicillin /Clavulanic acid was used in almost a fifth of the patients. The Practice Guidelines for the Diagnosis and Management of Skin and Soft Tissue Infections 2014 clearly categorize patients with cellulitis and suggest antibiotic therapy for the various categories[20]. Penicillin is recognized worldwide for use as the first line treatment of cellulitis if other factors do not preclude its use [21-23]. In the treatment of cellulitis the use of antibiotics other than penicillin has not resulted in any added advantage[21], as seen with the routine use of Clindamycin in this study. It's been shown that adherence to antibiotic guidelines is associated with better outcomes[22]. This is consistent with the high complication rate in the clindamycin group (p value 0.01) found in this study. Various hospitals should have a common protocol in line with international standards.

There was no recorded mortality in this study, consistent with the very low case fatality of cellulitis in many studies[9, 23].

Almost two thirds of the patients developed local complications and 35% of cases resolved without complications. These complications were ulcers, tissue necrosis, abscesses and gangrene. Complication rate for cellulitis is generally between 8.9 to 47.4% worldwide.[5] Our complication rate was higher than reported in previous studies[5,15,24]. The delay in seeking medical treatment has been identified as a cause of worse outcomes in cellulitis[8], as was observed in this study (p-Value 0.046).

More than half of the patients underwent surgical treatment for their complications and highest amongst them was surgical debridement. Our findings are consistent with other findings where surgery was indicated for majority of cases with cellulitis[16,24] but contrary to that of Mzabi et al who reported a very low rate of surgical management[1]. This is probably due to the relative late reporting of patients in this study for treatment.

The average length of hospital stay in this study was 7.5 days. Many studies have reported four to eleven days as the average length of hospital stay of patients admitted for cellulitis[2,3,25]. The length of stay was affected by the duration of symptom before hospitalization (p value 0.008). It is therefore important that patients report early to hospital to promote short hospital stay, reduce health cost and morbidity.

Conclusion

Lower limb cellulitis is more common in relatively younger people, in females and people of low socioeconomic status. The complication rate of cellulitis was high and is significantly affected by duration of symptoms prior to hospitalization and antibiotic therapy. We recommend early reporting to hospital to reduce the morbidity and costs associated with cellulitis.

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THE IMPACT OF MALARIA PARASITES ON THE PLACENTA AND PERINATAL OUTCOME AT KORLE BU TEACHING HOSPITAL, ACCRA, GHANA: A CASE CONTROL STUDY.

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Abstract

***Objective*:** Malaria remains a complex and overwhelming health problem affecting vulnerable groups such as pregnant women and their infants in Ghana. Malaria during pregnancy does not only pose a threat to the mother but can cause serious structural damages to the placenta and subsequently affect the pregnancy outcome. The aim of the study was to investigate the impact of *Plasmodium* parasites on the placenta and perinatal outcome of women delivering at Korle Bu Teaching Hospital. A better understanding of the impact of malaria parasites on the placenta morphology and prenatal outcome is crucial for better management of pregnant women and their babies.

Methods: The study involved testing blood collected from postpartum placentas and examining the placental tissue for *Plasmodium* parasites, after which they were classified as study group (*Plasmodium* positive) or control (*Plasmodium* negative). The patients in the study group with similar gestational and maternal age were matched with patients from the control group. The morphological characteristics of the placenta and the perinatal outcome of the two patient groups were compared using an unpaired t-test.

Results: Sixteen (16, 13.6%) out of 118 women tested positive for *Plasmodium* parasites on the maternal side of the placenta by both rapid diagnostic test and microscopy and /or tested positive for malarial parasite during pregnancy, whiles the rest (102, 86.4%) had no history of malaria in the index pregnancy and tested negative. The mean placenta weight was significantly reduced in the study group (difference: -102.0g; 95% Confidence Interval [CI]: 424.4g, 486.6g) who delivered during early term (p=0.02). Patients in the study group, who delivered during late term, had a significantly reduced mean placenta diameter (difference: -2.5cm; 95% CI: 20.0cm, 21.4cm) (p=0.003) and delivered infants with lower mean birth weight (difference: -0.693kg; 95 CI: 3.268kg, 3.475kg) (p<0.001).

Conclusion: Malaria during pregnancy does not only pose a threat to the mother but to the fetus and our results add evidence that malaria parasites cause alterations to certain morphological characteristics of the placenta which subsequently affect the birth weight as the pregnancy progresses to late term.

Keywords: *placental malaria, placenta morphology, perinatal outcome, birthweight*

Introduction

Malaria remains a complex and overwhelming health problem known to contribute significantly to maternal and infant mortality. In Ghana, malaria is hyper endemic in pregnant women, accounting for 17.6% of out patients' department attendance, 13.7% of admissions and 3.4% of maternal deaths[1]. Pregnant women are more susceptible than the general population to malaria[2]. Studies attribute the increased susceptibility to the lack of immunity to pregnancy-specific isolates that sequester in the placenta[3,4].

The placenta provides several functions during the different stages of pregnancy and has a sensitive morphology which can be altered. The physiology of the placenta permits it to perform respiratory, nutritive, and excretory functions, and it is also an important endocrine organ[5]. Although the detailed morphology of the placenta varies from patient to patient, a compilation of two studies reports the morphological characteristics (Quantitative variables) of the placenta at term to have a weight range of 470 to 530 grams, a diameter range of 18 to 22 centimeters, and a thickness range of 2.0 to 2.5 centimeters[6,7]. A study reported that placenta examination could be used to explain fetal death in majority of their study cases[8].

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Malaria parasites can affect the placenta directly by causing a mechanical compromise of the blood circulation or indirectly by interfering with the function and/or inducing pathological lesions. A study recorded that, the malaria parasites affect uterine and umbilical artery blood flows and suggested that this impairs the placental capacity to transport nutrients to the fetus[9]. It was reported in another study that the *Plasmodium* parasites indirectly interfere with the function of the placenta by disrupting its normal immune balance[10]. Other studies on placental malaria reported that the parasite causes histological changes to the placenta[11-13]. Histological changes may in turn cause morphometric changes of the placenta structure both of which can cause placenta inefficiency and other serious complications during pregnancy[13].

Low birth weight and intra-uterine growth restriction (IUGR) are frequently reported adverse perinatal outcomes associated with placenta malaria. Associations between placental malaria and birth weight have been reported in several studies[9, 14, 15]. Other studies have attempted to explain the mechanisms behind this association. A study suggested that the association between the parasite and low birth weight is IUGR and /or preterm delivery[16]. Another study suggests that placental vascular insufficiency is a cause of low birth weight[17]. The primary mechanism responsible for the negative prenatal outcomes is not fully understood.

Knowing how the placenta is affected when infected with the *Plasmodium* parasite will contribute to understanding pregnancy outcomes and management in the presence of the parasite. Furthermore, focusing more research on the morphological changes in the placenta, caused by the malaria parasite, is crucial for an effective intervention of the highly vulnerable population of pregnant women.

The aim of the study was therefore, to investigate the impact of *Plasmodium* parasites on the placenta and perinatal outcome at the Korle Bu Teaching Hospital. The specific objectives were, to determine the prevalence of placental malaria in the sampled population, to compare the gross placenta morphology of the study and control group, and to compare the perinatal outcome of malaria infested placentas and the control placentas.

Methods

Study design and setting

This was a case control study which involved a purposive sampling of the postpartum placenta of 118 patients at the Korle Bu Teaching Hospital (KBTH); a tertiary referral hospital in Accra, Ghana, with approximately 10,000 births a year.

Participants

The study participants were mothers delivering at the two labor wards of the Department of Obstetrics and Gynecology of KBTH, Accra, Ghana, during the day time shift (9:00-17:00) with the exception of weekends. All mothers who have delivered live singleton babies of pregnancies between 37-42 weeks of gestation were included in the study after signed informed consent. Women who did not give informed consent, had a medical history of HIV, were anemic (Hb record below 8g/dl in folder or had no Hb records) but tested negative for *Plasmodium*, sickle cell disease (SCD) or had an incomplete postpartum placenta were excluded from the study. Ethical approval to conduct the study was obtained from the Ethical and Review Committee of the College of Health Science, University of Ghana (Protocol Identification Number: CHS-Et/M.2 C/2017-2018).

Blood Examination

An immunoblot test kit (Immunetics Inc.) was used for the Rapid Diagnostic Test (RDT). A drop of whole blood collected from the maternal surface of the placenta and kept in K_2EDTA was placed on the sample column of the test kit after which four drops of the lysing buffer was added. The results were read within five minutes after application of the blood, following the manufacturers instruction and key for interpreting the results. The results were recorded as RDT positive or RDT negative. A grease free glass slide with frosted end was used for the thick and thin films. For thin film, an amount of 2µl of a thoroughly mixed whole blood sample (some of which has earlier been used for the RDT) was pipetted and put at the middle of the slide. Using a fine edge glass slide spreader, the blood was spread rapidly at an approximate angle of 45^0 to get a thin monolayer as recommended in previous studies[18].

For thick film, 5 µl of the blood was pipetted and place closed to the frosted end of the same slide having the thin film. The 5µl blood drop was spread circularly to obtain between 1-2cm thick smear. The stain was thick enough so that when the blood stained slide is placed on a newspaper, the newspaper prints was barely visible. The films were air dried for three hours at room temperature, after which the thin film was fixed in absolute methanol. Rapid Giemsa solution was prepared by adding buffered solution (pH 7) with concentrated Giemsa to prepare a 10% Giemsa solution. Then both the thick and thin blood smears were stained for 5 minutes in the 10% Giemsa solution. Afterwards, the slide was rinsed gently for 1 or 2 seconds in a jar of tap water. Finally, the slides were dried and examined under the microscope.

Comparisons

After the blood smears, an examination of the placenta was done in the labor ward within two hours of delivery. The umbilical cord was clammed and blood clots on the maternal surface of the placenta were removed. Quantitative data such as the weight (g), volume (ml), diameter (cm), thickness (cm), and surface area (cm^2) of the placenta were recorded. The widest stretch of the placenta was measured as the placenta diameter whilst the thickest part of the placenta was measured as the placenta diameter whilst the thickest part of the placenta was recorded as the placenta thickness. The circumference was measured by tracing around the placenta edges with a string. The string was then stretched into a straight line and measured to obtain

the circumference which was then used to determine the surface area. Afterwards, the placenta was placed into a premeasured bowl and the bowl with the placenta was put onto a scale to measure the weight of the placenta. The volume of the placenta was measured by placing the placenta into a bowl filled with water to the brim. The water displaced out of the bowl was measured in a volumetric cylinder to obtain the volume of the placenta.

The perinatal outcome, birth weight (kg) and APGAR scores were also recorded and compared.

Statistical Analysis

The data from the patients' questionnaire and from the placenta examination were transferred and recorded digitally using excel (Microsoft company, USA). To analyze the data from the placenta examination, the data of the placentas were divided into two groups. Patients with confirmed laboratory results of parasitemia during gestation, malaria parasites seen under light microscopy, and/ or with positive RDT results from the placenta blood constituted the study group. Patients with no malaria parasites seen under light microscopy and had negative RDT results constitute the control group. Before comparing the data, each mother from the study group was paired with a mother from the control group that had similar age and gestational age at delivery. Quantitative variables were compared using Student T-test. The control and study groups were further selected and subdivided into those who delivered early term (37-39 weeks, 6 days gestation) and those who delivered late term (40-42 weeks gestation), based on record of early ultrasound scan or early ultrasound scan and self-reported LMP before performing the statistical test. Results of the analysis were considered statistically significant at 95% confidence interval (CI) with $p<0.05$.

Results

Flow chart of patients throughout the study is shown in Figure 1. Sixteen (16, 13.6%) out of 118 women tested positive for *Plasmodium* parasites whiles the rest (102, 86.4%) had no history of malaria in the index pregnancy and tested negative (Fig. 1). Socio demographic characteristics of the patients in the control and study group were similar. Majority of the patients in the control group fell within the 26~30 age group whilst the majority of the patients in the study group were from the age group ≤25. Majority (>57%) of patients in both the control and study group had blood group O. More than half (≥50%) of patients in both the control and study group had gravidity equal to or greater than 3 (Table 1).

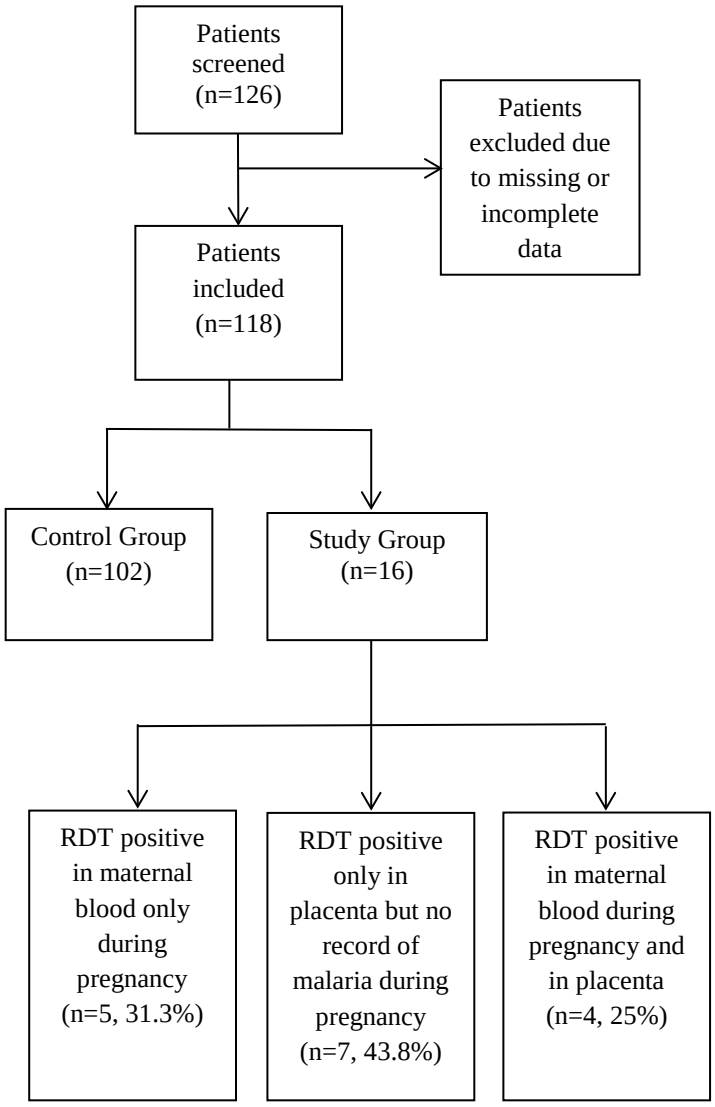

Fig.1 Flow of patients in the study

Placenta Examination

Among the various morphological comparisons with an unpaired t-test, the placenta weight, the placenta diameter, and the perinatal outcome (birth weight) revealed statistically significant differences (95% CI, $p<0.05$) between the two patient groups.

The mean placenta weight of study group patients who delivered early term (Mean standard Error of the mean; SEM) (455.5g SEM 31.1) was significantly lower than the mean placenta weight of the control group (557.5g SEM 30.4, n=10 in each group, p=0.02) (Fig. 2). However, in the case of patients who delivered late term, the mean placenta weight of the study group (563.3g SEM 43.0) was not significant different from the controls (548.8g SEM 40.4, n=6 in each group, p=0.67).

Table 1 Socio demographic characteristics of patients

Variables	Control N (%)	Study N (%)	Total N=118
Age Group			
≤25	15 (14.71)	6 (37.50)	21
26~30	38 (37.25)	4 (25.00)	42
31~35	29 (28.43)	5 (31.25)	34
≥36	20 (19.61)	1 (6.25)	21
Blood Group			
A	18 (17.65)	2 (12.5)	20
B	17 (16.67)	1 (6.25)	18
AB	4 (3.92)	1 (6.25)	5
O	59 (57.84)	11 (68.75)	70
Unknown	4 (3.92)	1 (6.25)	5
Gravidity			
1	22 (21.57)	4 (25.00)	26
2	27 (26.47)	4 (25.00)	31
≥3	53 (51.96)	8 (50.00)	61

n: number of patients in a group.

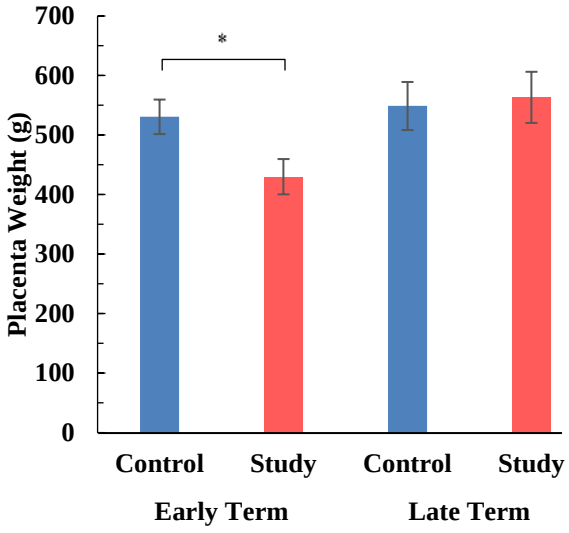

Fig. 2 The mean placenta weight (Columns) and error bars (±SEM) of the babies delivered to mothers infected with *Plasmodium* parasite during pregnancy (study group) was less than control at early term (n=10 each, p<0.05), but the difference in means was not significant at late term (n=6 each)

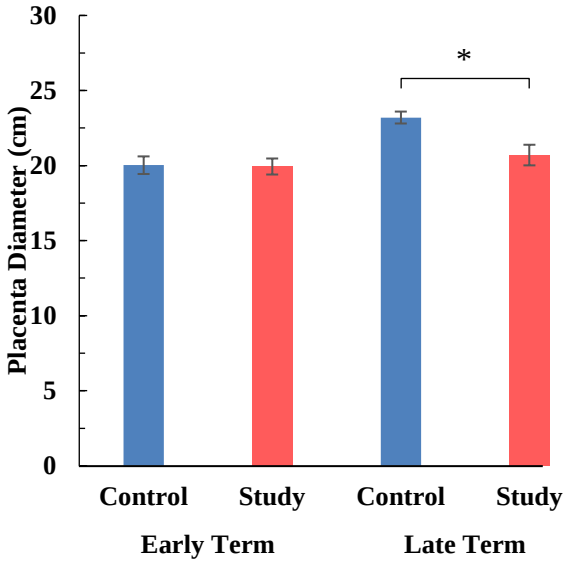

Fig. 3 The mean placenta diameter (Columns) and error bars (±SEM) of the babies delivered to mothers infected with *Plasmodium* parasite during pregnancy (study group) was less than control at late term (n=6 each, p<0.05), but the difference in the means was not significant at early term (n=10 each)

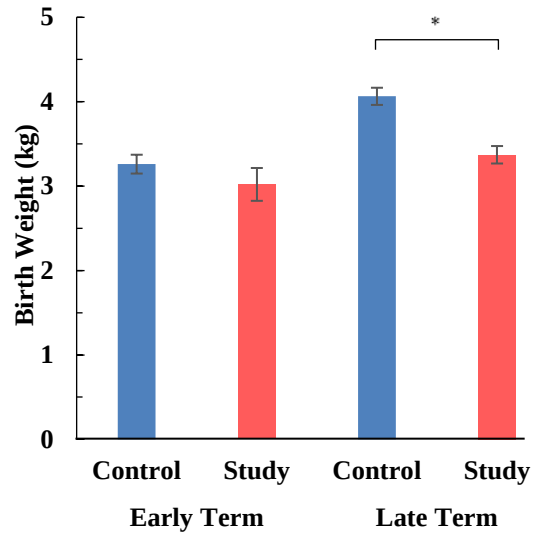

Fig. 4 The mean birth weight (Columns) and error bars (±SEM) of the babies delivered to mothers infected with *Plasmodium* parasite during pregnancy (study group) was less than control at late term (n=6 each, p<0.05), but the difference in means was not significant at early term (n=10 each)

The mean placenta diameter of study group patients who delivered early term was similar to that of the control group (19.9cm SEM 0.5 and 20.2cm SEM 0.6

respectively, n=10 in each group, p=0.67). For the late term patients, however, the difference in the mean placenta diameter of the study group (20.7cm SEM 0.7) and the control group (23.2cm SEM 0.4) was of statistical significance, p=0.003 (Fig. 3).

The mean birth weight of babies in the study group who were delivered early term, did not significantly differ from that of the control group who delivered early term (2.99kg SEM 0.1 and 3.34kg SEM 0.1 respectively, n=10 in each group, p=0.05). For the late term babies, however, the mean birth weights of the study group and the control group (3.37kg SEM 0.1, 4.06kg SEM 0.1 respectively) were statistically different, p<0.001 (Fig. 4).

Although the other morphological comparisons, namely: the mean placenta volume, surface area, thickness, as well as the Apgar's score revealed differences between the two groups, however, these differences were not of statistical significance (95% CI, p>0.05).

Discussion

Our study found 13.6% prevalence of malaria in the study population reflecting the endemic nature of the disease in the study population in spite of the use of intermittent preventive treatment with sulphadoxine-pyrimethamine during pregnancy.

The results of the comparison between the placenta weights of two groups were in agreement with previous studies which also observed a decrease in the mean weight of the malaria infected placentas[19, 21]. These changes may cause placenta insufficiency and adverse prenatal outcome. The results of this study give insight that the weight change in the placenta is more pronounced during early term. The cause for the significant differences recorded between the mean placenta weights in early term but not in late term is not clear, we can only hypothesize that the immature placenta is more susceptible to the malaria infection but as the pregnancy matures, there could be a compensatory role to rebuild itself, this might also depend on the time of infection and how effective the treatment was. We also observed a reduction in the mean birth weight of malaria associated pregnancies as reported in other studies[15,22]. The change in birth weights is more pronounced during late term and concurs with other studies which also reported a correlation between the placenta weight and the birth weight[23,24]. The mechanism responsible for the difference between early term (in placenta weight only) and late term (in birth weight only) is not certain. A possible explanation for this observation is that the placenta uses much of the energy for its compensatory reaction at the expense of the fetal metabolism as the pregnancy progresses to late term.

To our knowledge, this study represents the first instance in which multiple gross morphological characteristic (diameter, thickness, & surface area) have been compared between malaria-infected placentas and malaria free placentas. Past studies, however, established morphological changes such as macrophage concentration in the intervillous spaces, syncytiotrophoblastic damage, and trophoblastic basal lamina thickening as common features associated with placental malaria[19,20]. These changes observed in previous studies could explain the observation of significant decrease in the mean diameter of the placentas affected with malaria parasites in the present study. It can be inferred, that the effects of syncytiotrophoblastic damage, and trophoblastic basal lamina thickening are significant enough to reduce the placenta diameter. These changes could also explain the slight differences observed in the comparison of the means of placenta volume, surface area, and thickness in the two groups. This reflects on the intrauterine study of *Rijken et al*. who found that most placenta volumes in the *Plasmodium* infected women at 14-24 weeks' gestation were below the 50th centile for gestational age and in particular most of those with *Plasmodium falciparum* were below the 10th centile[25].

The strength of our study is the comparison between cases and controls at two timelines (early and late terms) and this reveals possible compensatory mechanism in the body's effort to protect the growing fetus during infection with the malaria parasite. This comparison was lacking in previous studies which put all term gestation as one group. One limitation worth mentioning is the fact that, our method of detecting placenta malaria could not identify when and how long the parasites were in the placenta. Morphological changes on the placenta are believed to be significantly greater if the placenta malaria occurred during the early stages of pregnancy compared to the changes if placenta malaria occurred later during pregnancy. However, our study focused on changes in the placenta that could only be examined post-partum without differentiation on the time of infection.

Conclusion

Among the various morphological and perinatal outcome comparisons, the placenta weight (for early term), the placenta diameter and the birth weight (for late term) revealed statistically significant differences (95% CI, p<0.05) between the two patient groups. The results add evidence that malaria parasites cause alterations to certain characteristics of the placenta which subsequently affects the birth weight as the pregnancy progresses to late term. Future studies could be focused on the follow up of the infants in the study group to determine the effect of the intrauterine infection on their developmental mile stones as compared with control infants.

List of Abbreviations

CHS - College of Health Sciences
CI - Confidence interval
Hb - Hemoglobin
HIV - Human immunodeficiency virus

IUGR - Intra-uterine growth restriction
KBTH - Korle Bu Teaching Hospital
NICU - Neonatal intensive care unit
NMCP - National Malaria Control Program
OPD - Out patients' department
RDT - Rapid diagnostic test
SEM - Standard Error of the Mean

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CASE REPORT

NEAR MISS: A CASE OF RUPTURED RUDIMENTARY HORN PREGNANCY MANAGED AT A TERTIARY CENTRE IN GHANA

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Abstract

Objective: To increase awareness on the potentially life-threatening consequence of rudimentary horn pregnancies, and to reiterate the need for elaborate obstetrics and gynaecologic ultrasound scans to enable early diagnosis. This is the second reported case of this condition in Ghana, and the first in our hospital in its 20 years of existence.

***Case Report and Interventions*:** A 26-year old with two previous uneventful pregnancies and vaginal deliveries presented at 33 weeks with a classical clinical picture of haemoperitoneum secondary to a spontaneous uterine rupture and a class IV haemorrhagic shock. Her antenatal records were nil of significance for risk factors for spontaneous preterm uterine rupture. She was resuscitated and had a successful laparotomy which revealed a unicornuate uterus with a ruptured non-communicating rudimentary horn pregnancy. She recovered remarkably post-operatively. Though she delayed in reporting her symptoms, the prompt management with adherence to referral protocols was life-saving.

Conclusion: The diagnosis of rudimentary horns can be quite challenging, but the consequences of a missed diagnosis can be life-threatening. Clinicians and sonographers need to consciously look for such anomalies in their routine gynaecologic and obstetric ultrasound scans. There must also be a high index of suspicion for a ruptured rudimentary horn in a spontaneous pre-term rupture of an unscarred uterus.

Key Words: Rudimentary horn, post-rupture, haemoperitoneum

Introduction

Unicornuate uterus forms 2.5-13.2% of uterine malformations[1]. It is a Class IIb under the Buttram and Gibbons classification of 1979,[2] and a V0C0U4aA0M0 under the VCUAM classification developed by Oppelt et al in 2005[3]. A rudimentary horn may exist in a unicornuate uterus due to incomplete development of one mullerian duct associated with the partial fusion of the contralateral one. It accounts for 74% of all unicornuate uteri. This rudimentary horn may or may not be communicating with the endometrial cavity of the unicornuate uterus. 70–90%, however, are noncommunicating[4]. The horn may or may not have an endometrium and when it does, there may be haematometra. Endometrial tissue can also escape into the peritoneal cavity through the tubes and hence cause endometriosis. Haematometra and endometriosis can therefore cause chronic pelvic pain[5]. A common association of unicornuate uterus is renal malformation, which is seen in 36% of cases. In view of this, it is important to investigate such women for these anomalies[6].

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Conflict of Interest: None Declared

Pregnancy in a non-communicating rudimentary horn is uncommon. It occurs in 1 in 76,000 pregnancies and they usually terminate by rupture in 50% of cases[4]. The pregnancy occurs through the transperitoneal transfer of the spermatozoon or the fertilized ovum and they are associated with poor reproductive outcomes because of increased abortion rate and low fetal survival rate. In isolated cases, a live infant may be delivered, but 70-90% of the cases terminate in rupture before the 20th week. The rupture of a rudimentary horn pregnancy can occur between the 5th and the 35th week, depending on the thickness of the myometrium of the horn and its ability to hypertrophy and dilate[6]. Mauriceau[7] reported the first case of a ruptured rudimentary horn in 1669[6,7]. Several others have subsequently reported rudimentary horn pregnancies, but until 2008 when Buntugu et al.[8] published one in Ghana, there was no such report from West Africa, and none has been reported after.

Diagnosing a rudimentary horn pregnancy can be very challenging even with the advancement of diagnostic imaging. It is even more difficult to suspect in a woman with prior vaginal delivery. Rudimentary horn pregnancies are usually detected after rupture. Advanced sonography and magnetic resonance imaging (MRI) have made pre-rupture diagnosis possible in several instances. Tsafrir et al.[9] derived three sonographic criteria for the diagnosis of a rudimentary horn. These are: an asymmetric bicornuate uterus pattern; no continuity between cervical canal and the

lumen of the pregnant horn; and the presence of myometrial tissue around the gestational sac. It however requires expertise and a high index of suspicion[4,6,9].

Case report:

A 26- year- old Ms FT, G3P2AA, both by spontaneous vaginal delivery, with a 33-week pregnancy, reported to the hospital in an ambulance. A call had been placed by the referral hospital to our facility two hours prior to her arrival. The referral diagnosis was intrauterine foetal demise and severe anaemia.

The patient began experiencing generalized persistent abdominal pain five days prior to presentation. The pain was gradual in onset, but increased in intensity over the days. It was associated with easy fatigability and dizziness. She however did not report it until the day she was rushed to the Health Centre that offers her routine antenatal care. She was transferred to the referral hospital and brought to our facility on the same day.

The patient's two previous pregnancies and vaginal deliveries were uneventful. In this index pregnancy, she had had three antenatal visits at the rural health centre and had done one 2-dimensional obstetric ultrasound scan at 16 weeks, which showed a normal intrauterine gestation.

She arrived in an ambulance with intranasal oxygen and a unit of blood in-situ. Earlier, she received two units of blood at the referral centre. The facility duly informed our unit about the patient's state, the interventions carried out and their limitations with respect to further management. The patient was in class IV haemorrhagic shock on arrival: blood pressure was 60/40mmHg; pulse - 129 beats per minute, weak volume and thready; respiratory rate was 32 cycles per minute; oxygen saturation was 84% on intranasal oxygen. A full blood count at our facility revealed a haemoglobin level of 2.1g/dl. Foetal heart beat was absent on auscultation.

A quick examination and abdomen-pelvic ultrasound scan revealed haemoperitoneum and foetal demise. An exploratory laparotomy was performed immediately under general anaesthesia and the intraoperative findings were: haemoperitoneum of about 2 litres; ruptured right non-communicating rudimentary horn; macerated 2.0kg male baby extruded into the peritoneal cavity; a partially-separated placenta in the rudimentary horn. The right ovary and the contralateral tube were normal. Exploration of the pelvis revealed no pelvic kidney. The rudimentary horn was excised, and the uterus repaired. An ipsilateral salpingectomy was also performed. Two units of whole blood were transfused intra-operatively and three more after surgery. Immediate post-operative condition was satisfactory and her recovery from the surgery - remarkable. She was discharged on day seven after surgery in a stable state. An abdominopelvic ultrasound scan done before discharge showed no gross renal anomalies. In order to rule out an ectopic ureter, duplication of the renal pelvis and a medullary sponge kidney, an intravenous urogram (IVU) was requested, but this could not be done at that time due to financial challenges on the part of the patient. She was to be reviewed a week later at the outpatients' department with the IVU report, but was lost to follow-up.

Fig 1: Ruptured Rudimentary Horn

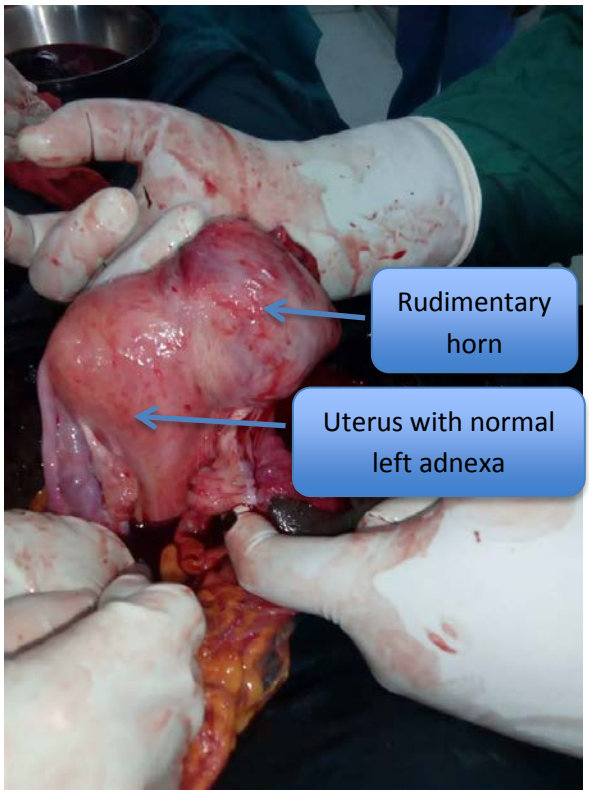

Fig 2: Posterior view

Discussion

The pregnancy occurred in a horn that was not communicating with the uterine cavity. It could either have occurred as a result of a transperitoneal transfer of spermatozoon, which then fertilized an ovum released by the right ovary or a migration of the fertilized ovum from the uterine side to the rudimentary horn through the right tube.

In the case of Ms FT, the uterine anomaly was not diagnosed with her 16-week ultrasound scan. This could be due to the fact that the condition is rare, and hence not actively looked for on routine obstetric scans. It may also be due to minimal expertise or experience of the sonographer and the possible lack of sophisticated ultrasound machines in that rural area. If it had been suspected earlier, more advanced imaging techniques could have been employed and this near-miss averted.

Again, the rupture occurred neither in the first nor the second trimesters as is often reported, but in the third trimester (33 weeks). This buttresses the point that some rudimentary horns with thick musculature can contain a pregnancy to a later gestational age, making the diagnosis more unsuspecting, and the consequences - dire. It is therefore important to emphasize the application of the three diagnostic sonographic criteria mentioned earlier in all obstetric and gynaecologic scans.

In this case report, the interventions were swift and timely, both at the referral and receiving centres. The pre-referral telephone call was an important contributory factor to averting this near-miss, as it enabled us to prepare adequately to receive and manage the patient.

Conclusion

This case report highlights the maternal/ foetal mortalities and near-misses associated with rudimentary horn pregnancies. It is clear that although obstetric ultrasonography has become more available to us than previously, rudimentary horn pregnancies can still elude us. A high index of suspicion and adequate expertise are therefore required for pre-rupture diagnosis. This case also prompts us to suspect a congenital uterine anomaly in a preterm unprovoked rupture of an unscarred uterus. An effective referral (where necessary) and swift and timely interventions are the keys to successful management of a ruptured rudimentary horn.

Recommendations

In view of the above, we recommend that sonographers be adequately trained to apply the three diagnostic sonographic criteria for the detection of rudimentary horn pregnancies. We should also hasten steps to regulate the seemingly booming business of ultrasound in the country.

Finally, we recommend that, as standard protocol demands, pre-referral telephone calls should be strictly adhered to. All hospitals must make their telephone numbers available and accessible to peripheral centres for easy communication and joint management of emergencies.

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ABSTRACTS / PROCEEDING: 1ST CAPE COAST TEACHING HOSPITAL SCIENTIFIC RESEARCH CONFERENCE

THEME: OPTIMISING OUTCOME OF HEALTH CARE DELIVERY: THE ROLE OF RESEARCH IN POLICY DECISION MAKING IN (CCTH) GHANA.

EVALUATION STUDY: EFFECTIVENESS OF THE E-HEALTH PROJECT IMPLEMENTATION AT CAPE COAST TEACHING HOSPITAL, GHANA, AND ITS IMPACT ON QUALITY HEALTH CARE

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Abstract

***Background/Objective*:** The objective of the study is to evaluate the effectiveness of the E-Health (EHR) Project Implementation (LHIMS Software) at the Cape Coast Teaching Hospital and its impact on patients' waiting time and Health Information Management System.

Implementing electronic health records system is a challenging one worldwide especially in developing countries considering the needed resources (technology and capacity building) and willingness of workers to change. However, the Ghana Ministry of Health (Ghana – MOH) in recognition of the benefits, made a policy decision to pilot the e-health (EHR) system at the Cape Coast Teaching Hospital (CCTH) in the Central Region of Ghana with the use of the Light Wave Health Information Software (LHIMS). The project was rolled out in January 2018.

Method: the study was conducted at the Cape Coast Teaching Hospital (CCTH), Ghana. A cross sectional design approach was used and a semi-structured questionnaire was administered to 307 CCTH staff and 197patients by using purposive sampling method. An observatory data collection approach was also used to monitor 30 of the patients at the outpatients' clinic to measure their waiting time (from entry into the hospital to exit at the pharmacy) under the e-health project. Data was analysed with Microsoft Office Excel 2016 and presented in the form of evaluation logical framework table and charts.

Results: Staff response was 90% out of the 307 sampled whilst patients' response was 100%. Overall, the average waiting time for OPD recorded a reduction to 1 hour 36 seconds after the introduction of the E-Health system in 2018 compared to the 2 hours under the Patients-folder system (paper system) recorded in 2015. The average waiting time in the consulting room was 17 minutes 33 seconds whilst the triaging area recorded 15 minutes 4 seconds. Eighty-six percent (86%) of the patients were satisfied with the e-health system. Fifty-nine percent (59%) of staff were able to access/generate performance report/data from the LHIMS software. Eleven (11%) of the staff indicated there were inadequate computers whilst 49% complained about interrupted power supply and internet network instability. There are bottlenecks in report and electronic financial claims (E-Claims) generation.

***Conclusion*:** The patients' waiting time has evidently improved under the e-health project. Data capture and retrieval have also improved. The financial e-claims need a solution to enhance the efficiency of the project. However, more studies should be conducted to ascertain the reasons behind the key bottlenecks identified. Nonetheless, the project may be scaled up because of its inherent benefits.

A 6-YEAR ANALYSIS OF FATAL GUNSHOT INJURIES IN THE CENTRAL REGION OF GHANA

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Abstract

Background*:* Despite many newspaper reports of fatal gunshot injuries in Ghana, there are no published data on gunshot fatalities. Our objective was to determine the demographical characteristics of victims of fatal gunshots in addition to the incidence, social characteristics and forensic characteristics of these fatal gunshots in the Central Region of Ghana.
Method**:** Existing autopsy records including Coroner's inquest forms in the Department of Pathology of Cape Coast Teaching Hospital (CCTH) were searched from 2011 to 2017. The demographic, forensic and social characteristics of victims of fatal gunshot injuries were reviewed and data entered into Excel and analyzed.
The circumstances of the resulting deaths were mostly related to hunting (27.5%), social
Gatherings/public unrest (27.5%), household accidents involving children (20.0%) and armed robberies (17.5%). The commonest firearm used were shotguns (85%).
Results: A total of forty (40) deaths due to gunshot injuries were recorded over the 6-year period of the review with an annual incidence of 0.3 per 100,000 population. Most victims were young adult males (95%), with a male to female ratio of 19:1.
Conclusion: Fatal gunshots are not uncommon in the Central Region of Ghana. The demographical characteristics of victims are identical to those reported in the literature, with fatalities mostly occurring in young adult males. Shotguns are the commonly used type of gun in fatal gunshot injuries. There is a high number of accidental gunshot fatalities involving children in the rural areas of the Central Region.

EVALUATION OF SURGICAL OUTCOME OF CATARACT OPERATION AT CAPE COAST TEACHING HOSPITAL

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Abstract

Background/Objective**:** This study seeks to evaluate surgical outcome of cataract operation among 86 clients at age 40 and above at Cape Coast Teaching Hospital**.** Cataract is the principal cause of low vision and avoidable blindness in the world. In fact, there are more cases of cataract worldwide than there are of glaucoma, macular degeneration and diabetic retinopathy according to Prevent Blindness America (PBA).
Methods**:** The study was a prospective cross-sectional one. Data was collected on patients aged 40 years and above who were to undergo age-related cataract surgery. A structured questionnaire was administered over a period of 7 months. Data was analyzed using SPSS version 20.0 with the results being presented in the form of tables and charts.
Results**:** A majority (73.8%) of the patients before the surgery had poor vision; a few (25.0%) had moderate vision and about 1.2% had borderline vision. After the surgery, 17.4% of the patients still had poor vision, more than half (57.1%) had moderate vision and 25.0% of the patients had good vision. Finally, when the patients were asked to rate the surgery process based on their current state of vision, more than half (55.0%) of the patients rated the operation as being successful, 31.0% rated it as average and 14.0% of the patients rated the surgery as a failure
Conclusion: The study showed that, there was positive impact on the vision level of most of the patients after the surgery.

PERCEPTION ON PROPHYLACTIC MASTECTOMY AMONG NURSES

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Abstract

Background: Breast cancer is the most frequently diagnosed cancer among women in 140 of 184 countries worldwide. Globally breast cancer represents one in four of all cancers in women. This therefore needs urgent preventive strategies to curb the disease.
Aim: To determine the perception of female nurses on prophylactic mastectomy.
***Method*:** The research was conducted at the Cape Coast Teaching Hospital. A descriptive study was conducted with structured questionnaires used for data collection. A sample size of 100 female nurses was determined with convenient sampling method. The Statistical Package for Social Sciences was used to analyze the data collected and they were presented in the form of charts and tables.
***Results*:** Out of the 100 respondents sampled for the study, 97% had knowledge on breast cancer. A total of 53% respondents are aware of the existence of prophylactic mastectomy. Six-seven percent (67%) of the respondents indicated that, they will opt for prophylactic mastectomy should the need arise. However, 33% of the respondents said otherwise. Fifty-five percent (55%) will opt for prophylactic mastectomy if adequate information was given to them. Five percent (5%) said their religion will not allow the removal of body parts. Twenty-eight percent (28%) of the respondents were concerned about stigmatization and 23% also said their partners will object to the procedure being carried out.
Conclusion: Education on voluntary prophylactic mastectomy should be intensified and more research should be conducted on the subject to reduce the rising incidence of breast cancer.

PATTERNS, INDICATION AND OUTCOME OF LIMB AMPUTATION IN CAPE COAST TEACHING HOSPITAL; A FOUR-YEAR RETROSPECTIVE STUDY

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Abstract

***Background/Objective*:** Limb amputation is reported to be a major but preventable public health problem that is associated with profound economic, social and psychological effects on the patient and family especially in developing countries where the prosthetic services are unavailable, inaccessible or unaffordable. The purpose of this study was to outline the patterns, indications and outcome of limb amputations and to compare the findings with other published data.
***Method*:** A retrospective study, covering a 4-year period, involving 126 patients was carried out. Data was obtained from patient theatre record books and folders and analyzed using SPSS and MS Excel.
Results: Most of the patients were in the 6th and 7th decades of life. There were more females than males (1.2:1). Diabetic foot gangrene was the commonest indication for the amputation of a limb involving 54 (42.86%) patients, followed by peripheral vascular disease 43 (34.13%) and trauma 12 (9.52%). Below knee amputation was the commonest procedure performed (43.65%). More than half (61.1%) of the patients had no immediate complications.
The commonest complication was surgical site infection (21.43%), followed by phantom pain (7.94%) and then necrotic stump (5.56%). Most of the patients (96.8%) who had amputations were discharged home, and none of them were discharged with prosthesis. Mortality rate was found to be 3.20%.
***Conclusion*:** The commonest indication for limb amputation was diabetic foot gangrene occurring more commonly in females in the 6th and 7th decades of life. Below knee amputation was the commonest type of amputation done with surgical site infection being the most common complication. If diabetic foot care education is properly done, traumatic conditions are prevented, and chronic diseases such as diabetes are carefully managed, there will be a significant reduction in limb loss following trauma or diabetic foot syndrome.

A FAILED BILATERAL TUBAL LIGATION WITH A SUCCESSFUL MEDICAL MANAGEMENT OF A LEFT TUBAL PREGNANCY: A CASE REPORT

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Abstract

***Background/Objective*:** Female sterilization is the most popular permanent contraceptive in the world. Bilateral tubal ligation (BTL) method failure is rare but can occur. Therefore, pregnancy should be excluded for every woman in the reproductive age group who presents with a missed period, irregular bleeding or pain after tubal ligation and the location confirmed sonographically since ectopic pregnancies are common among failed BTL clients and early detection of ectopic pregnancy makes it possible to explore the full range of management options.

The objective is to highlight the rare possibility of a BTL method failure and to emphasize on the medical management as a viable option for ectopic pregnancy even in a resource constrained environment.

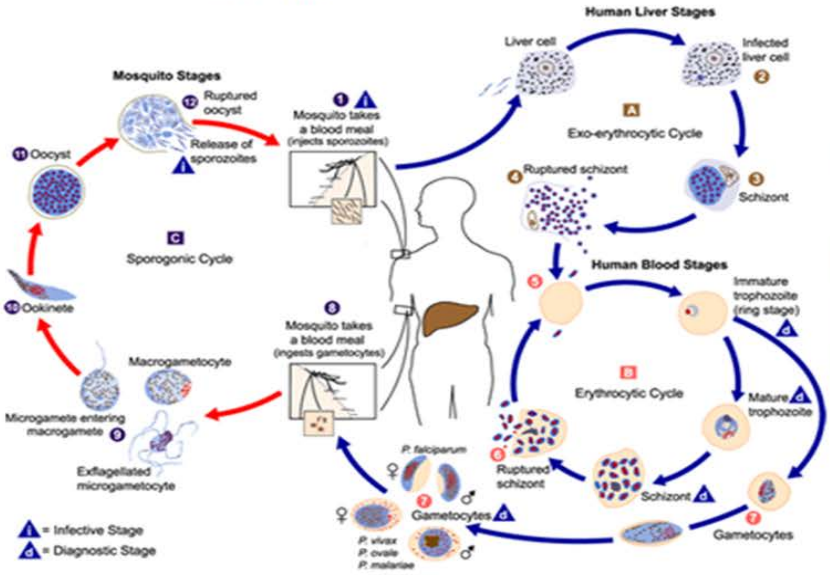
***Case Report*:** We report on a 34-year old now P^{3+2} with 3 previous caesarean sections who had an ongoing left tubal ectopic pregnancy 13 months after BTL was done during last caesarean section. The patient reported early because the pre-procedure counselling included the possibility of a method failure and early recognition of the ectopic pregnancy made it possible to medically manage the client successfully with a single dose methotrexate. Prompt response to the patient's complaints averted a legal suit.

***Conclusion*:** BTL failure is rare but possible as was seen in this case and should be mentioned in routine counselling. Early health-seeking behaviour and pregnancy detection with patient's compliance made the medical management of the ectopic pregnancy a success. Prompt attention to patients' complaints and a good professional rapport between patients and health workers may avert possible medicolegal tussles.

FROM THE PAST

MALARIA

The malaria Cycle



The female anopheles mosquito

Child with cerebral malaria

Malaria is transmitted to man by the bite of an infected female anopheles mosquito. The causative organism is the *Plasmodium*.

The important plasmodia that cause human malaria are P. falciparum, P. vivax and P. malariae.

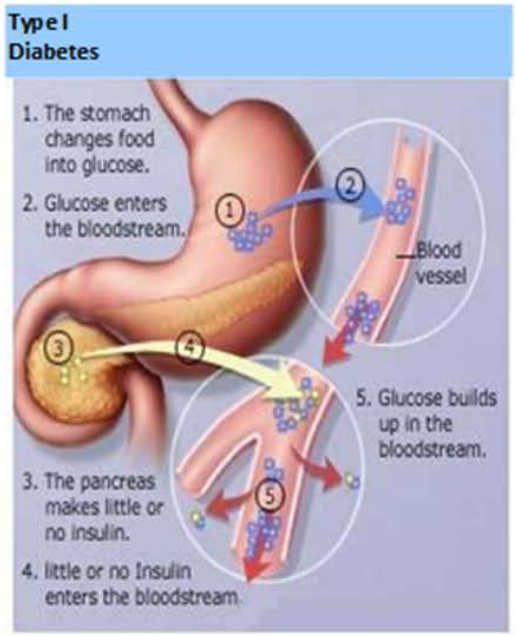
It is characterized clinically by fever, which is often periodic; varying degrees of anaemia; splenic enlargement; and various syndromes resulting from the physiological and pathological involvement of certain organs including the brain, the liver and the kidneys.

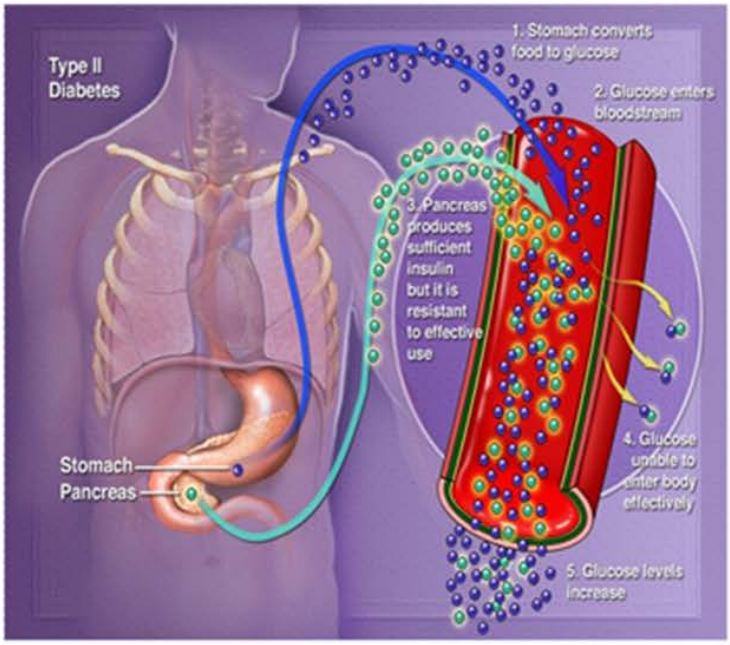
Malaria kills about one million people a year worldwide. It is the leading killer in under 5 mortality in Ghana.

About $772 million (this constitutes 6% of GDP) is spent yearly to treat malaria in Ghana.

Treatment: Historically, first with quinine. Later chloroquine was the standard. Resistance to drugs is a worrying problem. Current treatment is Artesunate + Amodiaquine.

DIABETES





Diabetes mellitus is a set of related diseases in which the body cannot regulate the amount of sugar (specifically, glucose) in the blood. Diabetes comes in two types—Type 1 diabetes and Type 2 diabetes.

In type 1 diabetes the body stops producing insulin or produces too little insulin to regulate blood glucose level. People with type 1 diabetes require daily insulin treatment to sustain life.

In type 2 diabetes the pancreas secretes insulin, but the body is partially or completely unable to use the insulin. This is sometimes referred to as insulin resistance. Type 2 diabetes is usually controlled with diet, weight loss, exercise, and oral medications.

GHANA COLLEGE OF PHYSICIANS & SURGEONS

ANNUAL GENERAL AND SCIENTIFIC MEETING 2019

Theme: Disability: Health and Socio-Economic Impact

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9.00am	Opening Ceremony	9.00am	Plenary Session	8.30am	Divisional Board Meetings
10.00am	College Lecture	11.00am	Scientific Session I	10.00am	Ethics Seminar
11.00am	Induction of Newly Qualified Members and Newly Qualified Fellows	2.00pm	Scientific Session II	11.00am	Business Meeting for Members and Fellows
2.00pm	Faculty Meetings & Elections				
7.00pm	Annual College Dinner				

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Article
McLendon WW. A historical perspective as a compass for the future of Pathology. Arch Pathol Lab Med 1986; 110: 284-288.

Book
Talbot CH. Medicine in Medieval England.Oldbourne, London. 1926 p 120-136.

Book Chapter
Philips SJ, Whisnan JP. Hypertension and stroke. In: Laragh JH, Bremner BM, editors, Hypertension: pathophysiology, diagnosis and management. 2nd Ed. New York: Raven Press, 1995, p465-478.

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