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EDITORIAL

COVID-19 PANDEMIC: EVOLVING PROBLEMS AND LESSONS LEARNT

Corona viruses are large viruses that affect animals and in rare occasions may become zoonotic. The transmission is by droplets or aerosols. Coughing, sneezing and handshake are dangerous modes of transmission. Fever, runny nose, sore throat, headache and loss of sense of smell are important symptomatology. Social or physical distancing, nose masking and hand washing are preventive measures that have been accepted globally.

The treatment protocol in some centres consisted of testing, isolation, hospitalization and the administration of hydroxycholoroquine, chloroquine, azithromycin, zinc, oxygen, methylprednisolone, doxycycline and ICU treatment in appropriate combinations. Hydroxychloroquine was initially accepted by the WHO which later withdrew it. So the world is still looking for an effective and affordable cure. Convalescent plasma is used for treatment in a few centres.

Fatalities have occurred globally with the USA, Brazil, Mexico, Britain, Italy and Spain losing a lot of their citizens. In Africa significant losses have occurred in S. Africa and N. Africa. The fatality rate for most of the rest of the African countries has been much lower but we do not know all the reasons.

The health delivery systems have been over-stretched in some countries. There have been new requirements as PPEs have to be obtained for all frontline workers at a tremendous cost to the nations. Despite the all hands-on- deck approach, the following are the figures obtained four months after recording the first positive CORVID-19 case in Ghana: 39,075 total positive cases, 3,313 active cases, 574 new cases, 199 deaths, 35,563 recoveries[1]. The Noguchi Memorial Institute for Medical Research, University of Ghana (NMIMR), and the Kumasi Centre for Collaborative Research, KNUST, (KCCR) have led the country in testing for the virus. The Ga East Municipal Hosp, Univ of Ghana Medical Centre, Ridge Hosp, Korle Bu Teaching Hosp, Univ. of Health and Allied Sciences, Ho, Komfo Anokye Teaching Hosp, Tamale Teaching Hosp, Pentecost Convention Centre, Nyaho Hosp, and the 37 Military Hosp are notable institutions that have treated some of the patients successfully. The Cape Coast Teaching Hosp, Effia- Nkwanta Hosp and the other regional hospitals have been converted to treat the COVID-19 patients.

Since 6th May, the UNESCO estimated that 177 nations had closed down schools affecting 1.2 billion learners to slow down the spread and mitigate the effect on health systems[2]. In Ghana 9.2 million pupils and 0.5 million students in tertiary institutions have been affected. The financial and psychological cost of online studying were high for the learners/students as well as the teachers.

About 77.7% of households in GH experienced a decrease in income since 16th March 2020 since the COVID-19 struck in Ghana. GH Statistical service (3). It is an emerging disease. The WHO and other world bodies tasked to solve the pandemic have also been under severe strain because the picture of the pandemic changes rapidly from time to time. The protocol for management has been challenged by political leaders many a time and nations have varied greatly with their approach, therefore resulting in varied results in terms of morbidity and mortality. The USA alone has lost about 170,000 patients so far and the need for a cure and vaccine has become paramount.

There is an urgent need to develop a vaccine and many nations have shown a lot of interest. China, USA, Germany, Britain, France and Russia are at the forefront. It would be prudent to have a coordinating body for all the endeavours but now the USA has withdrawn its membership from the WHO.

If we follow the science and data, we could use the preventive measures to reduce the effects of COVID-19. The cure or vaccine will take more time to come. The economy has to be re- built after the serious down-turn due to the COVID-19. We need to document the events completely and honestly for posterity.

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COMMENTARY

SPONTANEOUS MASSIVE FETOMATERNAL HEMORRHAGE

Transfer of fetal blood into maternal circulation occurs in most if not every pregnancy. This phenomenon was first proposed by Wiener in 1948 and later confirmed by Chown in 1954[1]. In the absence of antecedent events, the volumes of fetal blood involved are relatively small. Fetomaternal Hemorrhage occurs in 50% of pregnancies and in 1% of cases, the volume will exceed 40 ml[2]. Fetomaternal Hemorrhage generally refers to the entry of fetal blood into maternal circulation before or during delivery. Spontaneous massive fetomaternal hemorrhage is a relatively uncommon phenomenon which is said to have occurred when fetal blood loss into the maternal circulation is more than 150 ml or more than half the fetal blood volume[3]. In spontaneous FMH, there is no preceding history of trauma or clinicopathologic evidence of abruption.

There is no universal consensus on the definition of what constitutes a massive fetomaternal bleed. Massive fetomaternal Hemorrhage is commonly defined as bleed of more than 20% of fetal blood volume or a bleed associated with a Middle cerebral Artery Peak Systolic Velocity (MCA PSV) of more than or equal to 1.5 MoM[4]. These definitions are generally used because a bleed of more than 150mls is associated with severe fetal morbidity and mortality whiles an MCA PSV of the magnitude above is associated with moderate to severe fetal anemia. Some authorities also define it as a bleed of 30 ml to 150 ml of fetal blood[2]. Some experts however believe the interpretation of what constitutes a massive fetal bleed should be made with the fetal size and gestational age in mind. Fetoplacental blood volume is approximately 120 ml/kg estimated fetal weight before 32 weeks and 100 ml/kg after 32 weeks.

Spontaneous Massive FMH can be acute or chronic. In the case of an acute episode, it can result in a rapid fetal hemodynamic collapse and death. In chronic cases on the other hand, it can lead to severe anemia and hydrops.

FMH occurs mostly in the third trimester. Hemorrhage occurs mainly across the terminal villi at the vascular syncytial membranes which consists almost entirely of capillary membranes with little or no intervening stroma. The exact pathogenesis of fetomaternal hemorrhage however remains unclear. In a study that looked at the histology of placentae, retroplacental hemorrhage, intervillous thrombi and infarction within the placental bed increased the likelihood and extent of the hemorrhage[5].

Spontaneous massive FMH can occur at any time during pregnancy. In some cases, fetal death may be the only presenting sign. In a massive nonlethal FMH, the presenting sign may be an abnormal fetal heart rate pattern or a maternal report of a decreased perception of fetal movement. In chronic cases, fetal anemia may lead to hydrops. Further still, in some cases however, the diagnosis is retrospective since there are no signs or symptoms. In a review of cases of severe fetomaternal hemorrhage, 26.8% of patients presented with decreased perception of fetal movements[6]. In women with decreased perception of fetal movements, fetal heart rate patterns such as a sinusoidal pattern, absence of accelerations, recurrent late decelerations and fetal tachycardia should prompt one to think about the possibility of a FMH[7]. In a case series where fetuses had decreased body movement, evaluation of the middle cerebral artery peak systolic velocity was found to be a useful predictor of fetomaternal hemorrhage. In some cases, FMH presented as an unexplained neonatal anemia[8].

In order to detect a massive FMH, one should have a high index of suspicion. The evaluation of a massive FMH includes a detailed history, clinical examination and investigations. Tools used in investigating these cases will include cardiotocography, ultrasonography, and the Kleihauer Betke Assay or flow cytometry. Testing for FMH should be done when women present with decreased perception of fetal movements and also show signs of fetal anemia. These signs may include a sinusoidal FHR pattern, an elevated MCA PSV or fetal hydrops on ultrasound. In some centers, testing for FMH is done in all cases of reduced perception of fetal movement.

Of the various investigations employed, the Kleihauer Betke Test and Flow Cytometry are the definite tests used to quantify the extent to FMH. The Kleihauer Test has been the main test for diagnosis in most laboratories. It involves the separate counting of adult Hemoglobin A cells and fetal hemoglobin F cells. The Kleihauer Test is reported as a percentage. In most cases, maternal blood is assumed to be 5000 mls. Thus, if the test result is 1%, the extent of FMH will be 0.01 x 5000 mls which is 50 mls[9]. Flow cytometry is the other method of assessing FMH. It has been shown to be more accurate, more reproducible and less labour intensive. Many laboratories now prefer it to the Kleihauer Betke Test[10].

There are very few evidence based guidelines on the management of massive spontaneous FMH. This is generally because the condition is not quite common and the available evidence in literature is mostly limited to case series. Guidelines are therefore generally based on expert opinion.

Management depends on fetal status as determined by the various tests, the degree of anemia and the gestational age. Care of these fetuses is multidisciplinary. Care includes the Maternal and Fetal medicine specialist, Blood Transfusion specialist, Hematologist and Neonatologist.

Fetuses are generally divided into those with reassuring as against those with nonreassuring tests. Non reassuring tests will typically include sinusoidal waveforms and others as described above[7]. Viable fetuses with nonreassuring tests will typically require delivery.

For the fetuses with reassuring tests (Biophysical Profile and NST) diagnosed with fetal anemia (MCA PSV ≥ 1.5 MoM) and with massive FMH (> 20%), management will generally depend on gestational age. Fetuses above 32 weeks can be delivered and offered transfusion as neonates.

For the fetuses that are viable but below 32 weeks, serial intrauterine transfusion with weekly monitoring is the available option.

In these cases, when there is evidence of ongoing FMH as evidenced by increasing MCA PSV or evidence on repeat Kleihaeur, delivery will be considered.

In low resource settings where the facilities for intrauterine transfusion are unavailable, preterm delivery and neonatal transfusion may have to be considered in most of these cases[11].

For the fetuses with reassuring tests (Biophysical Profile and NST) diagnosed with fetal anemia (MCA PSV ≥ 1.5 MoM) but without massive FMH (<20%), they can be followed up closely with serial FMH testing and fetal assessment. If FMH worsens, they can be treated as above, otherwise, they are carried to term and delivered.

Most experts recommend Caesarean delivery to prevent any further deterioration of the fetus due to fetomaternal hemorrhage.

In most of these cases, the rhesus negative mother is also at risk of alloimmunization due to exposure to red cell antigens. The appropriate dose of anti-D should be given based on the extent of FMH. The outcome of the fetus often depends on the rapidity of the FMH and the extent of blood loss. Long-term follow however is less well described. Even though recurrence has been reported in case reports, there is no clear recommendation on follow up.

In conclusion, massive fetomaternal hemorrhage can lead to severe perinatal morbidity and mortality, a high index of suspicion is needed to make the diagnosis.

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PUBLIC HEALTH PHYSICIANS: PREVENTIVE MEDICINE SPECIALISTS PERPETUALLY CONFINED TO MANAGEMENT AND ADMINISTRATION

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Summary

A medical specialty constitutes a branch of medical practice, in furtherance of medical education focused on groups of patients, diseases, skills, or philosophy acquired after a multiple-year residency, pursued after completion of medical school education[1]. Specialist training in Ghana, typically state-sponsored, is aimed to ensure availability of highly skilled doctors to boost a currently sparse population of medical specialists who typically function in new professional capacities after post graduate training as specialists or consultants; this attracts higher remuneration. Public Health specialists, unlike clinical specialists, face a career, (refutably though) defined by an unclear *professional* job description coupled with ambiguous professional expectations. A reliable escape from this conundrum remains that of application for public health advertised jobs that are inextricably linked to management that will be competed for with other staff of varied backgrounds. This, by deduction, implies that Public Health specialists in the Ghana Health Service have no *technical/professional job descriptions* aside that of *management* which largely otherwise continues to define them. *Management* is inherently not entirely professional/technical as it essentially constitutes a responsibility that other cadre of varied professional backgrounds with recognized organizational and coordination skills can perform. The possible risk of inadvertent human resource underutilization should be averted through development of *specific professional job descriptions* for all public health practitioners of varying backgrounds in the health service.

Key Words: *Postgraduate, medicine, training, doctors, specialization, public health.*

Introduction

A medical specialty constitutes a branch of medical practice, in furtherance of education focused on groups of patients, diseases, skills, or philosophy acquired after a multiple-year residency, pursued after completion of medical school education[1, 2]. The concept of medical specialization has characterized the practice of medicine for a long time as Galen indicates it was common among Roman physicians[3]. Modern medical Specialization evolved gradually through the 19th century while the informal social recognition of medical specialization developed before the formal legal system[3]. Considered largely arbitrary, the particular subdivision of medicine into specialties varies by country[4]. Specialization throughout history has largely been characterized by division into *surgical* (i.e. with an important part of diagnosis and treatment achieved through major surgical techniques) and *internal medicine* (i.e. with the main diagnosis and treatment never being major surgery) [3].

Anesthesiology is classified as a surgical discipline in some countries as it remains vital to the surgical process[3]. The European Union publishes its recognized list of specialties within the territory of the Union and European Economic Area[4]. Medical specialties in Ghana, North America and other areas are largely organized into *surgical* (i.e. specialties that focus on manually operative and instrumental techniques of treatment) and *medical* (i.e. specialties that focus on the diagnosis and non-surgical treatments) of disease[4]. Ghana and the West African Sub Region organize the two-tier medical and surgical specialization system.

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Public health physician specialists – postgraduate training

Specialist training in Ghana, (started in 1973 prior to which postgraduate medical and surgical training abroad, particularly in the United Kingdom)[4] provides key state-sponsored career progression opportunities for medical doctors after a stipulated period of continued service in state-owned public health establishments/facilities; a practicing medical doctor is typically therefore due for the pursuance of postgraduate studies after three years of continued practice.[6] Doctors in the private sector may also pursue postgraduate medical qualifications with self-sourced funding.[5] Prior to the founding of the Ghana College of Physicians and Surgeons, *GCPS*, in 2003, facilities in Ghana to train specialist doctors were not available.[7] Prior to this, postgraduate ambitions were pursued through the West African College of Physicians and Surgeons, head quartered in Nigeria.[7] Others sought training in other areas e.g. South Africa, USA, United Kingdom etc.[7]

Postgraduate training areas include all specialties of the medical profession and various commensurate sub specialty areas organized by the West African and Ghana College of physicians and Surgeons; new areas for specialization have been added to the currently existent programs.[6] Specialist training is aimed to ensure the availability of human resource, highly skilled to offer services that are deemed subjectively and/or objectively beyond the capacity of a currently available comparatively less skilled workforce; it additionally aims to boost a currently sparse population of highly skilled personnel with the addition of specialists and consultants.[5] Medical specialists, i.e. products of the above mentioned medical postgraduate colleges, therefore typically function in new capacities following completion of post graduate training programs.

Specialization (i.e. acquisition of additional qualifications) for doctors engaged with the public sector, is inextricably further therefore linked with significant financial implications for the state (both during the training period and after completion) as assumption of duty after completion also bears implications for an upward adjustment of monthly or annual remunerations of such highly skilled medical doctors.[9, 10] The *judicious* use and most equitable distribution of such a highly skilled medical workforce (who also attract comparatively higher remunerations after qualification) remains of essence from the human resource management perspective. The Ghana and West African Colleges of Physicians and Surgeons, among predominantly clinical specialties, have public (or community) health faculties that responsibly organize Public Health residency programs training doctors towards the award of qualifications, membership and fellowship in the tier of physicians.[6, 11] Graduates of *clinical specialties* organized by these postgraduate colleges, after completion of training, serve in capacities with well-defined professional (clinical) job descriptions. Medical doctors who specialize in the non-clinical specialty of public health from the postgraduate college's tier of physicians however, upon completion, contrarily have a professional course of specialist practice characterized by an unclear job description and unclear well-defined professional expectations.

Professional job description versus managerial position

Technical or *default professional* portfolios for the public health (physician) specialists in the current Ministry of Health (MOH) and Ghana Health Service (GHS) structure remain unclear. Clinical specialists, after residency training, perform specific and well defined clinical tasks deemed a default professional function commensurate with their newly acquired specialist qualification characterized by clear professional job descriptions; this responsibility is discharged within the context of well-defined organizational units and purpose-designed infrastructure. Jobs or professional responsibilities of these clinical specialists are not applied for nor competed for as they are deemed a smooth continuum of the individual's professional obligations. Public health specialists, trained by the physicians' tier of the same postgraduate colleges, after completion, contrarily typically only get a job through application and attendance of interviews with persons of varied professional backgrounds together with whom they keenly have to contest for various *management positions*; these jobs largely comprise *management positions* and should therefore not be defined as default *professional positions*; they essentially comprise executive positions. The image of the public health physician in the health service delivery system therefore, virtually, invariably, remains synonymous with one who typically occupying a *management position* or *aspires to one*. *Management* in this regard, may therefore not be technically consistent with a default *professional* job of a public health (physician) specialist or any other person with public health skills as it otherwise comprises only one competence from a spectrum of concepts that public health specialists are exposed to during postgraduate training.

The image of the public health worker who performs a specific routine technical/professional assignment (*while not necessarily being a manager or institutional or departmental head*) is currently probably only a feature in disease prevention and control documentaries and/or only known to exist in other public health establishments e.g. at the Centers for Disease Control, *CDC*, Atlanta; clinical specialists, by virtue of the availability of *specific professional job descriptions*, contrarily may therefore perform *professional* functions without necessarily being in *management positions*. An example may include the fact that clinical specialists at hospitals may choose to work as a *specialist doctors* with a clear *professional job description* (that is different from the *management job description*) without necessarily being the medical superintendent nor clinical coordinator of the hospital; though not *mutually exclusive*, the two capacities are *different*. While clinical specialists assume *professional work* soon after completion of postgraduate training at a specific designated and amply available work posts (following postings), public health (physician) specialists, contrarily but ordinarily have to apply for a job which is typically *managerial* and not *professional in nature*, attend interviews and compete for the particular *management portfolios* with cadre of varied backgrounds.

Implications therefore hold, in view of the above, that public health specialists, trained by the same postgraduate medical colleges have no *technical/professional job description aside that of management* which otherwise continues to define such specialists. Management is *inherently* not entirely professional or technical and therefore remains open to other cadre of varied professional backgrounds with recognized organizational and coordination skills

coupled with a relevant academic management background. *Management* therefore essentially, but not invariably boarders on individual abilities, capabilities or skills to lead an institution towards attainment of very specific objectives, not necessarily being directly representative of the *manager's background*; examples may include the fact that an engineering firm may have a CEO who is a lawyer with *excellent organizational skills to lead staff and enhance productivity. It also further, in this vein, remains a political fact that ministers of health are not always medical doctors*.

What would then, hypothetically, be the job description or duties of the public health specialist who is not keen on assuming a managerial capacity but actually only wants to work in a strict technical or professional public health portfolio? This, likely unnoticed, unavailability of any professional job description implies that the highly skilled workforce of public health physicians may be *inadvertently rendered redundant*.

Further *avoidable* implications of the current virtually inextricable association between management/administration and public health work for public health (physician) specialists is the *hypothetical* scenario in which vacancies for *management positions* may all be occupied at some point; what then would *professionally* define the job of the next generation of public health physicians from the postgraduate college in this hypothetical scenario? The unavailability of a *professional* job description may further also raise concerns on the objective basis on which remuneration is premised; the practice of public health physicians, and indeed all other public health workers is characterized by wide heterogeneity in designation together with staff of varied professional backgrounds mostly largely performing the same or similar duties yet not all being on the same remuneration scale.

Vacancies advertised at the Ghana Health Service and Ministry of Health all essentially comprise management portfolios and, further still, do not uniformly apply throughout the Regions and districts of the country.[12, 13]

Human resource management implications in the public sector

Newly qualified senior specialists are observably, *though not in accordance with any established conventions*, posted to teaching hospitals and regional hospitals while specialist i.e. doctors awarded 'membership of the postgraduate college' are observably posted to both Regional and district hospitals. Public health physicians are on the contrary, posted back to their regions/districts to fill in the *same capacity they occupied* prior to leaving for postgraduate training; the logical assumption of a new role or performance of measurably *additional* duties, commensurate with the newly acquired specialist skills, remains unreal in this regard. Despite the *unavailability* of a clear technical/professional job description for the public health physician specialist, *an upward review of remuneration (common to all other specialists) applies to the public health (physician) specialist as well.* The profitability to the state of an upward review of remuneration for cadre without *clear job description*s who only *arbitrarily* choose their own magnitude of work mainly per individual *discretion and conscience* remains questionable.

Despite an upward review of remunerations of public health physicians (soon after completion of their postgraduate training), the specific set of professional tasks that they should expectedly perform differently from the other public health practitioners in the service (e.g. disease control/surveillance officers, public health nurses, nutrition officers, health promotion officers, etc. who may also be in identical managerial capacities) remains inconspicuous. The public health physician specialist is therefore remunerated varyingly for performing assignments/jobs almost identical to that of other public health practitioners/cadres of varied backgrounds; District Directors of Health Services, a heterogeneous group of public health practitioners for example, perform the same *managerial* duties as public health physicians in the same position.

Is the public health physician specialist therefore remunerated on a specialist scale by virtue of having attended and completed a recognized postgraduate medical college or by virtue of ascension to a new capacity defined by clear higher professional responsibilities, expectations, increased physical demands etc.? This therefore calls for dispassionate policy debates to ensure any risk for silent *human resource wastage* is averted timeously. Leaving any particular human resource to *arbitrarily* manage itself in accordance with human discretion and conscience while placed on a specialist remuneration scale calls for policy review and clear policy directives with regards to specific *professional* job descriptions defined and characterized by clear, (and if possible, uniform) performance objectives.

Recommendations

Development of *specific professional job descriptions* for all public health practitioners of varying backgrounds in the health service is imperative to avert any possibility of underutilization of a highly skilled workforce. Hospital public health units should be strengthened to accommodate public health physician specialists who may not aspire to mainstream health management positions or administrative positions. Such public health specialists may therefore be tasked to be actively involved in the use of institutional data to extensively conduct research, a competence that is otherwise very silent in the public sector, i.e. outside academia. This may help strengthen collaborations between public health physicians and clinical specialists and help erase all existent dichotomy between public health and clinical medicine.

Management positions in Ghana are *fixed term positions* i.e. after four years, performance is reviewed and after eight years, a tenure expires subject to reapplication. Public health physicians whose *management* tenure eventually expires would only be left with the option of looking for another related *management* position as they would have no professional public health job to return to in this hypothetical scenario. Creation of a default professional portfolio remains therefore imperative.

Posting directives for public heath physicians, inextricably linked to a specific *professional* public health job description should be prioritized to help eliminate ambiguity of duty or purpose after completion of postgraduate training. Assumption of a specific specialist portfolio should not be linked to a prior conduct of interviews that public health physician must attend together with all other public health practitioners/cadres.

Training of public health physicians, at both membership and fellowship levels should be regulated till a technical/professional job description is developed to ensure a streamlined scope of standardized, near homogeneous practice for such highly skilled public health practitioners who also have comprehensive clinical backgrounds as they are medical doctors as well.

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ORIGINAL ARTICLES

ASSESSMENT OF HEARING THRESHOLD AMONG POST REPAIRED CLEFT PALATE PATIENTS IN KORLE-BU TEACHING HOSPITAL, GHANA

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Abstract

Objective: The aim of the study was to assess the hearing threshold in patients with repaired cleft palate and to determine the degree of hearing loss in various types of cleft palate.
Methods: This was a cross-sectional study which was conducted on 97 consenting patients with clinical diagnosis of repaired cleft palate at the Plastic and Reconstructive surgery unit, Korle Bu Teaching Hospital. The hearing loss threshold levels in the right and left cleft palates were then compared using Chi-square test of independence.
Results: A total of 97 participants who had cleft palate were seen that is 194 ears were examined. Most of patients had cleft of secondary palate (n=65, 67.0%), only one participant had cleft of primary palate only (1.0%) and the rest had cleft of both primary and secondary palate (n=31, 32.0%).
The age range of patients in this study was between the ages of 6 years to 12 years with a mean (±SD) age of 7.43 (3.85) and the male to female ratio was 1:1. Out of the total ear examined, 76 were mild conductive hearing loss and 95 ears had abnormal tympanogram. The overall prevalence rate for the abnormal tympanograms (B, C1, C2) in both ears is 49%. There was no statistically significant association between the level of hearing loss and the type of cleft palate for the left ear and the right ear respectively as well as the association between the type of tympanogram and the type of cleft palate for the left ear and the right ear respectively ($p>0.05$).
Conclusion: Prevalence rate of hearing loss among post repaired cleft palate subjects is 33%. This hearing loss is usually mild conductive hearing loss only. Mild conductive hearing loss and abnormal tympanogram was common between the ages of 6-8years irrespective of the type of cleft palate.

Key Words: *Sensory Neural Hearing Loss, Otitis Media with Effusion, External Auditory Canal, Unilateral cleft Lip and Palate, Bilateral Cleft Lip and Palate, Tympanic Membrane*

Introduction

Hearing loss in cleft palate is a congenital conductive hearing loss caused by otitis media with effusion. In Otitis media with effusion, there is fluid in the middle ear with intact tympanic membrane for a continuous period of 3 months due to eustachian tube dysfunction. Treatment is required to prevent the impact of hearing loss on language acquisition, education and social development[1]. The WHO defines hearing loss as not being able to hear well, as someone with normal hearing threshold of 25 decibels or better in both ears[2]. Hearing loss can be mild, moderate, severe, or profound. This can affect one ear or both and lead to difficulty in speech acquisition especially in children, and hearing conversational speech.

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Cleft palate patients are more prone to otitis media with effusion because of the anatomical defect of cleft palate[3]. The tensor and levator veli palatine muscles which originate from the eustachian tube and insert at the midline of the soft palate are not able to contract. As a result, tensor and levator veli palatini muscles are not able to open the eustachian tube like a normal person does during yawning, swallowing and talking and therefore have eustachian tube dysfunction. The cleft palate defect also allows contamination of the nasopharynx and eustachian tube by food during feeding. The contamination causes constant inflammation and change in nasopharyngeal flora.

In addition, cleft palate patients have short posterior cranial base, backward and upward position of the maxilla, shorter mastoid depth and height than normal subjects[4]; and these predispose them to otitis media with effusion which causes conductive hearing loss. Paradise et al[5] deduced that middle ear disease probably develops in all cleft palate patients. Bilateral secretory (serous) or suppurative otitis media was found without exception in 50 infants with cleft palate who were 20 months of age or younger. However, more recent studies have confirmed this figure to be around 90%[6–8].

Chu et al analyzed results of otoscopy ,pure tone audiometry and tympanometry of Chinese children and young adult with cleft lip/palate and compared with previous studies of western population and found out that, the prevalence of hearing disorder was different with western studies that showed much higher rate of audiological problems in children and young adults with cleft lip /palate[9]. Race was the main factor affecting the hearing of cleft lip/palate but not factors like timely ENT medical and surgical interventions and cleft repair. In cleft palate patients, early identification of otitis media with effusion and treatment is important in the management of hearing loss in children. Treatment is usually medical in most patients (conservative management)[1]. However, some require surgical management like, insertion of ventilation tubes to aerate the middle ear and prevent middle ear scarring (tympanosclerosis), acute otitis media and its complications that will further worsen the hearing. Hearing aids are also used in management of hearing loss in cleft palate. Cleft palate repair rarely improves hearing[10].

According to the World Health Organization (WHO), the prevalence of disabling hearing loss generally worldwide is 1.7%, 1.9% in sub-Saharan Africa (SSA), 0.9% in Middle East and North Africa, and 2.4% in South Asia which is the highest[2]. Musa et al in Kaduna Nigeria found high prevalence (59.4) of conductive hearing loss hearing loss in patients with cleft palate anomaly compared with control (12%) using pure tone audiometry in a prospective study in adults and children not less than 5years of age with repaired or unrepaired cleft lip and palate attending Etomie Smile Train Centre Kaduna[11].

This research was aimed at determining the threshold of hearing in repaired cleft palate and the relationship between various degrees of hearing loss and their relation to the types of cleft palate as classified by Kernahan and Stark[12].

Subjects and Methods

Study Design

The research was a cross sectional study conducted on all consenting consecutive patients with clinical diagnosis of cleft palate that has been repaired, who were healthy and seen at the cleft clinic of the Plastic and Reconstructive surgery unit of Korle- Bu Teaching Hospital (KBTH) between 1th March 2017 and 1th June 2019.

Study Site

This study was conducted at the ENT department of the Korle Bu Teaching Hospital.

Study Population

The study population was all post-repair cleft palate patients presenting to the outpatient department of the cleft panel clinic under the Reconstructive and Plastic Surgery Centre (RPSC) which is the treatment site for cleft lip and palate patients at KBTH.

Sample size calculation

With a confidence level of 95% and error margin of 3%, the expected sample size for this study was approximately 75, which was calculated using the normal approximation to hypergeometric distribution formula for small populations[13] with an attrition rate of 20%. Thus, the total sample size needed was 94 participants.

Procedure

The participants were enrolled at cleft panel clinic as they presented and taken to the ENT clinic for a full ENT examination. After the preliminary assessment (screening) with regards to the inclusion and exclusion criteria which will be found in the history taking, the whole procedure was explained to them and their consent were sought after which a structured questionnaire was administrated. Each participant was assigned a serial number. After answering the questionnaire, each participant was seated in a comfortable chair in the ENT clinic. The Bull's lamp was placed at eye level over the participant's left shoulder. With the aid of light from the lamp and head mirror, a full ear, nose and throat examination was done. Otoscopy was done for visual clarity of Tympanic Membrane. The ears were examined for congenital abnormalities of the pinna and especially, EAC narrowing. TM examination was very essential to this research and was done preferably with otoscope because of the narrow nature of the EAC in cleft palate patients. TM was examined for retraction, bulging, scaring, perforation, ventilation tube, and attic retraction. The tip of the nose was lifted with the thumb so that the nasal vestibule could be examined for any obvious lesions. Anterior rhinoscopy with a Thudichum /Kilian nasal speculum was done to inspect nasal mucosa, septum, lateral nasal wall and floor of nasal cavity for any pathology. The lip, oral cavity and oropharynx were examined to confirm the type of repaired cleft especially in the lip, hard palate, soft palate, side of cleft, number of clefts, and dentition as documented from the surgical notes. A tongue depressor was used to depress the tongue and buccal mucosa so that the buccal mucosa, teeth, alveolar ridges and opening of the parotid duct, soft and hard palate could be examined. Nose and Oropharyngeal examination were guided by documentation in the folder with regards to the type of cleft palate that was repaired. Those who met the inclusion criteria were referred to the Hearing Assessment Centre for hearing assessment. The type of assessment used depended on the age of the participants which was between the ages of 6 to 12 years. The hearing assessment was performed by principal researcher under supervision by the audiologist. This was done once or twice depending on the performance of the patient during the hearing assessment to verify the hearing threshold. This involved the use of subjective test. The Subjective test was done for each participant using pure tone audiometry.

Data Management and Analysis

Data captured from the structured questionnaires were entered into Microsoft Excel spreadsheet for data management such as editing, recoding. It was then exported into SPSS version 25 for analysis. Demographic variables were represented using tables and charts while summary statistics were done using means and proportions. The hearing loss threshold levels in cleft palate patients were then compared using Chi-square test of independence. P-value < 0.05 was used in judging the significance of the associations.

Ethical Consideration

The study was performed in accordance with the declaration of Helsinki and ethical approval obtained from the Korle-Bu Ethical Review Board. Written informed consent was obtained from their parents or their care givers before the investigation (Date of issue: February 1, 2017; protocol identification number: KBTH-STC 00072/2016). Participants were assured of anonymity and confidentiality of the information provided.

Results

A total of 97 participants who had repaired cleft palate were seen and 194 ears were examined. The Prevalence of hearing loss in the 194 ears of repaired cleft palate is 33%. Repaired Cleft palate was divided into cleft of primary palate only, cleft of secondary palate only, and cleft of primary and secondary palate. Most of participants had cleft of secondary palate (n=65, 67.0%), only one participant had cleft of primary palate only (1.0%) and the rest had cleft of both primary and secondary palate (n=31, 32.0%) as shown Table 1.

Table 1: Components of the type of cleft palate

Type of repaired Cleft	Frequency (N=97)	Percentage
Primary Palate only (n=1)		
Unilateral Right complete	1	1.0
Secondary Only (n=65)		
Complete	22	22.7
Incomplete	38	39.2
Sub Mucous	4	4.1
Primary and Secondary palate (n=31)		
Right Complete	8	8.2
Left Complete	9	9.3
Right Incomplete	1	1.0
Left Incomplete	4	4.1
Median Incomplete	2	2.1
Bilateral Complete	8	8.2

The age range of participants in this study was between the ages of 6 years to 12 years with a mean (±SD) of 7.43 (3.85) years. Majority of whom are between the ages of 6-8 years (n=66, 68.0%). The males to female ratio was 1:1, the males were 49.5% and females 50.5%. The Akan tribe were the dominant ethnic group in the study (n= 49, 50.5%) followed by the Ewe's (n= 30, 30.9%), Ga Adangbe (n=15, 15.5%), 2 (2.1%) were Kassena and only one participant was a Dagaati. All of the participants (n=95, 97.9%) had cleft palate and were aware they had it but only two participants did not know they had cleft palate as depicted in Table 2.

Table 2: Demographic Statistics

Variables		Frequency	Percent
Age group	6-8 years	66	68
	9-10 years	20	20.6
	11-12 years	11	11.3
	Total	**97**	**100**
Mean Age (±SD)		**7.43 (3.85)**	
Gender	Male	48	49.5
	Female	49	50.5
	Total	**97**	**100**
Ethnic group	Akan	49	50.5
	Ewe	30	30.9
	Ga Adamgbe	15	15.5
	Kassena	2	2.1
	Dagaati	1	1.0
	Total	**97**	**100**
Do you have Cleft	Yes	95	97.9
	No	2	2.1
	Total	**97**	**100**

More than half of the participants were referred from other facilities (n=74, 76.3%) and the rest came to the hospital as results of delayed speech (n=23, 23.7%). Inability to suck was the most reason why participants were referred followed by Cleft lip, speech related problems, recurrent URTI (Upper Respiratory Tract Infection) and Bilateral cleft as depicted in table 3.

Table 3: Reason for coming to the Hospital

Variables	Frequency (N=97)	Percent
Reason for coming to the Hospital		
Delayed speech	23	23.7
Referral	74	76.3
Reasons for Referral		
Inability to suck	24	46.2
Cleft lip	19	36.5
Speech related problems	7	13.5
Recurrent URTI	1	1.9
Bilateral Cleft	1	1.9

Half of the participants had speech problems which were nasal speech problems (n=54, 55.7%) and the rest did not have speech problems (n=43, 44.3%). More than half of them were not seeing the speech therapist (n=64, 66.0%) whereas half of the mothers knew their children

had hearing loss because of the cleft (n=53, 54.6%) as shown in Table 4.

Table 4: Speech problems of Participants

Variables	Frequency (N=97)	Percent
Speech Problem		
Yes	54	55.7
No	43	44.3
If yes, what type		
Nasal Speech	54	100
Delayed speech	0	0
Stuttering	0	0
Patients seeing Speech Therapist		
Yes	33	34
No	64	66
Does Parent know Child has hearing loss		
Yes	53	54.6
No	44	45.4

Table 5 shows the hearing threshold of both ears of the participants. In the left ear, 32 (33.0%) participants were in the mild hearing threshold whereas the rest of the participants in the normal hearing loss (n=65, 67.0%) whereas in the right ear, 44 (45.4%) of the participants were in the mild hearing loss threshold and the rest of the participants were in the normal threshold (n=53, 54.6%).

Table 5: Hearing threshold of both ears

Hearing Threshold	Left ear		Right ear	
	N	%	N	%
Normal	65	67	53	54.6
Mild hearing loss	32	33	44	45.4
Total	97	100	97	100

N= Frequency %= Percentage

Comparing the hearing threshold with the age group of participants, it was determined that in the left ear, among the normal threshold, 46 of the participants were between the ages of 6-8 years, 15 were between 9–10 years and the rest were in 11-12 years (n=4). In the Mild hearing loss threshold, majority of the participant were between 6-8 years (n=20), 5 were in 9-10 years and 7 were in 11-12 years. It also indicated that there was no statistically significance association between the age group and the hearing threshold of the left ear (p>0.05). In the right ear, among the normal threshold, 39 of the participants were between the ages of 6-8 years, 11 were between 9 -10 years and the rest were in 11-12 years (n=3). In the Mild hearing loss threshold, majority of the participant were between 6-8 years (n=27), 5 were in 9-10 years and 7 were in 11-12 years. It also indicated that there was no statistically significance association between the age group and the hearing threshold of the right ear (p>0.05).

The Pure tone average analysis that was done on both ears shows that 118 ears were normal and 76 ears had mild hearing loss which was conductive hearing loss. No sensorineural hearing loss was recorded. No moderate, severe, profound or total hearing loss was also recorded as shown in figure 1.

Fig 1: Pure Tone Analysis of both ear

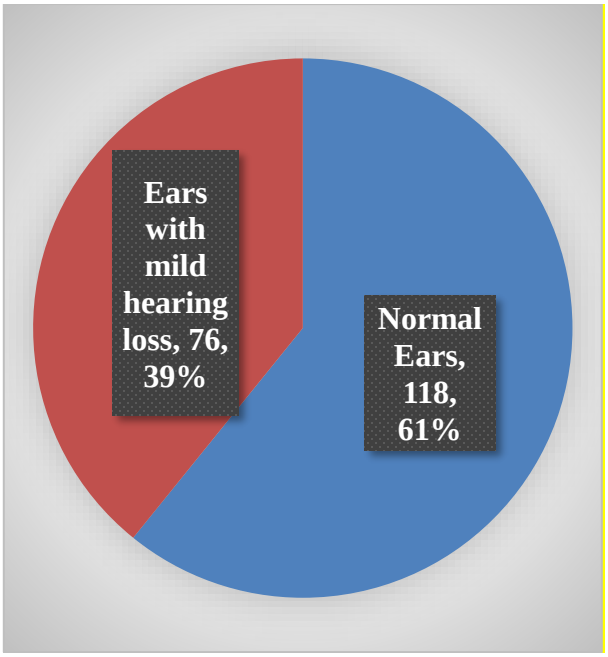

Table 6 shows the laterality of the ears, 13 out of the 23 patients had laterality in the left ear and the rest in the right ears. In the left ear, all 13 patients had both primary and secondary cleft palate and in the right ear, 8 had both primary and secondary cleft palate whereas 1 patient had primary cleft palate only and 1 in secondary cleft palate only each. There was no statistically significant association between the type of palate and laterality of cleft palate and hearing loss in both ears (p>0.05).

Table 7 depicts the PTA assessment of the type of cleft palate of both ears. In the left ear, PTA of 65 ears had normal hearing. Out of the 65 ears with normal hearing, 1ear had primary cleft palate only, 42 ears had secondary cleft palate only and 22 ears had primary and secondary cleft palate only. A total of Thirty-two ears had mild hearing loss in the left ear. Out of the 32 ears, no ear had primary cleft palate only, 23 ears had secondary cleft palate only and 9 ears had both primary and secondary cleft palate. There was no statistically significant association between the type of cleft palate for the left ear and the level of hearing loss (p>0.05).

Table 6: Laterality of both ears

Type of Cleft palate	Laterality		Total	P-value
	Left ear	Right ear		
Primary Cleft palate only	0	1	1	0.241
Secondary cleft palate only	0	1	1	
Primary and Secondary Cleft palate	13	8	21	
Total	**13**	**10**	**23**	

Table 7: Pure Tone Average (PTA) and Type of Cleft for both ears

Type of Cleft palate	Pure Tone Average for Left ear			
	Normal	Mild Hearing loss	Total	P-value
Primary palate only	1	0	1	0.644
Secondary palate only	42	23	65	
Primary and Secondary palate	22	9	31	
Total	65	32	97	
Type of Cleft palate	**Pure Tone Average for Right ear**			
	Normal	**Mild Hearing loss**	**Total**	**P-value**
Primary palate only	1	0	1	0.411
Secondary palate only	33	32	65	
Primary and Secondary palate	19	12	31	
Total	53	44	97	

Table 8: Tympanogram for both ears

Tympanogram for both right and left ear	Frequency	Percent
A	99	51.0
B	53	27.3
C1	28	14.4
C2	14	7.2
Total	**194**	**100.0**

Table 9: Tympanogram and Type of cleft palate for both ear

Type of Cleft	Pure Tone Average for Left ear					
	A	B	C1	C2	Total	P-value
Primary palate only	1	0	0	0	1	0.865
Secondary palate only	35	15	11	4	65	
Primary and Secondary palate	17	5	8	1	31	
Total	53	20	19	5	97	
Type of Cleft	**Pure Tone Average for Right ear**					
	A	**B**	**C1**	**C2**	**Total**	**P-value**
Primary palate only	1	0	0	0	1	0.508
Secondary palate only	31	22	8	4	65	
Primary and Secondary palate	14	11	1	5	31	
Total	46	33	9	9	97	

In the right ear, a total of 53 ears had normal hearing. Out of the 52ears, 1 ear had primary cleft palate only, 33 ears had secondary cleft palate only and 19 ears had both primary and secondary cleft palate. A total of Forty-four ears on the right had mild hearing loss. Out of these 44 ears with mild hearing loss, none had primary cleft palate only,32 ears had secondary cleft palate only and 12ears had both primary and secondary cleft palate. There was no statistically significant association between the type of cleft palate for the right ear and the level of healing loss ($p>0.05$).

Table 8 shows tympanogram analysis for both ears, 51% of the ears were normal and the rest were abnormal (B, C1 and C2). Table 9 shows the analysis of the tympanogram on the type of cleft palate for both ears the tympanogram in the left ears showed that 53 ears had Types A, 20 ears had B, 19 ears had C1 and 5 ears had C2. Out of the 53 normal Tympanograms (A) ,1 ear had primary cleft palate only, 35 ears had secondary cleft palate only and 17 ears had primary and secondary cleft palate. No type B, C1 or C2 tympanograms were recorded for primary cleft palate only. Secondary cleft palate only recorded, 35 ears for type A, 15 ears for type B,11 ears for type C1, and 4 ears for type C2 tympanograms. Primary and secondary cleft palate participants had 17 ears for type A,5 ears for type B, 8 ears for type C1, and 1ear for C2 tympanogram. There was no statistically significant association between the type of palate for the left ear and the type of tympanogram ($p>0.05$). The tympanogram in the right ears showed that 46 ears had type A, 33 ears had type B, 9 ears had type C1 and 9 ears had type C2. In the Primary palate only, only one participant had Type A tympanogram. In the Secondary cleft palate only, 31 ears for type A tympanogram, 22 ears for type B, 8 ears for C1 and 4 ears for C2. In both Primary and secondary cleft palate, 14 ears had type A tympanogram, 11 ears had type B,1 ear had type C1 and 5 ears C2 tympanogram. There was no statistically significant association between the type of cleft palate for the right ear and the type of tympanogram ($p>0.05$).

Discussion

The participants in this research were between the ages of 6 to 12 years. Mild conductive Hearing loss was found mostly between ages 6 to 8 years and improve generally by age group 11 to12 years. There was no statistically significance association between the age group and the hearing threshold ($p>0.05$) in this work. Male to female ratio in this work is 1:1. This finding of improvement of hearing with increasing age is similar to other studies done[14–20]. A similar prospective study used pure tone audiometry alone as a tool for hearing assessment[11].

Most participants had cleft of secondary palate only (n=65, 67.0%), only one participant had cleft of primary palate only (1.0%) and the remaining had cleft of both primary and secondary palate (n=31, 32.0%). This classification is different from what Thanawirattananit et al[15] and other studies used according to laterality[11,18]. Classification used in this study is similar to a study done by Wei Zheng et al[14]. This work classified cleft palate according to the anatomical part (primary and secondary cleft palate) which is what is used by KBTH plastic surgery unit. There were 97 participants and 194 ears seen. There was only conductive hearing loss but no sensorineural or mixed hearing loss recorded in this work. Conductive hearing loss was only mild hearing loss. No moderate, severe, profound and total hearing loss were recorded. 60.82% had normal hearing, 39.18% of the ears had mild conductive hearing loss with majority on the right (n=44) and on the left (n=32). There was no statistically significant association between the type of cleft palate and Pure Tone Average whether unilateral or bilateral ($p>0.05$). Normal hearing (60.82%) is higher in this research as compared to a study done in Kaduna[11]. A study by Handziae -Cuk et al revealed that most cleft palate have moderate and severe conductive hearing loss[21]. These variations are probably due to the age variations used in the studies. The Prevalence of hearing loss in the 194 ears of repaired cleft palate is 33% in this work using bilateral hearing loss. The overall prevalence rate of hearing loss among post repaired cleft palate subjects using better hearing ear is 23.9% in bilateral hearing loss. The prevalence of hearing loss in better ear among post repaired cleft palate participants in the left ear is 35.8% and right ear is 14.1%. There was no moderate, severe, profound and total hearing loss to compare and get the better hearing ear calculation. In this research pure tone average for repaired cleft palate ranged from 10 to 40dB for both right and left ears. This variation in hearing threshold could be due to the different age bands used (6 to 12years and 5 to 50 years) inclusion and exclusion criteria (syndromic and non-syndromic). However, Daniel et al[21] used Pure Tone Average (PTA) based on hearing threshold 0.5kHz, 1kHz and 2kHz for conductive hearing loss just like this research but PTA more than 20dB is abnormal whiles more than 25 is abnormal for this research.

There was no statistically significant association between the type of cleft palate for the left ear and the right ear and the levels of hearing loss ($p>0.05$). This finding compare favorably with reports of previous studies that the severity of the type of cleft palate does not correlate with the severity of hearing loss[15]. This means that, Eustachian tube (ET) dysfunction, palatine muscle abnormalities, and middle ear problems may still occur irrespective of the type of cleft palate. Thakur and co-workers found that, majority 72 (68.6%) of abnormal Pure Tone Audiometry was mild conductive hearing loss[17] which also revealed that 10 (9.5%) ears had moderate conductive hearing loss, 1 (1%) had mixed hearing loss and 22 (20.9%) had normal hearing which contradicts the findings of this research.

There was no association between the type of cleft palate and degree of maximum hearing loss. This is similar to findings by Garcia-Vaquero et al[18] which

states that most frequent type of cleft palate was complete unilateral cleft palate (55.37% type III) and the least was type Veau I (8.26%).

Abnormal Tympanogram findings (type B, C1and C2) were common between age 6 to 8 year and improved with the older age groups (9 to 10 and 11 to 12). In this study of 194 ears, 99 ears had type A (normal) and 95 abnormal tympanograms. Out of the 95 abnormal tympanograms, B is 53, C1 is 28, and C2 is 14. Severity of the cleft palate is not statistically related to the severity of the tympanogram ($p>0.05$) for both ears. The overall prevalence rate for the abnormal tympanograms (B, C1, C2) in both ears is 49%. Prevalence rate for the type B Tympanogram is 27.3% in any of the ears which is similar to the findings reports of Wei Zheng and co-workers[14] who found 60% of abnormal tympanogram at the crucial language learning stage. Majority of the abnormal tympanograms found by Thanawirattananit[15] are type B tympanogram (335 out of 461 ears) which is similar to the findings of this study, probably because Eustachian tube dysfunction has progressed for long resulting in secretory otitis media. The negative pressure in the middle ear created by abnormal function of eustachian tube cause middle ear mucosa to secrete serous fluid in to the middle ear. Abnormal tympanogram findings decrease with increasing age and it is similar to the findings by Flynn[22]. All participants in this work had repaired cleft palate by age one year. Prevalence rate for type B Tympanogram is 27.3% in both ears. In the left ear, 20.6% had type B tympanogram whereas in the right ear, 34% had the type B tympanogram in this work. Qun Lou et al[20] found that, middle ear dysfunction was 27.4% of group I participants 48.3% of group II, 40.6% of group III and 75.0% of group IV. They concluded that, the prevalence of middle ear dysfunction and hearing loss increased with advance aging of palatal repair and that early palatoplasty improves middle ear function and not age as found in this work.

Conclusion

There is hearing loss in repaired cleft palate patients in KBTH. The prevalence rate of hearing loss among post repaired cleft palate subjects is 39%. This hearing loss is a conductive hearing loss. There is no SNHL or mixed hearing loss from this study. Moderate, severe, profound and total hearing loss were not recorded in this work. Seventy-six ears (76) out of 194 ears of 97 children with repaired cleft palate suffer from hearing loss in KBTH in Ghana. This hearing loss is mild conductive hearing loss from this study regardless of the type of cleft palate that was repaired. Mild conductive hearing loss and abnormal tympanogram are common between the ages of 6-8 years irrespective of the type of cleft palate. Middle ear function is not related to the type or severity of the cleft palate but the age.

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OTOACOUSTIC EMISSION HEARING SCREENING OF NEWBORNS IN KORLE-BU TEACHING HOSPITAL, GHANA.

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Abstract

***Objectives*:** The aim of the study was to determine outcomes of new-born hearing screening and identify possible causes of hearing loss in NICU Admissions.
Method: The research is a cross sectional study of new born screening conducted on all consenting consecutive new- born who are healthy and seen at the post-delivery ward, and NICU outpatient department of KBTH. Associations or differences in variables were examined using chi-squared test. P-value ≤0.05 was considered statistically significant.
***Results*:** A total of 483 babies were screened during the period. The incidence of hearing loss in the new-born was 7.2%. More than half of the new-born were 4 weeks or less weeks (n=254, 52.6%) and the rest were greater than 4 weeks (n=229, 47.4%). The mean age (±SD) of the new-born are 3.94 (±2.09) and 3.80 (±2.16) weeks in the admitted and not admitted group respectively. It was revealed that 27% of the babies were admitted at Neonatal Intensive Care Unit (NICU) because of prematurity and Macrosomia (from diabetic mothers) respectively. Among the babies that were admitted, 7 failed the OAE and 101 passed. In the not admitted group, 28 failed OAE test and the rest passed (n=347). This study revealed that, there was no statistically significant association of hearing loss between babies admitted to NICU and Non-NICU babies (p= 0.728).
***Conclusions*:** The incidence of hearing loss among the new-born was 7.2% and the main reason for NICU admission are prematurity, big baby, Birth asphyxia, neonatal jaundice, neonatal sepsis, small baby and vacuum delivery. There is no statistically significant association between these different group babies with hearing loss.

Key Words: *Neonatal Intensive Care Unit, External Auditory canal, Otoacoustic Emissions, Caesarean Section, Ear, Nose and Throat*

Introduction

The degree of loss which is measured in logarithmic ratio decibels, at frequencies between 125 Hz (low-pitch sounds) and 8000 Hz (high-pitch sounds) is termed hearing loss[1]. Hearing loss in new-born can be caused by abnormalities or pathologies in the anatomical parts of hearing. These include pathologies in external auditory canal and or middle ear which cause conductive type of hearing loss and, cochlear and or eighth cranial nerve pathologies which results in sensory neural hearing loss. Others have both external auditory canal and or middle ear pathology with cochlear and or eight cranial nerve pathologies resulting in mixed type of hearing loss and finally, pathology in the brain resulting in central type of hearing loss.

Neonatal Intensive Care Unit (NICU) babies are unwell babies who are admitted after birth due to congenital or acquired pathologies within 28days of birth. Hearing loss in new-born can be caused by prenatal (intrauterine or genetic), perinatal (during delivery) and postnatal (after delivery) factors[2]. One of the most common congenital disorders is Significant hearing loss which occurs in 1 to 2 per 1000 new-borns[3]. It leads to delayed language development, difficulties with behaviour and impaired psychosocial development, and poor academic achievement. Hence, early identification of hearing loss and appropriate interventional measures such as amplification using hearing aids, Cochlear implants and, speech and language therapy improves language outcomes and level of intelligence. According to Peterson and Ramma[4], the incidence of hearing loss among new-borns in the United States of America (USA) is 1.86 per 1000 and 1.33 per 1000 in UK (United Kingdom). This variation in incidence is due to difference in screening methods and different definitions of significant childhood permanent hearing loss in USA and the United Kingdom[5]. In Nigeria, 44 babies out of 1274 babies who were involved in a two-stage screening test (Otoacoustic emissions and/or auditory brainstem response) were sent for a diagnostic evaluation. Confirmed cases gave an incidence of 5.5 per 1000 live births[6]. Moreover, a study by Morton[7] in the United Kingdom and another study by Nikolopoulos[8] in the United States (US), had unclear criteria for selecting subjects, and none compared babies

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of Neonatal Intensive Care Unit (NICU) admissions with normal new-borns. This study therefore sought to find the incidence of hearing loss in new-borns from NICU and post-delivery ward of Korle –Bu Teaching Hospital so as to detect hearing loss before children between age 6 months and up to 1 year start to pick words.

Subjects and Methods

Study settings

This study was conducted at KBTH in the Greater Accra region. The KBTH serves as a major tertiary health facility for Ghana with over 2000 beds with 45 in the NICU and receives referrals from all over the country and neighboring West African countries. The Unit admits averagely 2180 patients annually.

Study Population and Sample size

The study population was the new-borns from post-delivery ward and babies admitted in NICU babies at KBTH. Using the Fisher's formula for sample size determination with an attrition of 20%, a total of 483 patients was recruited for the study from the 1st February, 2018 to 10th December, 2018.

Study design

The study used a cross sectional study design which was conducted on all consenting consecutive new-borns who are healthy and seen at the post-delivery ward, and NICU of Korle Bu Teaching Hospital.

Procedure

The participants were enrolled from the post-delivery ward and NICU, and their mothers or guardian asked to present at ENT clinic after their first weighing and immunization visit with the babies. The whole procedure was explained to the mother or guardian after the preliminary assessment (screening) with regards to the inclusion and exclusion criteria. Some information was taken from NICU participants folder. Each participant was seated in the arms of the parent or guardian in a comfortable chair in the ENT clinic. With the aid of light from the lamp and head mirror, a full ear, nose and throat examination was done. Otoscopy was done for visual clarity of tympanic membrane (TM). The ears were examined for congenital abnormalities of the pinna and especially, external auditory canal (EAC) narrowing (atresia or stenosis) and the state of the TM.

The lip, oral cavity and oropharynx were examined for congenital or neurological pathology. Head and neck examination were done for any craniofacial deformities and neurological deficits. Physical examination of other systems of the body was also done.

Those who met the inclusion criteria and none of the exclusion criteria, were referred to the hearing assessment centre for hearing assessment.

Data processing and Analysis

Data Handling

The participants were assigned serial numbers at enrolment into the study and subsequently used during analysis. Questionnaire was used to collect all data which was entered into a computer that is strictly protected and only accessible by the researcher (s).

Statistical Analysis

The data obtained was entered into Microsoft Excel 2016 and exported to Statistical Package for Social Sciences software (IBM SPSS version 25.0) for analysis. Descriptive statistics were performed to obtain frequencies and percentages for categorical variables and means (±Standard deviation) for continuous variables such as age of the baby, maternal age. Associations or differences in variables were examined using chi-squared test. P-value ≤0.05 was considered statistically significant.

Study Limitations

Some of the study limitations are low number of participants from the post NICU well babies and most mothers were not interested in the hearing screening and those who agreed to take part had some anxiety.

Ethical Consideration

The study was performed in accordance with the declaration of Helsinki and ethical approval was obtained from the joint Korle –Bu Ethical Review Board (Date of issue: March 26, 2018; protocol identification number: KBTH-IRB/00064/2017). The declaration of Helsinki states that medical research must protect the life, health, dignity, integrity, right to self-determination, privacy and confidentiality of personal information of research subjects.

Results

Of the 483 patients involved in the study, the incidence of hearing loss among the participants (new-borns) was 7.2% (n=35) as depicted in table 1. Majority of the participants (54%) were males and 46% were females.

Table 1: Incidence of hearing loss

Hearing loss	Frequency	Percent
Yes	35	7.2
No	448	92.8
Total	**483**	**100.0**

The age group of the participants ranged between 1 week and 6 weeks; more than half of them were 4 weeks or less but greater than 1 week (52.6%) and the rest were greater than 4 weeks but less than or equal to 6 weeks (47.4%) as shown in table 2.

Table 2: Demographic Statistics

Variable	Frequency (n=483)	Percent
Sex		
Male	220	46.00%
Female	263	54.00%
Age group		
>1week & ≤ 4 weeks	254	52.60%
> 4weeks but ≤ 6weeks	229	47.40%

The mean weight of the participant was 3.11 ± 0.6kg and an average head circumference of 34.41 ± 2.01cm shown in table 3.

Macrosomia from diabetic mothers (big baby) was the topmost diagnosis for NICU admission as depicted in table 4.

Table 3: Mean and standard deviation of Maternal age, weight and head circumference of baby

Variable (N=483)	Mean	SD	Min.	Max.
Maternal Age (years)	31.07	5.58	18	45
Weight of baby (kg)	3.11	0.6	1.1	5.1
Head circumference (cm)	34.41	2.01	25	40

SD= Standard Deviation
Min= Minimum
Max= Maximum

Table 4: Topmost cause of Admission of baby

Topmost Cause of Admission	Frequency
Macrosomia from diabetic mother	36
Prematurity	33
Neonatal Jaundice	12
Birth Asphyxia	12
Neonatal Sepsis	6
Fetal Distress	3
Small baby	3
Vacuum Delivery	3

None of the mothers had congenital or intrauterine infection during their pregnancy. 3.8% of the mothers used other drugs such as Metformin. According to alcohol or substance abuse in pregnancy, 27 of the mothers had abused alcohol and only 4 children of those mothers failed the hearing loss. A little above 50% of the mode of delivery were caesarean section (C/S) and the rest were spontaneous virginal delivery (SVD). Majority of the participants did not have any family history of hearing loss (n=441, 91%) while 9% (n=42) have a family history of hearing loss. 4 of the total participants who had family history of hearing loss failed the OAE test and the rest passed and there was no statistically significant association between the family history of hearing loss and hearing loss (p=0.551). A total of 45 participants had exposure to Ototoxic drug. 2 of the total participants who had the exposure failed the OAE test and the rest passed which, was no statistically significant (p=0.739) as shown in table 5.

Table 5: Pregnancy related Characteristics of participants

Variable	Frequency (n=483)	Percent
Use of other drugs apart from antenatal medications		
Yes	18	3.8
No	465	96.3
Alcohol or substance abuse in pregnancy		
Yes	27	5.6
No	456	94.4
Mode of delivery		
C/S	246	50.9
SVD	237	49.1
Family history of hearing loss		
Yes	42	9
No	441	91
Ototoxic drug exposure		
Yes	45	9
No	438	91

Of the total participants, 108 participants were admitted at NICU and 375 were not admitted. Among the participants that were admitted, 7 failed the OAE test and 101 passed. In the not admitted group, 28 of the participants had hearing loss and the rest did not have hearing loss (n=347). It was also revealed that there was no statistically significant association of failed test between the admitted or not admitted babies (p=0.728). The null hypothesis is thus rejected i.e. there is a high incidence of hearing loss among NICU babies compared with babies that were not admitted to NICU as shown in table 6.

Table 6: Hearing loss and type of Admission

Type of Admission *Hearing loss	Hearing loss		Total	P-value
	Yes	No		
Admitted	7	101	108	0.728
Not Admitted	28	347	375	
Total	35	448	483	

Discussion

Newborn hearing screening provides for early detection of hearing disorders thus enabling intervention before 6 months of age[9]. It is considered a process, and not an event which provides parents and children a follow up, from pre-screening instructions all the way to the treatment and follow up of the child diagnosed with the hearing loss and child's family[9].

The incidence rate of hearing loss after OAE testing in this study is 7.2% as compared to a study done by Olusanya and coworkers[6] in Nigeria found an incidence of 5.3 (7/1330) per 1000) using a two-stage screening, 5.0-5.6 in India by Peterson & Ramma[4], Pourarian and coworkers[10] in Iran showed 13% and 25.3% by Onoda and co-workers[11] in Brazil. Antwi B.B[12] had 35% of participants and Akinola and co- workers[13] had 29.0% failing the initial OAE hearing screening test. Antwi B.B[12] and Akinola and co-workers[13] used only OAE as the screening tool. Antwi B.B worked on only MBU neonate[12] but Akinola and co-workers worked on neonates with and without risk factors[13]. This variation in incidence could be due to sample size variation, type of test (OAE, Automated ABR, time of test (< or > 1week old), addition and exclusion of syndromic babies, unwell babies and other factors in NICU. This study supports that, new born hearing loss can be detected early, followed up and managed appropriately as found by Patel and coworkers[1] and Nikolopoulos[8].

Wroblewska-Seniuk and coworkers stated that, the incidence of SNHL in healthy neonates is 1 to 3 per 1000 and 2-4 per 100 in high risk infants and found hearing loss in 11% in less than or equal to 25 weeks, 5% at 26-27 weeks, 3.46% at 18 weeks and 2-3 at 29-32 weeks preterm[14]. TOAE screening was used and participants included new-borns with craniofacial abnormalities who will fail OAE because of eustachian tube disfunction. It is therefore not surprising that, participants in their research who had the highest fail(referred) in OAE screening were preterm with craniofacial disfunction[14]. In this research, 28(7.47%) out of 375 normal participants (non NICU admitted) had hearing loss and 7(6.48%) out of 108 post NICU admitted newborn babies with hearing loss with p=0.728.

In this study, more than half of the new-borns were 4 weeks old or less but more than one week old (n=254,52.6%) and the rest were greater than 4 weeks old but less than or equal to 6weeks old (n=229, 47.4%). The mean age of the new-borns is 3.02 and 2.12 weeks respectively. This is different from Olusanya and coworkers in Nigeria who used infants aged 46 days to 360days at diagnosis[6] and by Onoda and co-workers from Brazil in which the age groups were not highlighted[11]. One week to 6weeks old were used in this work to ensure there is no vermix in the external auditory canal to prevent false fail.

The data revealed that 54% of the participants were females and their male counterparts formed the remaining 46% which is similar to the published series by Onoda and co-workers[11].

This study revealed that majority 27% of the babies were admitted because of prematurity and big baby, 13.5% were due to Birth Asphyxia, Neonatal jaundice and neonatal sepsis and 2.7% were due to small baby and vacuum delivery. There was no statistically significant association between reason for admission and hearing loss (p>0.05). This finding is similar to studies by Pourarian and co-workers who found no association between hearing loss and new born admitted at NICU for ventilator use, transient tachypnea of newborn, sepsis, neonatal jaundice and congenital heart disease[10].

In this study, there was no statistically significant association between family history of hearing loss, exposure to Ototoxic drugs and mechanical ventilation of new-born for more than 5 days. This is contrary to the study done by Onoda and co-workers which stated that hearing disorders are significantly associated with the variables such as family history of hearing loss, use of ototoxic drugs, use of mechanical ventilation, stay in middle to high risk neonatal ICU for over 48 hours and birth weight below 1,500g[11]. Onoda and coworkers screened all new-borns admitted to NICU including ill babies, and syndromic babies regardless of the age groups (babies less than a week old) [11]. This study used well babies from NICU and post-delivery w**o**rd who are non-syndromic and without any form of congenital anomaly. No genetic studies of hearing loss were done in both studies. This study was a one stage screening test using (OAE testing) and Onoda and co- workers used a 2-stage screening test using Transient Stimulus Evoked Otoacoustic Emissions (TEOE) and the Cochleo-eyelid Reflex (CER) by means of an Agogô musical instrument (large campanula) at 100 dBSPL of intensity in a retrospective study[11].

Amini and co-workers found that there is no statistically significant correlation between asphyxiated babies and hearing loss[15]. This finding is similar to that of this study except that, OAE testing screening was done in only asphyxiated babies in 80 participants out of 149 having a mean 1st minute APGAR score of 4.01, and mean in first 5 minutes score of 7.24. However, they found a significant relationship between the mean birth weight and abnormal OAE (P value = 0.0406).

Akinola and co-workers[13] found that, prematurity, multiple births, jaundice and small birth weight are significantly associated with referrals (fail) outcome with prematurity being the highest. The difference is that, new-borns born in the hospital within 6 months with a mean age of 2.3 days (SD ± 1.5) were used for that study instead of 1 to 6 weeks old and healthy post NICU babies used for this study.

Wroblewska-Seniuk and coworkers stated that, Hearing impairment is a severe consequence of prematurity[14]. This is not surprising because their research was limited to premature neonates including participants with craniofacial abnormalities (excluded in this work) who will usually have eustachian tube dysfunction and fail OAE as a result. AL-Kandari and Alshuaid in Kuwait found 2% hearing loss in well babies' and 46.7 in high risk groups in 200 well babies and 15 high risk babies[16].

Among the participants that were admitted in NICU, 7 participants failed the OAE and 101 passed. In the non NICU admitted group, 28 of the participants failed OAE test and the rest passed (n=347). It was also noted that there was no statistically significant

association between hearing loss and a baby admitted into NICU or not (p=0.728) thus ,agreeing with the null hypothesis i.e. there is no high incidence of hearing loss among NICU babies compared with babies that were not admitted to NICU which is in contrast to the study done by Wilson et al which says that babies who were born prematurely and were admitted to NICU had a higher chance of developing hearing loss than normal babies[17].

Conclusion

The incidence of hearing loss in new-borns loss was 7.2%. There were no main reasons for NICU admission associated with hearing loss in KBTH. The post NICU babies in this research do not have high incidence of hearing loss as were expected.

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NEONATAL MORBIDITY AND MORTALITY IN BINGHAM UNIVERSITY TEACHING HOSPITAL JOS, PLATEAU, NORTH-CENTRAL NIGERIA

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Abstract

Background: Neonatal mortality rate (NMR) remains high in Nigeria. There is the need to know the major causes of neonatal morbidity and mortality, so as to reduce the trend.
Aim: To determine the causes of neonatal morbidity and mortality in the neonatology unit of Bingham University teaching Hospital (BHUTH), Jos.
Method: This is a retrospective, analytical descriptive hospital-based study carried out in the special care baby unit of BHUTH from January- December 2018.
Results: A total of 324 neonates were enrolled in the study. The ratio of male (189) to female (135) neonates was 1:0.7. There were more babies in the out born (168) than inborn (156). Major causes of morbidity were prematurity (29.3%), Neonatal jaundice (NNJ), (21.9%), Neonatal sepsis (NS), (12.3%), birth asphyxia (BA), (11.4%) and NNS+NNJ (9.9%). The three main causes of mortality were prematurity (59.1%), severe birth asphyxia (SBA) (27.3%) and NS (13.6%). The difference in mortality due to prematurity was statistically significant between the inborn and out born, ($\chi 2$ =9.08, p=0.001), but that due to severe birth asphyxia was not statistically significant ($\chi 2$ =1.44, p=0.230). Case fatality rate for severe birth asphyxia (SBA) was 32.4%, prematurity 27.4%, and NS 15.0%. Out of 324, 259 (80%) were discharged, 44 (14%) died, 17 (5%) were discharged against medical advice (DAMA) and 4 (1%) were referred.
Conclusion: Prematurity, NNJ and NS were the leading causes of morbidity, while SBA, prematurity and NS were the main causes of mortality in this study**.**

Key Words: *morbidity, mortality, neonate, Jos, Nigeria.*

Introduction

Neonatal period is the first 28 days of life. It is the most vulnerable period in the child's life. This is the time the baby completes many of the physiologic adjustments required for extrauterine life. As such there are high rates of morbidity and mortality associated with this period.[1,2] Globally out of 130 million children born each year, it is estimated that 4 million die within the neonatal period, with 75% of the deaths occurring within the first seven days.[3,4] 66% of neonatal deaths worldwide occur in Africa and South East Asian regions.[4] 25% of the one million under five deaths annually occur within the neonatal period in Nigeria.[5] Globally, neonatal mortality rate has reduced from 37 per 1000 in 1990 to 18 per 1000 in 2017 while in Africa, it was 27 per 1000 in 2017.[6-12]

Neonatal morbidity and mortality result from inadequate care during delivery or immediately after birth. Prematurity, low birth weight(LBW), sepsis, jaundice and asphyxia are major problems affecting neonates in the developing countries.[13] Studies done over the past 20 years in Nigeria, showed similar pattern with prematurity, sepsis and birth asphyxia being the major causes of morbidity.[14-25] Most of these studies showed neonatal mortality ranging between 13% and 25.9%. Studies done in other African countries like Cameroon, Ghana, Ethiopia, South Africa, India and Bangladesh showed similar pattern of morbidity and mortality as in Nigeria.[26-32]

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Conflict of Interest: None Declared

Materials and Methods

Study setting and Population

The study was carried out at Bingham University Teaching Hospital, Jos. The neonatal unit has a special care baby unit (SCBU) where neonates in need of intensive and special care are managed. The inborn SCBU takes care of babies born within the hospital while the out born SCBU takes care of babies referred from other hospitals. The SCBU has a 16-bed capacity for both the inborn and out-born with facilities available for neonatal resuscitation, incubator care, phototherapy, exchange blood transfusion and other essential newborn care services. Staff include consultant paediatrician, senior and junior residents and interns. Nurse: patient ratio varies from 1:3 to 1:6.
Methodology: The study was a retrospective descriptive study of all neonates admitted into the SCBU of BHUTH, Jos between the period of January-December 2018. Consecutive sampling of all the patient's data was done from the hospital records. Approval was obtained from the Research Ethical

Committee of Bingham University Teaching Hospital, Jos.

Statistical analysis was done using Epi info version 7.1. Data was expressed as proportions and Chi-square test was used to test for relationships. Results were presented in tables and figures. p-value of less than 0.05 was considered statistically significant in comparative analysis.

Results

A total of 324 babies were admitted during the study period. The ratio of male (189) and female (135) neonates was 1:0.7. There were more babies in the out born (168) than inborn (156). Major causes of morbidity were prematurity (29.3%), NNJ (21.9%), NS (12.3%), Birth asphyxia (11.4%) and NNS+NNJ (9.9%). There was a significant difference between the inborn and out born cases in prematurity, NNJ, NNS and NNS with NNJ.

The three main causes of mortality were prematurity (59.1%), SBA (27.3%) and NS (13.6%). The difference in mortality rates due to prematurity was statistically significant between the inborn and out born, ($\chi 2$ =9.08, p=0.001), while the difference in the mortality rates due to severe birth asphyxia in out born and inborn, was not statistically significant. There were more deaths due to prematurity than SBA. However, the case fatality rate(CFR) for SBA was higher than prematurity 32.4%, vs 27.4%. Neonatal sepsis had the least CFR of 15%.

Out of 324 admissions, 259 (80%) were discharged, 44 (14%) died, 17(5%) signed against medical advice(SAMA) while 4(1%) were referred to other health facilities.

Table 1. Morbidity profile of neonates admitted during the study period

Morbidity	Inborn No. (%)	Out born No. (%)	Total (%)	$\chi 2$ value	p-value
Prematurity	70 (44.9)	25 (14.9)	95 (29.3)	33.68	<0.001
NNJ	22 (14.1)	49 (29.2)	71 (21.9)	9.86	0.002
Birth Asphyxia	13 (8.3)	24 (14.3)	37 (11.4)	2.28	0.13
Macrosomia	12 (7.7)	1 (0.6)	13 (4.0)	8.82	0.003
NNS Bld. cul. +ve	2 (1.3)	4 (2.4)	6 (1.9)	*	0.503
NNS Bld. Cul. -ve	9 (5.8)	25 (14.9)	34 (10.5)	7.15	0.001
NNS+NNJ	9 (5.8)	23 (13.7)	32 (9.9)	4.85	0.028
Hypoglycaemia	9 (5.8)	2 (1.2)	11 (3.4)	3.87	0.049
Dehydration	2 (1.3)	2 (1.2)	4 (1.2)	*	0.944
TTN	2 (1.3)	2 (1.2)	4 (1.2)	*	0.944
Malaria	0 (0.0)	4 (2.4)	4 (1.2)	*	0.071
Bronchopneumonia	0 (0.0)	4 (2.4)	4 (1.2)	*	0.071
Congenital anomaly	1 (0.6)	0 (0.0)	1 (0.3)	*	0. 241
Cellulitis	2 (1.3)	1 (0.6)	3 (0.9)	*	0.291
Birth trauma	1 (0.6)	1 (0.6)	2 (0.6)	*	0.963
HDN	2 (1.3)	1 (0.6)	3 (0.9)	*	0.291
Total	156 (100)	168 (100)	324 (100)		

*- mid-p exact test. TTN- transient tachypnea of the newborn. BPN- bronchopneumonia. HDN-haemorrhagic disease of the newborn. Bld. Cul. – blood culture. +ve. – positive. -ve. - negative

Table 2. Mortality profile of neonates admitted during the study period

Mortality	Inborn No. (%)	Out born No. (%)	Total (%)	$\chi 2$ value	p-value
Prematurity	19 (82.6)	7 (33.3)	26 (59.1)	9.08	0.003
SBA	4 (17.4)	8 (38.1)	12 (27.3)	1.44	0.230
NNS	0 (0.0)	6 (28.6)	6 (13.6)	*	0.008
Total	23 (100)	21 (100)	44 (100)		

*- mid-p exact test

Table 3. Distribution of case fatality rate of mortalities

Diagnosis	No. admitted	Deaths (%)	CFR (%)
Prematurity	95	26 (59.1)	27.4
SBA	37	12 (27.3)	32.4
NNS	40	6 (13.6)	15.0
Total	172	44	

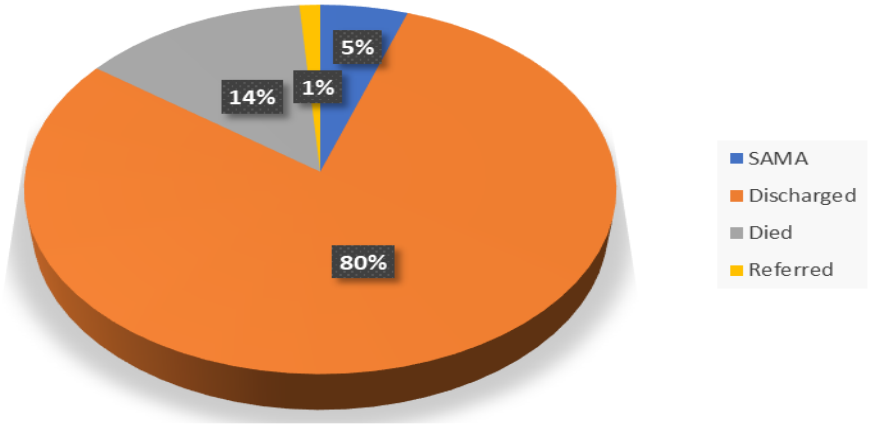

Fig 1. Outcome of admissions

Discussion

Three hundred and twenty-four babies were admitted during the study period, comprising 189(58.3%) males, and 135(41.7%) females. This finding is similar to studies done in other developing world.[18,20,22,23,26, 31,32,33] Prematurity, Neonatal jaundice, Neonatal sepsis and Birth asphyxia were the most common diagnosis at admission. The high rate of prematurity is due to the tertiary status which is a referral center for other health facilities. This also explains the predominance of out born admissions 168(51.9%) compared to inborn 156(48.1). This is in contrast to findings obtained in the University of Benin Teaching Hospital (UBTH) by Omoigberale et al,[16] and Ekwochi et al in Enugu[18] where there were more inborn patients than out born. The high rate of neonatal jaundice in the out born is related to the high rate of home deliveries without strict asepsis for cord care and the use of naphthalene ball.

The mortality rate in this study was 13.6% which is similar to what was obtained in Sagamu,[14]Enugu,[18]and Birnin kudu,[25]but lower than rates obtained by Ugwu in Delta state, [23]Ndombo in Cameroon [26] Kotwal in India, [30] and Toma in Jos.[33]The high mortality rate seen in this study and other studies in Nigeria is due to high home deliveries which are usually conducted by unskilled birth attendants, lack of adequate facilities in the primary and secondary health care centers to care for new born and delay in presentation to referral centers due to delay in referral, financial constraints and poor road networks. This is in contrast to what is obtained in the developed countries.[12]

Prematurity accounted for the highest mortality in this study with 59.1%, which could be attributed to lack of ventilator support. 5% were discharged against medical advice which is comparable to what was obtained in Azare,[19]Kano,[20] Abuja,[22] and in Birnin Kudu.[25]

Conclusion

The three main causes of morbidity in this study were prematurity, neonatal jaundice and neonatal sepsis, while the three main causes of mortality were prematurity, SBA and NS. All these could be prevented by improving facilities for the care of preterm neonate, health education on the risk factors for preterm delivery, jaundice, sepsis, severe birth asphyxia and improved antenatal care services.

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MID-GESTATIONAL SERUM LEPTIN CONCENTRATION IN OBESE AND NON-OBESE GHANAIAN MOTHERS AND ITS RELATIONSHIP WITH GESTATIONAL OUTCOME.

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Abstract

Background: Leptin is produced abundantly in adipose tissue and in human placental trophoblast so serum leptin concentration in BMI matched pregnant women is higher than non-pregnant women. The aim of the study was to compare serum leptin concentration of obese and non-obese pregnant Ghanaian women and to match it with pregnancy outcome.

Method: This was a nested case control study, for which 80 antenatal women grouped into obese (cases) and non-obese (control) based on their booking body mass index (non-obese≤29.9kg/m^2<obese). The participants had their mid gestation (20-24 weeks) serum stored until delivery and serum leptin concentration of the first 20 cases and 20 controls who delivered at the study site were compared to examine if it had effect on gestational outcome. Correlation between leptin concentration, gestational age at delivery and birth weight were assessed using Spearman's correlation coefficient.

Results: The ages, median (range) 31(20-39) of cases and controls 32 (17-40) were not significantly different. There was no significant difference between the serum leptin concentration of cases 1.9 (0.5-50) ng/ml and controls 1.9 (1.5-50) ng/ml (P>0.05) and these had no correlation with maternal BMI or with baby's Apgar scores. Our study subsequently, found no correlation between maternal mid-gestational leptin concentration and gestational age at delivery, as well as with birth weight of neonates.

Conclusion: Mid-gestational leptin concentration did not correlate with BMI in pregnant Ghanaian women and our study failed to find correlation between mid-gestational leptin concentration and gestational age at delivery.

Key Words: *Body Mass Index, Leptin, Mid-gestation, Parturition*

Introduction

Leptin, the obese (*ob*) gene product, is a peptide hormone which is produced abundantly in adipose tissue and released into the blood circulation[1,2]. Leptin concentration is known to be higher in obese persons and well correlated with body fat mass and body mass index (BMI)[3,4]. Leptin plays extensive role in energy metabolism and works as a local mediator for glucose and lipid metabolism[5,6]. It suppresses appetite andincreases energy expenditure, thereby decreasing body weight[7].

Leptin is also produced in the placental trophoblast and secreted into maternal and fetal circulations, so serum leptin concentration in pregnant women are higher than non-pregnant women[8-10].

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It was previously reported that, increase in leptin concentration peaks in the second trimester, decreasing slightly in the third trimester but remaining higher above first trimester concentration[11]. Leptin concentration further increased during labour declines to pre-pregnancy levels in the postpartum period[12]. A positive umbilical venous-arterial difference of leptin concentration and its rapid decline after birth also suggests a possible contribution of placental leptin production on fetal metabolism during pregnancy and in labour[9]. The fetus depends on the mother for its metabolism, therefore defective maternal metabolism may adversely impact on fetal outcome, including birth weight. Obesity in pregnancy, a defect in maternal metabolism is found to be a risk factor for adverse fetal and maternal outcomes[13-15].

According to the Ghana Demographic Health Survey, 40% of women aged 15-49 years are overweight or obese indicating significant proportion of obesity in pregnancy in the country[16]. However, there is limited information regarding leptin, the obese (*ob*) gene product, and pregnancy outcomes in the Ghana. Leptin resistance is reported in pregnancies complicated by maternal obesity[17] and a recent study by Bawah *et al* in

Ghana, found a significantly higher first trimester leptin concentration among those who subsequently developed gestastional diabetes mellitus (GDM) as compared to those who did not (35.0434±8.700 21.9352±9.192 respectively[18].The aim of the study was to compare mid-gestatioan serum leptin concentration of obese and non-obese pregnant Ghanaian women and to correlate it with pregnancy outcomes such as gestational age at delivery, birth weight, Apgar scores at 1 and 5 minutes.

Methods

Study participants and design

This was a nested case control study involving mothers who booked for antenatal care at the Korle-Bu Teaching Hospital (KBTH) between 20-24 weeks of gestation from September15th to October 26th, 2015. All pregnant women with singleton gestation were eligible. We excluded those who had plans to deliver outside the study site. The sample size for the study was calculated based on previous studies indicating that the mean leptin levels in pregnant women is greater than 37ng/ml (37.5±5.8ng/ml) and that among non-pregnant women is less than 37ng/ml (20.3±4.5ng/ml)[12]. In non-pregnant women the leptin concentration is higher in obese as compared with non-obese women[19]. At the 95% confidence level and power of 90% based on EPI INFO version 4.3.1, a minimum sample size of 18 for each patient group (obese and non-obese pregnant women) was obtained. Accounting for losses to follow up and incomplete data, the sample size was increased by 10% giving 20 persons in each group. With information that about 40% of women aged 15-49 years are overweight or obese and another study reporting that 9%-37% of Ghanaian women of child bearing age are obese,[16,20] we recruited 80 pregnant women after written informed consent by a simple random sampling. The recruited participants were then grouped into obese (cases) and non-obese (controls) pregnant women, based on their booking body mass index (BMI) (Supplementary table 1) and followed up until delivery. Selection of final follow up (nested) participants were based on first 20 cases or controls who delivered at KBTH, until the desired sample size for each group was obtained: the first 20 obese (BMI>29.9kg/m^2) and 20 non-obese (BMI≤.29.9kg/m^2) parturients. The flow chart of patient's participation and follow up is shown in Figure 1. The research protocol was approved by the Ethical and Protocol Review Committee of the College of Health Sciences, University of Ghana (Study protocol no: MS_ET/P3.1/2014-2015).

Maternal and infant demographics and anthropometry

All participants were interviewed with a structured questionnaire to obtain demographic information and anthropometry. The height of the mothers was measured using a stadiometer attached to a mechanical scale (SecaCE 0123) with maximum capacity of 200cm for height and 160kg for weight and graduation in 1mm and 0.5kg for height and weight respectively. In measuring the height, the women had no shoes on and any head gears were also taken off. In measuring the weight of the women, minimal clothing was ensured. These were used to determine the mother's BMI at the antenatal visit between 20 weeks and 24 weeks gestation.

The weight of the baby was determined after delivery using a mechanical scale (Kinlee with a maximum capacity of 20kg and a graduation of 0.1kg). Babies with birth weight<2.500kg (2500g) were classified as low birth weight and those with birth weight>4000g, obese. The gestational age was estimated using first trimester ultrasound scanned report.

Blood sampling and determination of leptin concentration

After the written informed consent, about 5mls of blood sample was drawn from the antecubital vein of each participant with sterile disposable needles and syringes. The blood sample was transferred immediately into a gel separator tube and gently inverted several times (5-10) for thorough mixing of blood with clot activator to separate the clot from the serum in the specimen bottle. Samples were then allowed to clot by leaving them standing for about 30 minutes, placed on ice and transported to the laboratory at the Department of Chemical Pathology of the School of Biomedical and Allied Health Sciences, University of Ghana where samples were centrifuged at 3,000 x g for 3 minutes at 4°C. The serum samples thus obtained were transferred into Eppendorf tubes and stored at -20°C until required for use.

ELISA analysis

Reagents

All reagents used for the study, were bought from MedPoint Medical Laboratory and Equipment Supplies, Kwabenya, Accra. Ghana.

Leptin assay was conducted at the Virology unit of Microbiology Department, School of Biomedical and Allied Health Sciences, also of the University of Ghana. Prior to the ELISA, all reagents were brought to room temperature (18-25°C). Standard samples of concentrations were prepared in duplicates according to protocol provided. The antibody-coated micro-plate module was affixed onto the frame. The blank wells, standard wells and test sample wells were set respectively. Prepared sample, standard and HRP-Conjugate reagent was added. 50µl of the standard prepared was pipetted into the pre-coated 96-wells plates in duplicates. 40µl of the sample diluents and 10µl of the sample was added. 50µl of horseradish peroxidase (HRP) were added into each well except the blank. The plates were sealed with adhesive cover and incubated for 60 minutes at 37°C. After incubation, the excess liquid was discarded and the wells washed five times with the washing buffer. 100µl of the anti-human antibody was then placed into each well. The micro-plate was then

incubated for 15 minutes at 37°C and 50µl of stop solution was added into each well. A colour change occurs and the absorbance is read at 450nm within 15 minutes. The Leptin concentrations were calculated using the standard curve. The detection limit of this assay is 1.0 ng/ml for serum leptin.

Data handling and analysis

Data were entered in excel spread sheet (Microsoft company, USA) and imported into SPSS version 22 (IBM SPSS, Chicago, Illinois, USA) for analysis. Descriptive analysis was performed and baseline characteristics of the participants were presented as median (range)for continuous variables.The normality assumptions of the continuous variables were assessed using Q-Q plots and confirmed with Shapiro-Wilk text. Generally, all the variables violated the normality assumptions and therefore nonparametric test (Mann-Whitney test) was used in the comparison of the variables between obese and non-obese mothers. Correlation between the circulating maternal serum leptin concentration and outcome variables was assessed using Spearman's correlation coefficient. Results of the analysis were considered statistically significant with a *P*-value of <0.05.

Results

The flow chart of study participants is shown in figure 1. The prevalence of obesity among the 80 baseline study participants was 41%. Table 1 outlines BMI characteristics at booking. Selection of cases to controls was 1:1 (obese (20) and non-obese (20).

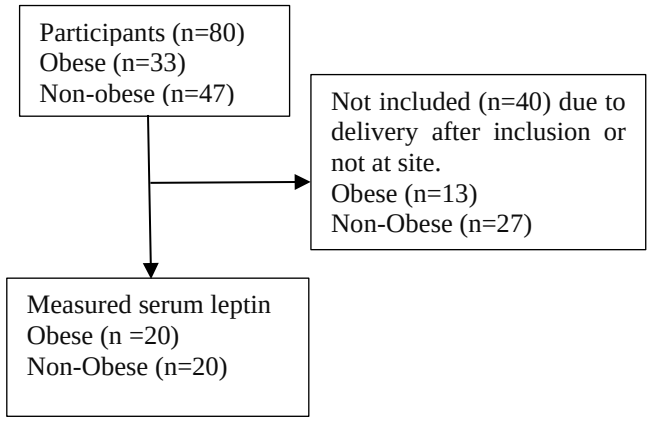

Fig 1. Flow chart of study participants

However, the obese mothers were of a significantly higher gravidity than the non-obese mothers 3(1-10) and (1-6) respectively,*P* < 0.05(Table 1). There was no significant difference in serum leptin concentration between obese and non-obesemothersobese 1.9 (0.5-50) ng/ml versus 1.9 (1.5-50) ng/ml respectively. Mid-pregnancy serumleptin concentration did not correlate with mid-pregnancy BMI and there was nosignificant inverse correlation between maternal leptin concentration and gestational age at delivery for both obese cases and non-obese controls(r_s=-0.07, n=20, *P*=0.75)(fig. 2A), r_s=-0.27, n=20, *P*=0.27)(fig. 2B).Birth weight also showed no significant inverse related with maternal leptin concentration both in cases and controls (r_s=-0.29, n=20, *P*=0.22)(fig. 3A). r_s=-0.02, n=20, *P*=0.49)(fig. 3B).

Table 1. Maternal and neonatal characteristics of non-obese and obese women

Category	**Non-obese (n=20) Median (Range)**	**Obese (n=20) Median (Range)**	***P*-value**
Age (yrs)	32 (17-40)	31 (20-39)	0.924
Gravidity	2 (1-6)	3 (1-10)	0.022
Parity	0 (0-2)	1 (0-3)	0.067
Weight (kg)	66 (53-79)	84.5 (76-137)	< 0.001
BMI (kg/m^2)	25.3 (19.4-29.3)	32.8 (30.5-53.5)	< 0.001
Leptin (ng/ml)	1.9 (1.5-50)	1.9 (0.5-50)	0.183
GAD (weeks)	38.5 (31-42)	37 (34-41)	0.0123
Birth Weight (g)	3.035 (1.100-3,755)	3.145 (2.075-4.090)	0.285
Apgar scores 1 min.	7 (2-8)	7 (5-9)	0.507
Apgar scores 5 mins.	8 (5-9)	9 (7-10)	0.159

Abbreviation: GAD; Gestational Age at delivery, n; number in a group, min.; minute.

Supplementary Table 1. Body mass index (BMI) characteristics of participants at booking

Variable	Non-Obese (n = 47) Median (range)	Obese (n = 37) Median (range)	P value
Gestational weeks	20 (20-24)	20 (20-24)	0.95
Weight	67(44-86)	91(68-137)	< 0.001
Height	1.61 (1.5-1.71)	1.6 (1.16-1.72)	0.43
BMI	25.28 (19.04-29.73)	33.26 (30.22-69.86)	< 0.001

Abbreviation: n; number in a group
N: number in group

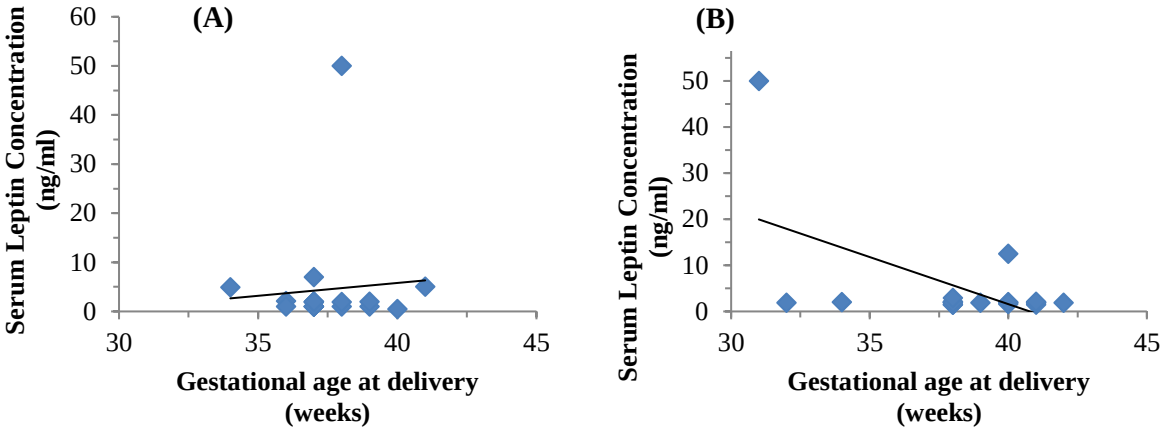

Fig 2. Correlation between maternal mid-gestational serum leptin concentration and gestational age at delivery. **(A)** Correlation in obese pregnancy. (**B**) Correlation in non- obese pregnancy. Correlation coefficient: r_s (95% confidence interval), is shown for twenty women in each group (n=20, *P*>0.05). Two women (1 non-obese, 1 obese) had Leptin concentration of 50ng/ml each.

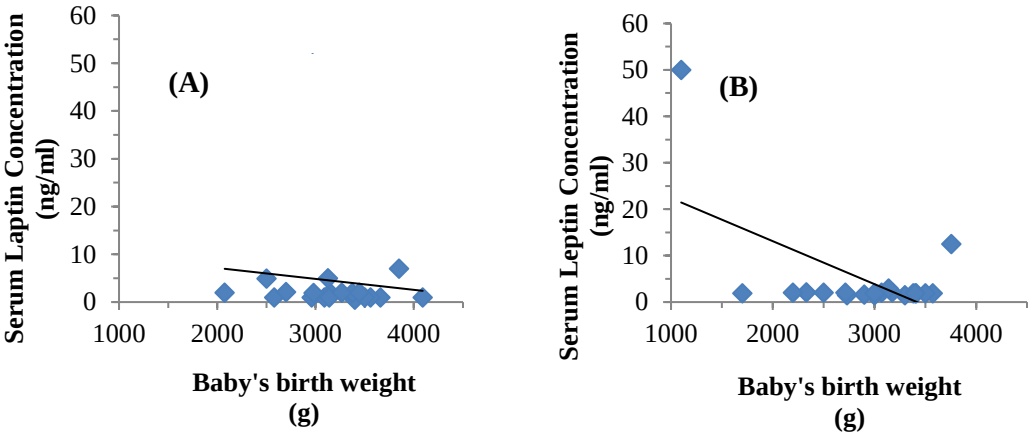

Fig. 3 Correlation between maternal mid-gestational serum leptin concentration and neonatal weight at delivery. **(A)** Correlation in obese pregnancy. (**B**) Correlation in non-obese pregnancy. Correlation coefficient: r_s(95% confidence interval), is shown for twenty women in each group (n=20, *P*>0.05). Two women (1 non-obese, 1 obese) had Leptin concentration of 50ng/ml each

Table 2. Maternal and neonatal characteristics of vaginal and cesarean deliveries

Category	VD (n=21) Median (Range)	CS (n=19) Median (Range)	P-value
Age (yrs)	30 (17-40)	34 (20-39)	0.132
Gravidity	2 (1-10)	3 (1-8)	0.1787
Parity	1 (0-2)	1 (0-3)	0.486
Weight (kg)	75 (56-137)	78 (53-100)	0.924
BMI (kg/m^2)	28.2 (19.4-53.5)	30.5 (21.6-40.0)	0.655
Leptin (ng/ml)	1.9(1.0-50)	1.9 (0.5-7)	0.134
GAD (weeks)	38 (31-41)	38 (34-42)	0.036
Birth Weight (g)	3,000 (1,100-3,755)	3,300 (2,075-4,090)	0.030
Apgar's score at 1 min	7 (5-8)	7 (2-9)	0.916
Apgar's score at 5 min	8.5 (7-9)	8 (5-10)	0.856

Abbreviation: VD; Vaginal Delivery, CD; Cesarean Delivery, GAD; Gestational age at delivery, n; number in a group.

The median birth weight for babies delivered by obese and non-obese mothers was also not significantly different (3.145g versus 3.035 respectively $P > 0.5$). Seven babies (17.1%) had low birth weight (LBW< 2500g), comprising 2 (9.5%) from obese; and 5 (25.0%) from non-obese mothers, but there was no significance difference in leptin concentration between women who gave birth to low and normal weight babies (Table1). Eleven (55%) obese mothers were delivered by cesarean section as compared with 8 (40%) non-obese mothers. Maternal age, BMI, gestational age at delivery, baby's weight and Apgar score were not significantly different between the vaginal and cesarean groups (Table 2). Leptin concentration was higher in the vaginal group 1.9 (0.5-50) ng/ml, n=21) as compared with the CS group 1.9 (0.5-7) ng/ml, n=19) but the difference did not reach statistical significance.

Discussion

The study provided the first leptin report on obesity in pregnancy in Ghanaian women at the Korle-Bu Teaching Hospital. The study observed high prevalence (41%) of obesity in pregnancy among the participants, confirming the previous observations of high prevalence of obesity in child bearing women in Ghana[16,20]. Obesity was significantly associated with high gravity in the present study as in another study reported in the African subregion[21].

We did not find any significant difference in the mid-pregnancy leptin concentration between obese and non-obese mothers. Several studies have attempted to examine association between maternal circulating leptin and BMI. One study reported significant association in early and late pregnancy[22], whereas others could not find significant association[23,24]. A recent study reported that at gestational week 29, the mean leptin concentrations are not significantly higher in women with obesity class II compared to women in obesity class I, in spite of the differences found in early gestation and in the postpartum[23]. This may reflect different physiological states or dysregulation of leptin during different gestational weeks and in pathological pregnacies[25-28].

More of the non-obese mothers delivered per vaginum (60%) than the obese mothers (45%), confirming previous studies that obese women have increased risk of complications during pregnancy and delivery[13,14,29-31].Obesity showed no significant association with neonatal outcome in our present study. In a similar study, Shroff et al studied mid-gestation maternal serum leptin levels which were significantly higher in the obese women compared to those with normal BMI but were markedly attenuated after adjustment for prepregnancy BMI[24]. In their study, mothers who delivered large-for-gestational age neonates had significantly higher levels of serum leptin and they concluded that mid-pregnancy leptin levels might correlate with fetal growth status. In our study, on the contrary, there was no significant difference between maternal serum levels and the birth weight.

A relatively higher leptin concentration was seen in the vaginal birth group but this did not reach statistical significance. However, this may have physiological significance and calls for further studies. Strengths of this study include the recruitment of a larger base eligible women and allowing natural self-selection in each study group through delivery at the study site to mitigate lost to follow up which is common at the study site. This is because many women comes for antenatal care at this tertiary referral center and go to deliver elsewhere. Possible limitations are the sample size of 40 which could contribute to lack of power to observe differences in outcomes; however, the sample size was relevant for meeting the objective of the study. It is plausible that, a longitudinal sampling of blood at several gestational ages would have given a broader spectrum in the changes of leptin concentration during the course of the pregnancy. Another limitation was the wide range of leptin values with extreme outliers with very low and very high values than reported values of leptin in pregnancy.[11,12,18,24] However, having extreme values equally distributed in both the cases and the controls, normalize the effect of bias that could have affected the difference seen in the patterns observed in this study. Also, non-parametric test was used to assess the statistical differences as the continuous variables were not normally distributed. Future research could take a longitudinal approach that could relate the dynamics of leptin changes with respect to weight gain and changes in the physiology of the pregnancy as it progresses. Nevertheless, the findings of this study has clinical and scientific significance in our sub-region, being the first leptin study comparing the obese and non-obese women in pregnancy in Ghana and suggesting a possible role of leptin in the metabolism of normal and obese human pregnancy at the Korle-Bu Teaching Hospital.

In conclusion,there was no significant difference between obese and non-obese pregnant women with respect to mid-gestationalserum leptin concentration. Our study subsequentlyfound no correlation between maternal mid-gestational leptin concentration and gestational age at delivery, as well as with birth weight of neonates, neither in the obese cases nor in the non-obese controls. This finding calls for more research of the role of leptin in human pregnancy outcome.

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PREFERENCE AND REASONS FOR PEOPLE CHOOSING A PLACE OF FRACTURE CARE: A CASE STUDY IN SIX COMMUNITIES OF ASSIN NORTH DISTRICT, GHANA

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Abstract

***Background*:** Studies in the African Sub-region have highlighted injuries and its associated morbidity and mortality as an emerging public health problem, making it necessary to develop a holistic approach to handle injury outcomes in Ghana. The study purposed to assess the preference and reasons for people choosing a place of fracture care among the general population in the Assin North District of the Central region of Ghana.

***Method*:** A prospective cross-sectional study was employed in which 237 participants were randomly selected from six communities in the Assin-North District of the Central Region. Structured questionnaires after verbal informed-consent were used to collect data. The data collected was analyzed using descriptive statistics and chi-square test.

***Results*:** A total of 237 participants were interviewed, 14.8% of them had a history of fracture for which 60% sought treatment with Traditional Bone Setters (TBS). About 27.8% of respondents preferred TBS treatment over orthodox fracture care. Most of them (69.6%) were females with more than half (56.1%) being young adults. Only gender (p=0.029) and religion (p=0.043) were associated with the study group's preference of fracture care. Common reasons for choosing a particular place of fracture care included "perceived" healing methods (77.6%), past experience (20.7%), time to fracture healing (11.8%), and cost of treatment (9.3%). Generally, fear of complications such as mal-union (60.8%), stiff knee (62.1%), delayed union (69.6%), amputation (63.3%), and infection (76%) were some of the reasons why participants chose hospital care over TBS.

***Conclusion*:** People make decisions about where to seek fracture treatment (either at a hospital or with a traditional bonesetter) influenced by cost of treatment and knowledge of complications that may result from poorly handled fracture-care. The study showed the need to improve knowledge about the potential benefits of orthodox fracture-care using scientifically tested and reproducible methods which have been shown to consistently improve outcomes.

Key Words: *Preference, traditional bone setting, Orthodox, place of fracture care, Assin North District*

Introduction

According to a Global Burden of Disease (GBD) Study Report, 973 million people suffered injuries and 4.8 million people died from injuries in 2013.[1] An earlier report by Peden et al reveals that about 90% of deaths from severe injuries occur in low- and middle-income countries (LMICs).[2] The same report notes that injury is increasingly becoming a cause of death and disability in children in LMICs.[2]

The use of traditional medicine is a very common practice in most developing countries;[3,5–9] it is often preferred to the use of orthodox methods. In Ghana, the use of traditional medicine is very common, probably because it is readily available and accessible in most communities. A Traditional Bone Setter (TBS) is a traditional practitioner known for treating fractures and dislocations, who educates him/herself from observation of traditional methods of caring for patients with fractures and takes up the practice of fracture-care without having had any formal training in accepted medical procedures.[4,9–11] Bone setting practice is common in indigenous rural populations and contributes a significant proportion of alternative medicine practice especially in rural communities of Asia, Africa and South America owing to considerable gaps in healthcare delivery resulting from a shortage of both trained personnel and infrastructure.[4,10–12] TBS care are easily accessible, cheaper and believed to give quick results, making them the first choice of natives in developing countries.[11,12]

Despite the active role of TBS in fracture care, a good number of patients return to orthodox facilities with various complications such as sepsis, mal-union, non-union, limb gangrene, joint stiffness, chronic osteomyelitis, and many more.[8,13] These sometimes avoidable complications are left for orthopedic surgeons to correct or treat and such patients may be left with lifelong deformities and other sequelae of inappropriate initial fracture care. The earlier inadequate attempts make subsequent orthopaedic management very

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complicated and costly, sometimes leading to limb amputations which regrettably strengthens the belief of some people that the only orthodox treatment option available is amputation.[8]

Reviewed literature have concentrated on patients with fracture complications who received treatment from either TBS or orthodox facilities,[3,8,9,15–18,18–21] but little is known of the views of the general population, their preferences and possible reasons for selecting a particular place of fracture care. This study is in line with an initiative of the Ghana College of Physicians and Surgeons with the AO Alliance through the Paediatric Fracture Solutions to engage Traditional bonesetters, caregivers, parents, and children to improve knowledge, attitudes and behaviour relating to injury prevention and management.[21] This study assessed the preferences and reasons for the choice of a place of fracture care in six communities of Assin North District in the Central Region of Ghana.

Methods

Study design and setting

A prospective cross-sectional design was employed to study the preferences and reasons for choosing a place of fracture care of the inhabitants of six communities in the Assin North District of Central Region, Ghana from June 13th to July 2nd, 2018. The six (6) communities within the district had been adopted as a "social laboratory" to facilitate the training of University of Cape Coast medical students under the Community-Based Experience and Service (COBES) Programme, with ethical approval from the same institution to undertake non-invasive research. These communities included Breman, Dense, Aboteriyie, Ahuntamu, Assin Akyeano, and Assin Kushea.

Participants and data collection

A total of 300 participants were selected and proportionate allocation for the six communities was done based on the estimated population from the 2010 Population and Housing Census:[22] 20 Participants were selected from Breman, 15 from Dense, 20 from Aboteriyie, 20 from Ahuntamu, 45 from Assin Akyeano and 180 from Kushea.

The approximate number of households in each of the six communities was obtained from the COBES Coordinator. We calculated the sampling interval (total number of households in a community / minimum sample required) for each community. We employed systematic sampling using the sampling interval to select the 300 households from the six communities based on the proportionate allocation for the six communities.

The participants were randomly sampled each from different households and those who consented to participate were interviewed with a structured questionnaire.

Data collected included their demographic characteristics, history of fracture or injury, place of treatment of the injury, preferred place for fracture care, reasons for choosing a place of fracture care and reasons for preference of orthodox care over TBS and vice-versa.

Data analysis

The data was captured and analyzed using SPSS IBM version 21. The ages of participants were categorized and expressed in proportions. Descriptive statistics such as frequencies and percentages were used to summarize the socio-demographic characteristics, history of fracture or injury, place of treatment of the injury, preferred place for fracture care, reasons for choosing a place of fracture care and reasons for preference of orthodox care over TBS or vice versa. The Chi-square test method was used to assess the association between socio-demographic characteristics and preference of fracture care at the 5% significance level.

Ethical considerations

Approval was sought from the Authorities of the Community-Based Experience and Service (COBES) programme of the University of Cape Coast to use their study site. The principles of the Helsinki Declaration on human research ethics was strictly followed throughout the study.

Results

Demographic characteristics participants and Place of fracture care

The demographic characteristics of participants have been summarized in Table 1. Most (69.6%) of them were females. Young adults accounted for 56.1%, middle-aged participants (31.6%) and elderly participants constituted 12.2% of total participants. There was a significant association between participants' place of preference for fracture care and gender (p=0.029) at 5% level of significance.

Religion and Preferred place of fracture care

The majority of the participants were Christians: 61.6% Protestants and 11% Catholics. Fantis (45.6%) and Ashantis (44.7%) were over-represented in the study subjects. There was a significant association between participants' place of preference for fracture care and religion (p=0.043) at 5% level of significant (Table 2).

Table 1: Demographic characteristics of participants and Place of fracture care

Characteristics	**Total, N=237 (%)**	**Orthodox n=171 (%)**	**TBS n=66 (%)**	**X^2 (df)**	**P-value**
Gender				4.8 (1)	0.029
Male	72 (30.4)	45 (62.5)	27 (37.5)		
Female	165 (69.6)	126 (76.4)	39 (23.6)		
Age groups (years)					
Young Adult (18-44)	133 (56.1)	95 (71.4)	38 (28.6)	0.09 (2)	0.957
Middle age (45-64)	75 (31.6)	55 (73.3)	20 (26.7)		
Elderly (65+)	29 (12.2)	21 (72.4)	8 (27.8)		

Chi-square (X^2), degree of freedom (df)

Table 2: Religion and Preferred place of fracture care

Religion	Total, N=237 (%)	Orthodox n=171 (%)	TBS n=66 (%)	X^2 (df)	P-value
				9.84 (4)	0.043
Catholic	26 (11.0)	15 (57.7)	11 (42.3)		
Protestants	146 (61.6)	107 (73.3)	39 (26.7)		
Muslim	33 (13.9)	29 (87.9)	4 (12.1)		
Traditional	5 (2.1)	2 (40.0)	3 (60.0)		
Other	27 (11.4)	18 (72.2)	9 (27.8)		

Chi-square (X^2), degree of freedom (df)

Education and preferred place of fracture care

Table 3 shows the highest level of education attained by participants and their preferred place of fracture care. One hundred (42.2%) of the participants had Middle/ Junior High School education while only ten (4.2%) had tertiary education. One-fourth (25.3%) of the respondents were illiterate. Generally, most of the participants at each level of education preferred orthodox fracture care to TBS, and education was found not to be associated with participant preference (P=0.610).

Income and preferred place of fracture care

As shown in Table 4, more than half (58.2%) of the participants earned less than GH₵250.00 per month. Fewer, 4.2% (10) earned above GH₵1,000.00. Furthermore, participant's preference for orthodox fracture care was higher across various levels of income, but no significant association was found between average monthly income of participants and preferred place of fracture care (p= 0.616).

Table 3: Preferred place of fracture care and participants' highest level of education

Education	Total, N=237 (%)	Orthodox n=171 (%)	TBS n=66 (%)	X^2 (df)	P-value
None	60 (25.3)	43 (71.7)	17 (28.3)	2.7 (4)	0.610
Primary	40 (16.9)	30 (75.0)	10 (25.0)		
Middle/ JHS	100 (42.2)	73 (73.0)	27 (27.0)		
SHS/ Technical/ Vocational	27 (11.4)	20 (74.1)	7 (25.9)		
Tertiary	10 (4.2)	5 (50.0)	5 (50.0)		

Chi-square (X^2), degree of freedom (df)

Table 4: Average monthly income of participants and preferred place of fracture care

Average Monthly income (GH₵)	Total, N=237 (%)	Orthodox n=171 (%)	TBS n=66 (%)	X^2 (df)	P-value
<250	138 (58.2)	97 (70.3)	41 (29.7)	1.80 (3)	0.616
250-500	71 (30.0)	54 (76.1)	17 (23.9)		
501-1000	18 (7.6)	14 (77.8)	4 (22.2)		
>1000	10 (4.2)	6 (60.0)	4 (40.0)		

Chi-square (X^2), degree of freedom (df)

Choice of place for fracture care

The proportion of participants with history of fracture was 14.8% (n=35). As illustrated in Figure 1, 27.8% (66) of respondents preferred TBS fracture care over orthodox care. However, 60% (n=21) of participants with history of fracture sought treatment with a TBS (actual place of treatment). There was a significant difference in preference for TBS treatment between the entire sampled population and participants with history of fracture (X^2 =8.08; p-value=0.004).

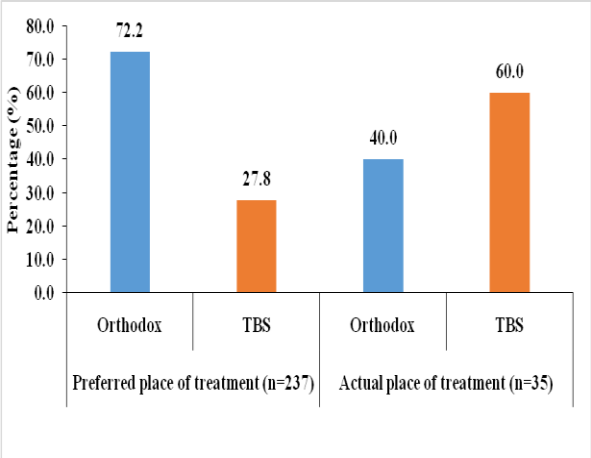

Fig 1. Participant's preferred and actual place of choice for fracture care

Reasons for preferred place of fracture care

As shown in Table 5, the majority of the participants (77.6%) indicated they chose a particular place of fracture care based on healing methods. Other reasons include past experience (20.7%), the time it took to heal (11.8%), cost of treatment (9.3%), traditional beliefs (8%), fear of amputation (5.9%), distance from treatment facility (5.5%) and fear of infections (5.1%).

Table 5: Reasons for choosing a particular place of fracture care

Reasons	Number of respondents (n=237)	Percentage (%)
Cost of treatment	22	9.3
Distance to facility	13	5.5
Time it took to heal	28	11.8
Healing methods	184	77.6
Past experience	49	20.7
Fear of amputation	14	5.9
Fear of infections	12	5.1
Traditional beliefs	19	8.0

Reasons for preference of orthodox care over TBS

The perceived reasons why participants chose Hospital treatment over TBS have been summarized in Table 6. Generally, fear of complications such as mal-union (60.8%), stiff knee (62.1%), delayed union (69.6%), amputation (63.3%), and infection (76%) were some of the reasons why participants chose hospital care over TBS. The majority said they would go for Hospital treatment because they believed that Hospital doctors would spend more time with patients (76%), treatment of fractures would take a long time to heal (73%), doctors were more skillful in treatment of fracture than bonesetters (76.4%), and Hospital treatment was always effective (77.2%).

Table 6: Perceived reasons why one will choose treatment at the hospital over TBS

Reasons	Yes, n (%)	No, n (%)
Fear that bone will not unite well (mal-union)	146 (60.8)	91 (39.2)
Fear that they will have stiff leg (fixed knee)	147 (62.1)	90 (37.9)
Bone healing will delay (delayed union)	165 (69.6)	72 (30.4)
Fear that limb will be cut off (amputation)	150 (63.3)	87 (36.7)
Treatment at the hospital reduce risk of infection	181 (76.4)	56 (23.6)
Doctors spend more time with patients	180 (76.0)	53 (24.0)
TBS Treatment of fractures take a long time to heal	173 (73.0)	64 (27.0)
Doctors are more skillful in treatment of fracture than bonesetters	181 (76.4)	56 (23.6)
Treatment at hospital are always effective	183 (77.2)	54 (22.8)
Doctors are more competent in fracture care than bone setters	186 (78.5)	51 (21.5)

Discussion

Fracture treatment by Traditional Bonesetters (TBS) has long been accepted in African settings and continues to play an integral role in healthcare delivery. Ghana as a sub-Saharan African country has a significant and vibrant TBS practice and it is not uncommon to see complications that accompany poorly managed injuries or fractures.[8,11,13,23,24] The Trauma and Orthopaedic Surgeons practising in Ghana, like other developing countries, are at the fore-front of the battle to treat these complications to improve health, quality of life and reduce disabilities. This makes fracture care in hospitals complex, protracted and expensive. This study assessed the preference and reasons for people choosing a place of fracture care in six communities of Assin North District in the Central region of Ghana.

The study revealed that out of 237 community participants interviewed, 14.8% of them had a history of fracture, and 60% of those with a history of fracture sought treatment with TBS practitioners. This finding supports literature that TBS facilities are the most preferred place of fracture care among trauma patients in Ghana and other African countries.[12,14,16,17,19,20]

The findings of this study further indicates that a greater proportion of participants who had history of

fracture (60%) preferred TBS treatment to orthodox care compared to that of the entire sampled population (27.8%). The observed difference in preference for TBS treatment between the entire sampled population and participants with history of fracture was highly significant (p-value=0.004). Our study sharply contrasts the findings of Nottidge et al. who reported that 64% of the sampled population preferred fracture care by a TBS.[18] The observed difference in pre-event and event preference can be explained using the influence of socio-demographic factors and other external influences like relatives, cost and beliefs.[8,24–27] In addition to one's traditional belief and external influence from close relatives and "well-wishers", orthodox care is perceived to be for emergency care and provision of surgical interventions at an expensive rate.[13–15] In such unplanned event like injuries, patients or their relatives make decisions considering financial strength, rate of healing, and proximity to an orthodox care facility.[8,13–15,20] Again, it was not surprising that participant's gender and religious affiliation were identified as the factors influencing their choice of place for fracture care (p=0.029 and p=0.043 respectively). Irrespective of one's age, choosing a place of fracture care may be influenced by the level of education and financial status.[30]

We also identified that greater proportions of our study population were young adults (56.1%) and females (69.6%). This adult group represents the active work force of our economy and requires the best health care services to reduce disabilities or deaths particularly in low and middle-income economic nations of Africa. Therefore, making the right choices for treating limb fractures is relevant to the economic growth of such nations.

Analysis of complications presented at Hospitals or TBS centers have highlighted a number of reasons for high TBS patronage over orthodox orthopaedic care.[8,13–16,24,26,28–30] They reported the cost of treatment, fear of amputation, distance to treatment center, healing approach, beliefs, family influence among others as the reasons why patients patronize TBS more often than orthodox orthopaedic care facilities. Consistent with these findings, this study revealed that majority of the participants (77%) will select a particular place of fracture care based on healing methods, and other reasons being past experience, perceived time to healing, cost of treatment, traditional beliefs, fear of amputation, distance to facility and fear of infections.

Generally, the attitude of people towards orthodox care in Assin North was positive; it was observed that majority of our study participants (72.2%) without a history of fracture or musculoskeletal injury preferred Hospital care over TBS care. Among several reasons for this preference was the fear of complications with some highlights like mal-union, stiff knee, delayed union, amputation, and infection. These reasons suggested that a good knowledge of treatment outcomes of Hospital settings among the general population will influence one to choose orthodox fracture-care over TBS care. In addition, most of these people believe that orthodox doctors are more skillful in the treatment of fractures than bonesetters, and that Hospital treatment is always effective. Building patients' confidence in Orthopaedic care is a key determinant for a patient to choose orthodox care over TBS. However, external factors like the cost of treatment and the influence of relatives and "well-wishers" undermine individual patients' trust in Hospital-based care.[14–16,24,26,28,30].

Conclusion

People make decisions about where to seek fracture treatment, either in a Hospital or a traditional bone setting centre. This decision may be influenced by the cost of treatment, fear of amputation, distance from treatment center, healing approach and beliefs. People are more likely to go for Hospital-based orthopaedic care over TBS, if they have a good knowledge of the complications that may result from poorly handled fracture-care. There is an urgent need for mass-education of the populace on the advantages of accepting orthodox fracture care methods which have been scientifically validated and have been shown to deliver far better outcomes. A holistic approach should be adopted by relevant stakeholders to embark on mass campaigns to enhance awareness of the outcomes of fracture care from both orthodox orthopaedic practitioners and TBS, and also to address the high cost of treatment that discourages people from accessing Hospital-based fracture care.

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EPIDEMIOLOGY AND PATTERN OF ORTHOPAEDIC TRAUMA IN PATIENTS ADMITTED TO THE SURGICAL WARD OF A REGIONAL HOSPITAL

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Abstract

Background: Orthopaedic trauma related injuries have not been extensively studied in Sub-Saharan Africa. Increase in industrialization and motorization in these countries have seen a corresponding increase in injuries. The causes of these injuries may vary slightly from one geographic region to another. Knowing the circumstances under which these injuries occur affords policy makers the opportunity to put in place the necessary preventive measures

Objectives: To describe the epidemiological characteristics and cause of orthopaedic related trauma injuries in patients admitted to the surgical ward of Greater Accra Regional Hospital

Methods: Patients admitted to the surgical ward with orthopaedic trauma related injuries between May 2016 and October 2017 were retrospectively reviewed

Results: A total of 253 trauma related injuries were admitted to the surgical ward with an average age of 45.2 years and a male to female ratio of 2.3:1.
Road Traffic Accidents (RTA) accounted for 49.2% of all trauma related admissions, with motorcycle related accidents accounting for 52.8% of all RTAs. The second most frequent cause of trauma related admission was falls, representing 29.9 %. Two hundred and thirteen patients (84.2%) were admitted with fractures. Seventy-eight percent of the patients with fractures were managed operatively. The overall in-ward crude mortality was 1.98%

***Conclusions*:** The findings from this study points to the fact that RTAs, (especially motorcycle related injuries) and falls, account for the majority of trauma related admissions. Fractures account for the majority of injuries sustained, with a significant proportion being managed operatively.

Key Words: *Epidemiology, Pattern, Trauma, Admission*

Introduction

According to the World Health organization (WHO), injuries account for 5 million deaths per year, representing 9% of all global deaths[1]. It has also been projected that accidents will be the third leading global cause of death by the year 2020[2]. Globally, orthopaedic conditions incur more than 52 million disability-adjusted life years (DALYs) annually, comprising more than 16% of the global disease burden[3]. In the developed countries, the burden of injuries is showing a downward trend while the exact opposite can be said for developing countries especially within sub-Saharan Africa[4]. In developing countries, the surge in industrialization and motorization is usually accompanied with increasing numbers of injuries[5].

In Ghana the epidemiology of orthopaedic trauma related injuries has not been extensively studied. Among the handful of information available is a study conducted by Torgbenu et al that revealed that nearly half of the injuries sustained were fractures, and common causes were vehicular crash 113 (42.0%) and fall 68 (25.3%)[6]. Studying the epidemiology and pattern of these injuries will not only help policy makers put in place preventive measures, but also will help the hospital management team to apportion resources appropriately for the care of these patients.

As a consequence, the authors investigated the epidemiological characteristics and pattern of orthopaedic trauma related admissions to the surgical ward of a Regional hospital in Ghana. As an accredited tertiary facility with a recent upgrade from 180 to 420 bed capacity. This increment may have a positive correlation with trauma related admissions because of increased number of beds on the surgical ward. Data from this study can provide a baseline information that can be used by management in planning towards trauma care delivery

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Materials and methods

This study received institutional permission from the Greater Accra Regional Hospital (GARH), Accra, Republic of Ghana. GARH is the biggest regional hospital in Ghana, with a wide catchment area, and accredited as a tertiary hospital in 2019. Between May 2016 and October 2017, 253 patients were admitted to the surgical ward with trauma related injuries. Majority of these patients were admitted through the emergency without a referral, implying that it was the first point of call for most of these patients. Patient demographics, mechanism of injury, and sites and types of injury were retrospectively reviewed. IBM SPSS Statistics version 19.0 (IBM Corp., Somers, NY, USA) was used for

statistical analyses. Continuous variables were compared using Student's t-test and categorical data were compared using the chi-square test and Fisher's exact test according to the mechanism of injury. Two-sided p values less than 0.05 were considered statistically significant.

Results

The mean age of trauma related admission was 45.2 years with a SD of 22.3. The admission pattern showed a preponderance of males, ratio of 2.3:1 (table 1).

Table 1. Characteristics of the patients

	N=253
Age (years, means)	45.2±22.3
Sex (M: F)	176:77
Injury site	
Lower extremities	221 (87.4%)
Upper extremities	32 (12.6%)
Not specified	8 (3.2%)
Multiple site injury	64 (25.3%)
Injury type	
Fracture	213 (84.2%)
Open fracture	69/213 (32.4%)
Dislocation	12 (4.7%)
Laceration Degloving injury	12 (4.7%) 6 (2.4%)
Others	10 (4.0%)
In-hospital mortality	5 (2.0%)
Pulmonary embolism	1
Aspiration pneumonia	1
Fat embolism	2
Sepsis	1

The commonest injury site was the lower extremity (n=221, 87.4%) with the commonest injury type being fractures, (n= 213, 84.2%). Sixty-nine out of all the fractures (32.4%) were open fractures. There was an overall in-ward mortality rate of 1.98 among trauma admitted patients. Majority of the fractures admitted during this study period were managed operatively (n=166, 77.9%, table 2).

Table 2. Treatment of fractures

	N=213
Operative	166 (77.9%)
ORIF with plate and screws	58
Debridement with external fixation	36
Open/Closed IM nailing	36
Hemiarthroplasty	22
K-wiring/Cerclage	14
Conservative	34 (16.0%)
Not specified*	13 (6.1%)

*Include patients who opted for discharge against medical advice after admission and patients who asked for transfer to other facilities because of proximity sake

Road traffic accidents (RTA) accounted for 49.4 % of all trauma related admissions, with motorbike related injuries accounting for 52.8% of all RTAs (table 3).

Table 3. Mechanism of injury

	N=253
Road traffic accident	125 (49.4%)
Motorbike rider	66/125 (52.8%)
Vehicle	12/125 (9.6%)
Pedestrian	35 (28.0%)
Not specified	12 (9.6%)
Fall-down	76 (30.0%)
Fell from height	19/76 (25.0%)
Slipped and fell	45/76 (59.2%)
Fell into a gutter	10/76 (13.2%)
Not specified	2 (2.6%)
Extrinsic injury	16 (6.3%)
Not specified	36 (14.2%)

This was followed by 35 pedestrian injuries (28.0%) and 12 vehicular accident related injuries (9.8%). There was a relationship between gender and mechanism of injury in the RTA patients with significant male preponderance in motorbike injuries ($p<0.001$, table 4).

Table 4. Characteristics of the 113 patients who were injured by road traffic accident according to the mechanism of injury. Twelve patients who were not specified with the mechanism of injury were excluded from analysis

	Motorbike (n=66)	Vehicle (n=12)	Pedestrian (n=35)	p-value
Age (years, means)	32.2±11.4	37.3±13.1	38.3±20.9	0.136
Male	65 (98.5%)	7 (58.3%)	19 (54.3%)	<0.001
Lower extremity injury	60 (90.9%)	11 (91.7%)	32 (91.4%)	>0.999
Pelvis, Acetabulum	3 (5.0%)	1 (9.1%)	1 (3.1%)	0.377
Femur, Thigh, Knee	22 (36.7%)	2 (18.2%)	7 (21.9%)	
Tibia, Fibula, Ankle, Foot	35 (58.3%)	8 (72.7%)	24 (75.0%)	
Upper extremity injury	7 (10.6%)	2 (16.7%)	4 (11.4%)	0.615
Fracture	59 (90.8%)	9 (81.8%)	30 (90.9%)	0.572
Multiple site injury	20 (31.7%)	5 (45.5%)	10 (29.4%)	0.605

Table 5. Characteristics of the 74 patients who were injured by fall-down according to the mechanism of injury. Two patients who were not specified with the mechanism of injury were excluded from analysis.

	Fell from height (n=19)	Slipped and fell (n=45)	Fell into a gutter (n=10)	p-value
Age (years, mean ± SD)	45.6±22.2	76.6±15.5	53.8±17.2	<0.001
Male	13 (68.4%)	18 (40.0%)	6 (60.0%)	0.087
Lower extremity injury	16 (84.2%)	44 (97.8%)	8 (80.0%)	0.042
Pelvis, Acetabulum	4 (25.0%)	5 (11.4%)	1 (12.5%)	<0.001
Femur, Thigh, Knee	6 (37.5%)	37 (84.1%)	3 (37.5%)	
Tibia, Fibula, Ankle, Foot	6 (37.5%)	2 (4.5%)	4 (50.0%)	
Upper extremity injury	4 (21.1%)	2 (4.4%)	1 (10.0%)	0.084
Fracture	16 (84.2%)	44 (97.8%)	7 (70.0%)	0.012
Multiple site injury	5 (27.8%)	2 (5.1%)	1 (10.0%)	0.041

The second cause of trauma related admission was falls (n=76, 30.0%). In this category of patients, there was a statistically significant relationship between age and mechanism of fall (p<0.001, table 5) Slipped and fell was generally seen in elderly patients while falling from a height and falling into a gutter were seen in relatively young patients (table 5). There was a statistically significant relationship between sustaining a fracture and the nature of fall injury with 97.8% of the patients sustained a fracture after slipping and falling (p=0.014, table 5).

Discussions

This study revealed a male to female ratio of 2.3: 1 for patients admitted with orthopaedic trauma related injuries. This finding, is in keeping with other studies conducted in sub-Saharan Africa[7] and South Africa[8], which showed a male preponderance.

The overall mean age for trauma related admission was 45.2 years with a SD of 22.3, close to the results of an earlier study, conducted by Torgbenu et al[6,] which stated a mean age of 38 years with a standard deviation of 19.88.

The main causes of trauma related admissions were, RTAs (49.4%) and falls (30.0%). This was in conformity with studies conducted in Iran[9] and Nigeria[10]. The fact that this study was conducted in an urban setting, heart of Accra, with increased vehicular and motorcycle transportation, also lends explanation to the majority of trauma related admissions being RTA related

It was also observed from this study that, motorcycle related injuries accounted for 52.8% of all RTAs. This finding, is in keeping with earlier work done in a tertiary facility in Nigeria by Madubueze C, C et al[11], indicating that motorcycle injuries accounted for 54% of all RTAs. Moreover, a study conducted at the Accident Centre of the Korle Bu Teaching Hospital revealed that, RTAs, especially motorcycle related, are a significant cause of injuries in Ghana[12]. With the ever increasing numbers of motorcycles on our road, supported by a publication in 2018, that revealed that there was a 47% increment in the number of motorcycles in Ghana over a five year period, spanning from 2012 (350,000) to 2016(515000)[13]; it will be prudent to pay more attention to motorcycle injuries when discussing prevention of RTAs. The recent calls for the amendment of the Legislative Instrument (LI 2180) that banned the use of motorbikes as taxis in the year 2012[14] should be looked at carefully, because legalization of motorbikes as a means of transportation, without adequate regulation and law enforcement will put a lot of pressure on our already constrained health system. This is supported by a study conducted in the northern region of Ghana that estimated the economic burden of motorbike injuries as 1.2 million US Dollars[15]

Also, this study showed that, slipping and falling, mainly occur in elderly patients in their sixth to eighth decade of life. We need to pay attention to this finding, because, earlier data from the United Nation population division, captured in a WHO global report[16] on falls among older persons revealed that, absolute number of older persons in Africa is projected to increase dramatically: from 47.4 million in 2005 to 193 million by 2050 with a corresponding increase in life expectancy; 15 years for men and 17 years for women at age 60, slightly similar to that in other developing and developed regions. This increase in the number of older persons in Africa, together with increased life expectancy, will expose a greater number to the risk of falls. To prevent such falls, the components of successful multifactorial approaches as captured by WHO report[17] on fall prevention should be adopted; these include environmental risk assessment and modification; balance and gait training with appropriate use of assistive devices; medication review and modification; managing visual concerns; and addressing orthostatic hypotension and other cardiovascular problems. As a retrospective study with its general limitations, subsequent studies should assess the frequency of slipping and falling due to a preceding medical condition, so that appropriate preventive interventions can be put in place.

An in-ward crude mortality rate of 1.98 was observed over the study period, similar to a study conducted in Nigeria[18] but slightly lower than two other

studies conducted in sub-Saharan Africa[19] and the United Kingdom[20].

Although the severity of injuries was not standardized for direct comparison of crude mortality between countries, this finding, of relatively low mortality rate shows that patient care at GARH is satisfactory.

Conclusion

Orthopaedic trauma related admissions were found to be as a result of road traffic accident and falls. Motorcycle injuries accounted for majority of Road traffic Accidents, while slipping and falling accounted for the main mechanism of fall injuries. Majority of these injuries were fractures with about a third being open fractures. Most of these fractures were managed operatively. The overall in-ward crude mortality rate of 1.98 was slightly lower than most centers, in and outside of sub-Saharan Region.

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REVIEW OF ONE YEAR MORTALITY PATTERNS AT THE ACCIDENT AND EMERGENCY OF A TEACHING HOSPITAL IN NORTHERN GHANA

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Abstract

Background: The burden of disease in every geographical area is reflected by the diseases patients present to hospital with and die from. Many deaths in hospitals occur in the emergency department. We sought to describe the mortality rate, patterns, and causes of death in the Accident and Emergency (A&E) Department of Tamale Teaching Hospital.

Methods: This was a retrospective review of deaths that occurred in the Accident and Emergency Department from January to December 2016. Information was gathered from death registers, folders, nurses' notes, and admission and discharge books.

Results: In 2016, 7,369 patients visited the A&E and 215 died, with a mortality rate of 2.9%. The age range of patients who died was 3-93 years. Most deaths (121, 50.2%) occurred in patients aged 50 years and above. Over 60% of the deaths occurred in the first 24 hours. Most (69%) deaths were due to a medical cause. The leading individual causes were: sepsis (17%), trauma (16%), cerebrovascular accident (12%), and pneumonia (9%). The peak age group of medical deaths was 70-79 (eighth decade) years and peak age of surgical deaths was 30-39 years. Most patients (77%) died in the absence of an emergency physician.

Conclusion: The mortality of 2.9% can be reduced. The first 24 hours in the emergency is crucial since most of our patients died in this period and in the absence of an emergency physician on duty. In addition to increasing the equipment and supplies in the emergency department, increasing the number and availability of emergency physicians and improvement in records keeping will have an important role.

Key Words: *Mortality, Death, Cerebrovascular accident (CVA)*

Introduction

Information on the mortality pattern of every institution is a very relevant source of knowledge concerning the burden of disease. It provides information regarding the quality of care, challenges of care, and the debilitating diseases affecting patients in the communities served by the health facility[1,2].

The emergency department of every hospital serves as the gateway to the facility. It receives patients of varied conditions including medical and surgical cases of various degrees of severity, of which most are treated and discharged or admitted into the hospital for further management. It is the emergency department that creates the platform for the correction of certain physiologic abnormalities in patients thus help prevent the progression of organ failure and eventually lowers mortality[3]. Reported rates of mortality vary widely across the world with about 15-60% of all deaths in a hospital occurring in the emergency department[4].

Many factors contribute to mortality in Accident and Emergency departments all over the world. Delay in seeking care, lack of an efficient prehospital care and transport system, lack of equipment, severity of illness or injury, and inadequate skilled manpower in trauma and emergency all contribute to the mortalities we see in our facilities[5-8].

This study is aimed at documenting the demographic data, crude mortality rate, the mortality patterns, and clinical causes of death of affected patients from January to December 2016 at the Accident and Emergency Department of Tamale Teaching Hospital. We believe this will provide relevant information for

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policy makers in Ghana and other parts of Africa to design interventions to reduce mortalities in our A&E centres.

Materials and Methods

A retrospective review of patients who died at the A&E Department of the Tamale Teaching Hospital while on admission from January to December 2016 was carried out. This facility is the biggest referral hospital of about 350 bed capacity (as of the time of the study) in Northern Ghana and serves a population of over 4 million in the Upper East, Upper West and Northern regions including parts of Burkina Faso, Ivory Coast, and Togo. The Accident and Emergency department of the Tamale Teaching Hospital is a 12-bed capacity unit with a triage area of unspecified bed capacity. For the year under review, two Emergency Medicine Physician Specialists ran the department working averagely 52 hours a week with 3-medical officers, 7-emergency nurses and 39-general nurses with a few patient monitors, beds and a small triage area, but lacks some basic equipment for patient resuscitation and monitoring such as ventilator, defibrillator and patient monitors.

Information was gathered from patient folders, admission and discharge books, nurses' registers, and death certificate registers in the Accident and Emergency department. Data on patient demographics, clinical diagnosis/cause of death as documented by the doctor present at time of death, and duration of admission before death were collected. Patients who died in the wards after having left the Accident and Emergency were excluded from this study as well as patients who were brought in dead (BID). The data generated was entered in Excel and exported to SPSS version 16 for analysis. The results were illustrated using frequency tables and charts. Chi-square test was used for categorical data with a significance *p* value of 0.05.

The Ethical Research and Review Board of the Tamale Teaching Hospital approved the study.

Results

During the period under review, a total of 7369 admissions to the Accident and Emergency department were recorded. A total of 215 patients died, for a crude mortality rate of 2.9%. Among the deaths, 153 (64%) were males and 87 (36%) females. The age range of patients who died was from 3-93 years with a mean age of 50 $\pm$ 23 (SD) years.

The highest number of deaths occurred within the eighth decade (70-79 age group) (Table 1). Most deaths (121, 50.2%) occurred in patients who were aged 50 years and above. The mean age of death increased as the duration of stay increased. Younger patients appear to die in the first 24 hours more often than older patients (Table 2).

Table 1. Age and Sex Distribution

Age	Male	Female	Total	Percentage
0-9	3	1	4	2
10-19	7	5	12	6
20-29	18	10	28	13
30-39	21	6	27	13
40-49	15	9	24	11
50-59	19	9	28	13
60-69	15	9	24	11
70-79	23	18	41	19
80-89	7	7	14	7
90-99	3	0	3	1
Missing	9	1	10	5
Total	140	75	215	100

Table 2- Mean age of death with duration of stay in A&E

Duration before Death(Hours)	Age$\pm$ SD
Less than 24	49.0 $\pm$ 4.0
24-48	56.6 $\pm$ 7.7
48-72	57.8 $\pm$ 16.6
More than 72	62.9 $\pm$ 8.0

Table 3. Duration before death in A&E and sex distribution

Duration before death (hours)	Male	Female	Total	Percentage
< 24	95	25	119	64
24 to 48	23	9	33	18
48 to 72	6	7	13	7
72 and above	11	10	21	11
Total	135	51	186	100

footnote: "Data on duration of admission before death not available (missing data) for 29 patients; 9 females 20 males"

There was a preponderance of deaths in the first 24 hours (64% of all deaths, Table 3, Fig 1), and the number of deaths in the first 48 hours was about 4 times the deaths after 48 hours. Males were more likely to die in the first 24 hours (70% of all male deaths) than females (49% of all female deaths, p=0.007).

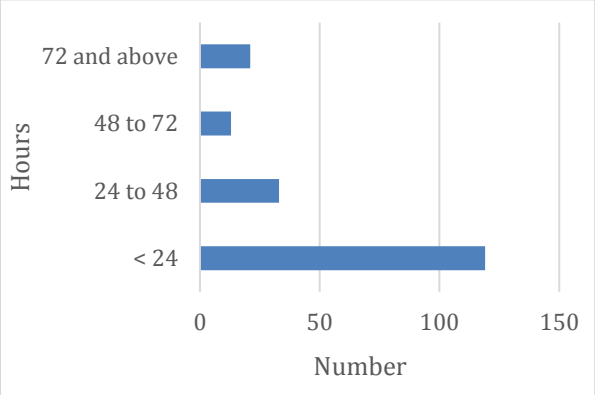

Fig 1. Duration of stay before death in Accident and Emergency

Clinical causes of death are shown in Table 4. Sepsis (17% of deaths) and trauma (16%) were the leading causes, followed by cerebrovascular accidents at 12%. Most deaths (69%) were from medical causes. Noteworthy is that data on clinical cause of death was missing for 31 cases. Knowing these causes of death might have changed the picture.

Table 4. Clinical causes of mortality

Causes of Death	Number	Percentage
Acute Abdomen	18	10
Asthma	5	3
Burns	2	1
CVA	22	12
Diabetic emergency	5	3
Heart failure	10	5
Liver disease	11	6
Severe Malaria	3	2
Malignancy	6	3
PE	2	1
Pneumonia	16	9
Renal condition	5	3
Respiratory failure	3	2
Sepsis	31	17
Haemorrhagic Shock	8	4
Snake bite	4	2
Trauma	29	16
Others	4	2
Total	184	100

Footnote: Data on clinical cause of mortality missing for 31 persons.
CVA: cerebrovascular accident. PE: Pulmonary embolus.

All of the broad categories of causes of death (medical, surgical, trauma) were most common in the first 24 hours (Table 5). The mean age for medical causes of death was 56 ± 19 years. About 63% of medical deaths occurred in patients older than 50 years with the largest single group (24%) in the 70-79-year age group. The mean age for surgical causes of death was 41 ± 27 years. Among surgical deaths, 66% of the deaths occurred in patients less than 50 years of age. About 23% in the 30-39 age group.

Table 5. Categorical cause of death and duration before death (hours)

Duration before death (hours)	Medical	Surgical	Trauma	Missing	Total
Less than 24	68	15	16	20	119
24-48	19	6	3	5	33
48-72	9	1	2	1	13
More than 72	15	1	3	2	21
Total	111	23	24	28	186

Footnote: "29 patients lack duration before death"- Missing data.

The months of November (10%), March (13%), and December (15%) registered the highest number of deaths in an ascending order (Figure 2).

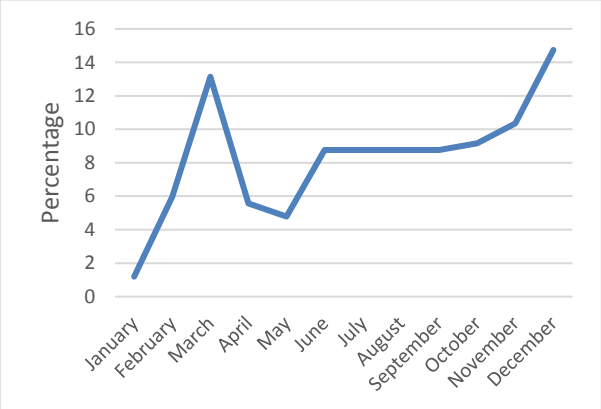

Fig 2. Monthly mortality

Most deaths (77%) occurred in the absence of an emergency medicine specialist. Moreover, this was especially a problem on weekends, when no emergency medicine specialist was available (Figure 3). Although Tamale Teaching Hospital does have emergency medicine specialists, it does not appear to have enough for full time coverage of the accident and emergency.

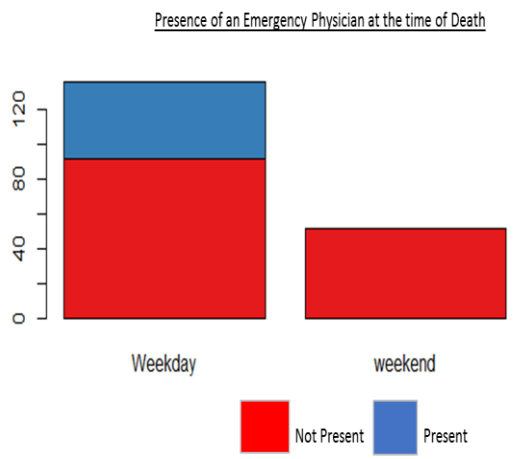

Fig 3. Presence of an emergency medicine physician at time of death, by weekday vs weekend

Discussion

The year 2016 under review recorded a total of 7,369 patients admitted to the Accident and Emergency department with 215 deaths representing a crude mortality of 2.9%. This rate is similar to what was recorded in a Nigerian tertiary institution[9], but rather low compared to other studies within the sub-region recording a crude mortality rate of the range 4-8.6%[1,5,10,11]. However a study in Port Harcourt in Nigeria recorded a rate of 2%[6]. These variations are bound to occur due to different infrastructure, human resource, and varied expertise in the various facilities reviewed, as well as different mixtures of types and severities of cases.

The male to female ratio of death was 1.7:1. This ratio is comparable to other studies recording similar findings [1, 6, 10, 11] showing male dominance in death. The data showed that the number of males dying in the first 48 hours on admission in the A&E was about 4 times the number of female deaths. This could be as a result of males usually reporting to hospital only when sickness is critical and also probably engaging in more risky adventures, since they usually do not want to appear weak in the family or community conforming to sociocultural beliefs. Also, more males are likely to engage in dangerous adventurous activities resulting in fatal injuries leading to death on admission to hospitals especially in trauma cases.

In our review, the mean age of death was 50 years and most deaths occurred in patients in the 8th decade of life. Half (50.2%) of deaths occurred in patients older than 50 years. This finding is surprisingly in variance to most studies within the sub-region which found most deaths occurring in the under 50 years group. [1, 6, 9] This was somewhat similar to what was found in London and Nepal [12, 13], where life expectancies are longer and thus one might expect higher average ages of presentation. However, in our setting it could probably be due to most deaths occurring in the older age group due to medical causes of death being the majority. Also the exclusion of patients who were Brought in Dead from the study could have made a difference.

Over 60% of deaths occurred in the first 24 hours, with the mean age of patients dying within 24 hours being 49 years. An increasing age of death was observed with more than 24 hrs duration of stay. This finding agrees with what was found in Nigeria by Kolawole et al. (64%) and Ekere et al. (70.9%) and in Nepal by Bharati et al. who reported almost 100% mortality within 24 hrs[6,9,13]. However Ugare et al. reported differently in Nigeria, with 56% of deaths within the first 48 hrs on admission to the A&E.[5]This is not surprising in our sub-region since most patients tend to report late to hospital when condition is critical probably due to poverty, lack of transportation to health facility, poor health seeking behaviour due to sociocultural factors, and inadequate prompt attention on arrival to health facility or poor triaging systems in the emergency departments. These need to be tackled head on if Africa will reduce mortality rates in emergency departments.

Mortality from medical causes in the first 24 hours was three times that from surgical and trauma combined. This finding is similar to most studies reporting higher mortality from medical causes in the first 24 hours of admission[6,9,13].

More than twice the number of deaths resulting from surgical (31%) causes was from medical (69%) cause of death in our study. Trauma (16%) and sepsis (17%) nearly equally accounted for the highest clinical cause of death followed by CVA (12%) with patients with missing data of 14%, which could have influenced the findings. Our finding is similar to what was reported by other studies[9,14-16]. This is however in contrast to what was found by Chukuezi that trauma was the leading cause of death in their study in Nigeria[1]. Among the medical causes of death, the specific causes were: sepsis (25%), CVA (15%) and pneumonia (12%). This is similar to what was found in other studies[13,17]. Most patients dying with medical cause of death were older with a mean age of 56 ±19 years and with most deaths in the eighth decade- 70-79 year group (24%).

Of the surgical causes of death in this study, trauma was (51%), acute abdomen (31%) and sepsis (7%). The mean age of surgical deaths was 41 ±27 years with most death occurring in the 30-39 age group (23%). Therefore, younger patients were dying from surgical

causes compared with older patients dying from medical causes.

A lot needs to be done in most low and middle-income countries to reduce the deaths among young people from trauma since they are mostly the "work-horse" of every economy and the situation is likely not to get better due to increasing urbanization and industrialization in these countries. The introduction of basic emergency medical care into health systems and staff can help improve emergency care[18]

Most deaths (77%) occurred in the absence of the emergency physician. It is difficult to say with a degree of certainty that the presence of the emergency physician could have prevented the deaths of most of the patients. However, having more skilled providers (such as training more emergency physicians) present for the more severely ill or injured would likely have improved their chances of survival[19,20]. A study in Rwanda demonstrated that the presence of Emergency Physicians through training can reduce mortality and improve quality of care in hospitals[21]. There is therefore the need for more trained emergency physicians, trauma surgeons, and emergency nurses all over Africa to help reduce mortalities in the emergency departments of our health facilities since about 15-60% of deaths in hospitals occur in emergency departments[4].

Conclusion

The crude mortality rate in the Accident and Emergency department at Tamale Teaching Hospital in the year 2016 was 2.9%. Medical causes of death accounted for most deaths and most deaths occurred in the first 24 hours. Generally, older aged patients were likely to die of medical causes compared to younger aged patients who are most likely to die of surgical causes. Emphasis needs to be drawn to equipping health facilities, simple interventions to facilitate timely triaging of patients, prehospital care, education on prompt health seeking behaviour, good referral systems, increasing number of emergency physicians to allow a more consistent coverage, and regular in-service training on resuscitation, medical and surgical emergency care for providers. There is also a need to improve record keeping, monitoring quality of care and research funding of emergency care.

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CASE REPORT

LIVE UNILATERAL MONOCHORIONIC DIAMNIOTIC TWIN ECTOPIC GESTATIONS AT THE LEKMA HOSPITAL, TESHIE. ACCRA, GHANA – A CASE REPORT

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Abstract

Live unilateral twin ectopic gestations are a rare ultrasound finding with only 12 previous cases documented, none in Africa. This 13th case highlights a 30 year old primigravida who presented with abdominal pain. Transabdominal ultrasound found live right adnexal monochorionic diamniotic twin ectopic gestations and 200 mls of free fluid in the pouch of Douglas. Laparotomy showed two gestational sacs within the right fimbria and a right Salpingectomy was performed with good maternal outcome.

This case is different from most previous cases in having previous appendectomy as a risk factor and also for its use of transabdominal ultrasound. During transabdominal ultrasound, Sonologists must carefully evaluate any surgical scars and other risk factors, as these may raise the index of suspicion and lead to a prompt diagnosis of live unilateral monochorionic diamniotic twin ectopic gestations.

Key Words: *Live, Monochorionic Diamniotic, Transabdominal Ultrasound, Twin Ectopic, Ghana.*

Background

Ectopic pregnancy (EP) is a type of pregnancy in which the gestational sac is implanted anywhere outside the endometrial cavity. Such locations include the ampulla, isthmus and fimbria of the fallopian tubes and in a minority of patients the abdominal cavity, cervix and ovaries[1].

Patients with a history of pelvic surgery including appendectomy show an increased risk[2] of developing EP because of post-inflammatory scarring of the fallopian tubes. A unilateral twin ectopic pregnancy is a rare condition and occurs in about 1 in 200 ectopic gestations[3]. Twin ectopic pregnancy occurs at a frequency of 1/125 000[4] and only 12 cases have been reported with documented fetal cardiac activity[5]. When the diagnosis of EP is missed, there is a huge likelihood of a bad maternal outcome due to haemorrhage.

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Conflict of Interest: None Declared

Case Report

A 30-year-old primigravida of Nigerian origin presented with a history of 2 month's amenorrhoea and 1 month's lower abdominal pain. Although initially relieved by analgesics, pain became aggravated a day prior to presentation and was more severe on the right iliac fossa. There was no associated bleeding per vaginam or symptoms of anaemia. She had previously been investigated for infertility. She neither smoked nor drank alcohol. On examination, patient looked acutely ill, was in pain and showed mild pallor. Her cardio-respiratory systems were stable. The pelvis was full and tender on palpation with rebound tenderness and guarding, more within the right adnexa. Vaginal examination showed a normal introitus. There was fullness at the pouch of Douglas and cervical motion tenderness. The cervix was closed and there was no blood in the vagina. No pelvic masses were noted on bimanual examination.

Ultrasound Findings

Transabdominal ultrasound showed an empty uterus measuring 8.2 x 5.8 x 4.4 cm. The endometrium was mildly thickened and echogenic. No pseudogestational sac seen. There was a right adnexal gestational sac with twin gestations, both with active foetal heart activities (Fig 1-3).

Crown-Rump length measurements were 1.33cm and 1.27cm, corresponding to estimated gestational ages of 7 weeks 4 days each. A solitary chorion was noted and the "Lambda sign" was absent. A thin intervening membrane was noted between the two gestations, conforming to the "T – sign" seen in monochorionic diamniotic gestations. In addition, there was free intraperitoneal fluid estimated at 200mls.

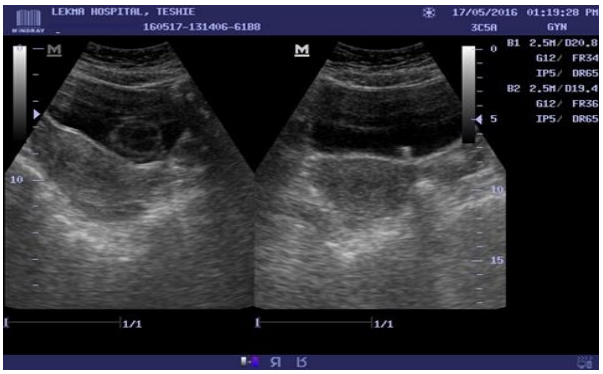

Fig 1. Longitudinal and Transverse transabdominal ultrasound of the pelvis showing an empty uterus. There is a Folley's catheter in the urinary bladder.

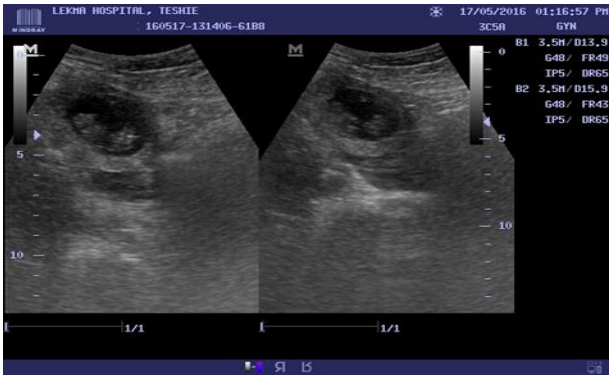

Fig 2. Pelvic Ultrasound images demonstrating a gestational sac with two embryos within the right adnexa.

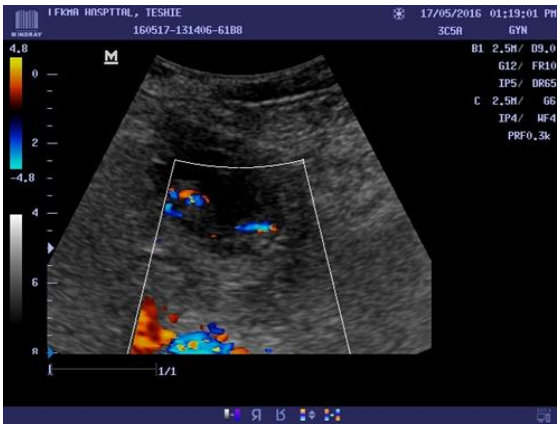

Fig 3. Colour Doppler depicts 2 gestations with active foetal heart beats

The left adnexa was unremarkable. A diagnosis of haemoperitoneum secondary to leaking right adnexal live monochorionic diamniotic twin ectopic gestations was made. Patient and her partner were counselled for an emergency laparotomy.

Intraoperative findings

Exploratory laparotomy showed an unruptured right ectopic fimbrial gestation containing 2 sacs with attachment to the omentum, suggesting pelvic adhesions (Fig 4). There were additional moderate adhesions within the right adnexa and right iliac fossa, as well as 500 mls of haemoperitoneum. The right ovary was normal. The left fallopian tube was normal. There was a 2.0 x 2.0 cm left adnexal simple cyst.

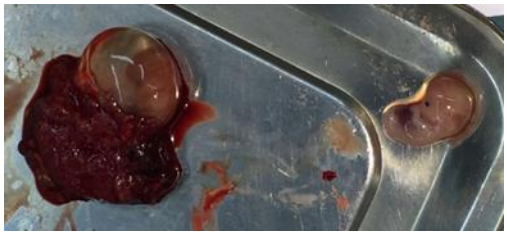

Fig 4. Intraoperative photograph showing 2 embryos obtained from the right adnexa

After a right salpingectomy was performed, patient was monitored and was discharged home on the third post-operative day.

Discussion

Ectopic pregnancies are potentially life-threatening gynaecologic emergencies and require early diagnosis and prompt management for good maternal outcomes. Some studies suggest that there is a delay in ovum transport and consequently implantation, which increases the risk of occurrence of monozygotic twin pregnancies[6].

The first report of a unilateral twin ectopic pregnancy was made in 1891 by De Ott[7]. In 1990, Sherer[8] described unilateral twin ectopic gestations with the beating of the foetal heart by transabdominal ultrasound. Then in 1994, Gualandi[9] documented live unilateral twin tubal pregnancy detected by transvaginal ultrasonography. Since then, an average of one case of live unilateral twin ectopic gestation has been reported per year by transvaginal ultrasound. Most recently, in 2018 Chang-Ihll et al[5] reported the 12th case of a live unilateral twin tubal pregnancy making this current report the 13th case. Of the 12 previous cases of unilateral twin tubal pregnancies presenting with cardiac activity reported between 1994 and 2018, 4 cases had no risk factors and all were managed by surgical intervention except one[5].

In the current case, the patient had a scar at McBurney's point, from a previous appendectomy. This observation is consistent with a previous finding by Fernandez[2] that appendectomy is associated with an

increased risk of EP in general. The presence of any previous appendectomy scars on a patient presenting for early pregnancy ultrasound should therefore raise the index of suspicion for EP. Other risk factors[11] for EP include a prior ectopic pregnancy, prior genital surgery, psychiatric disorders, pelvic inflammatory disease, infertility, use of intrauterine contraceptive devices, tubal surgery, tubal ligation, smoking and previous exposure to Diethylstilboestrol, and Sonologists must be aware of the presence of any of these risk factors at the time of the ultrasound examination.

The patient in this case was of Nigerian origin and had a positive family history of twin gestations. This is consistent with the findings in literature that Nigeria is the country with the highest rate of twin pregnancy worldwide[2]. The positive family history of twinning also corroborates previous research findings that twin pregnancy rates are higher in patients with a positive family history[11] and also that twinning may be attributable to genetic and environmental factors[12]. Indeed, globally, the highest burden of multiple pregnancy has been found not just in Nigeria, but in the entire sub-Saharan Africa, with an average twinning rate of 20 per 1,000 deliveries[13], double the figures from Europe[14] and quadruple the rates in Asia[11,13,14] . The evidence further shows that twins and multiple pregnancies worldwide are associated with a higher risk of maternal and perinatal morbidity and mortality as compared to singletons. The higher morbidity risk is manifested in prematurity, low birthweight, and intrauterine growth restriction[15,16,17].

Interestingly, in the current case the diagnosis of live unilateral EP was made on transabdominal sonography. Several studies have compared the effectiveness of transabdominal and transvaginal sonography in the diagnosis of EP and confirmed the transvaginal approach to be vastly superior[18-21]. One of the prerequisites for using the transabdominal approach is a full maternal bladder. Waiting for bladder filling may lead to unnecessary delays in diagnosis or possibly a suboptimal ultrasound procedure if a full bladder is not attained. In addition, there may be an undue need for a speedy procedure when the patient's urinary bladder is overfilled and is no longer able to hold urine, potentially compromising the results. Transvaginal sonography, however helps identify subtle adnexal lesions which may be missed with other methods. Besides, patients do not require bladder filling for transvaginal ultrasound, enabling a quicker diagnosis. It must be noted however, that many ultrasound units in Ghana only have a convex probe and are not equipped for transvaginal ultrasound, as occurred in this case report. It therefore remains the responsibility of Sonologists to educate management in hospitals and clinics as to the value of investing in such valuable transvaginal transducers to avoid missing EP. Difficult cases may be referred for repeat ultrasound at centers with endovaginal transducers. In the interim, sonographers who only work with transabdominal ultrasound may still employ optimum bladder filling and a careful and systematic approach to aid the prompt diagnosis and management of EP.

This current case is distinguished from other cases of live unilateral twin ectopic gestations reported. Firstly, it is the first live unilateral twin ectopic pregnancy reported with previous appendectomy as a risk factor. Secondly, to the best of our knowledge this is the first report of a live unilateral monochorionic diamniotic twin ectopic gestation to be reported in Ghana and Africa. Thirdly, it is only the second report after Sherer[8] et al in 1990 to diagnose a live unilateral twin ectopic gestation by transabdominal ultrasound. Sonologists will be encouraged by such diagnoses to continue to scan the adnexa even after one EP has been found, and even when they only have transabdominal ultrasound probes.

Conclusion

Careful and systematic ultrasound procedures are required for the early diagnosis and prompt management of live unilateral twin ectopic gestations. During sonography, it is still vital to review other areas of the pelvis even when an ectopic gestation has been found, because of the possibility of a second gestation. Radiologists must take into account any scars on the patient's abdomen and other risk factors, as these may raise the index of suspicion and lead to prompt diagnosis of live unilateral twin ectopic gestations. Finally, though surpassed by transvaginal ultrasound, clinicians can still diagnose cases of live unilateral monochorionic diamniotic twin ectopic pregnancy on transabdominal ultrasound through careful ultrasound technique.

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Availability of data and material: No datasets were used and/or analysed during the current publication.

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Authors' contributions

JNO was responsible for the design of the manuscript for intellectual presentation. He also contributed to the collection, management, analysis and interpretation of the ultrasound images. EEA assisted in the operative management and subsequent follow up of the patient. Both authors read and approved the final manuscript.

EKO assisted in the preparation and reviewing of the manuscript.

RA assisted in the ultrasound image acquisition and formatting of this work.

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MULTIDISCIPLINARY TEAMWORK IN THE MANAGEMENT OF ADVANCED ABDOMINAL PREGNANCY- A CASE REPORT

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Abstract

Introduction: Abdominal pregnancies are rare; often being misdiagnosed or completely missed till surgery is done. This presents a challenge in the diagnosis and management of the condition, especially in a resource-constrained setting. A high index of suspicion is therefore required for prompt diagnosis. The objective in this report is to increase the awareness of the need for early diagnosis of abdominal pregnancy and the need for multidisciplinary planning and care for optimum management.

Case Report and Interventions: A 34-year-old gravida 4 parity 2+1, presented at 41 weeks with a two-month history of abdominal pain. Thorough examination and ultrasound revealed an advanced abdominal pregnancy.

At laparotomy an abdominal pregnancy with placenta attached to the omentum was noted. A live male infant was delivered with a birthweight of 3.4 kg with an APGAR score of 4 and 6 at 1 and 5 minutes respectively. The baby had a respiratory arrest a few hours after the delivery. Attempted resuscitation in the SCBU unit was unsuccessful. Mother was discharged three days later with no post-op complications.

Conclusion: The occurrence of abdominal pregnancy seems to be a gradually increasing phenomenon. It is therefore imperative for clinicians to have a high index of suspicion to reduce maternal as well as perinatal morbidity and mortality associated with the condition.

Key Words: *Advanced Abdominal Pregnancy, Placenta, Multidisciplinary management.*

Introduction

Abdominal pregnancy is uncommon[1], posing considerable management challenges especially in developing countries. Advanced abdominal pregnancy is associated with significant fetal and maternal morbidity and mortality[2]. Analysis of 11 abdominal pregnancy related deaths and an estimated 5221 abdominal pregnancies by Atrash and associates in the United States, reported 10.9 abdominal pregnancies per 100,000 live births and 9.2 per 1000 ectopic pregnancies [3] and a maternal mortality rate of 5.1 per 1000 cases [3]. We present a case of advanced abdominal pregnancy in a 34-year-old multipara who had a successful laparotomy with delivery of a live fetus. We also emphasize the need for multidisciplinary planning and care for optimum management.

Case report

Patient was a 34-year-old gravida 4 parity 2 (all alive) +1 spontaneous abortion. She was referred to our facility from a neighbouring health center on account of multiple myoma in cyesis. At presentation her estimated gestational age was 41 weeks 1 day. She presented with a two month history of abdominal pain, most severe in the suprapubic region and right flank. The pain, described as intermittent in the last 48 hours prior to presentation, had become particularly intense such that the patient could not sleep at night. On examination, the patient looked ill, had mild conjunctival pallor, anicteric with a temperature of 37.9ºC, a respiratory rate of 24 cycles per minute, a pulse rate 98bpm and a blood pressure of 110/70mmHg. On abdominal examination, there was generalized tenderness with fetal parts easily palpable. Fetal heart tone was present, ranging between 154-160bpm. Vaginal examination revealed an uneffaced, soft, 2cm long and central cervix. An abdominal ultrasound showed a live fetus noted to be extrauterine. The uterus which was seen to be empty, measured 6.09*5.36*5.56 cm with multiple heterogenous masses (myomas) seen in the anterior wall. The placenta was thought to be attached to the anterior abdominal wall. Small amount of intra-abdominal fluid was also noted. The fetal biometry gave a composite gestational age of 30 weeks with an estimated fetal weight of 3.422kg. The patient's previous deliveries were spontaneous vaginal.

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Antenatal Care

She started antenatal from the referral site at 8 weeks. She had two other visits at 16 weeks and 22 weeks. She defaulted subsequent antenatal visits till she reported with severe abdominal pain that led to her referral to our facility. An ultrasound done at 20 weeks queried abdominal pregnancy but another scan done at 35 weeks did not make mention of any abdominal

pregnancy but commented on her multiple uterine myomas.

Subsequent to her findings at presentation, a decision to deliver was made but the full blood count done at presentation showed a Haemoglobin of 7.8g/dl, MCV of 74.4fl, MCH 24.9pg, MCHC 33.5g/dl, white cell count of $6.75*10^9$/L and platelets $451*10^3$/ml. In view of the risk of potential heavy bleeding intraoperatively, she was transfused 2 units of blood with a unit on stand-by to be given in theatre. The general surgeon (we have no vascular surgeon in our hospital) was asked to be present at delivery knowing that the placenta could well be attached to the bowel and we may need his help to deal with it.

Findings

Prior to going into theatre, the team had discussed the possible scenario of a torrential bleed and what interventions we had in mind. The laparotomy was done under general anesthesia *via* a midline incision with the general surgeon assisting the obstetrician, and three nurse anesthetists present. The uterus was noted to be about 16-week size, with three small subserosal myomas. A live male infant was delivered with an APGAR score of 4 at one minute, and 6 at five minutes. The birthweight was 3400g with bilateral talipes equinovarus, a distended abdomen and a seemingly prominent forehead. He was transferred to the special care baby unit (SCBU).

The placenta was attached to the omentum, part of the mesentery of the transverse colon and left fallopian tube. Main blood supply was from a left tubo-ovarian pedicle. Right tube and ovary were normal. The main blood supply of the placenta was ligated, and the placenta completely removed. Haemostasis was secured. The estimated blood loss at surgery was 1000 ml. The patient received one unit of whole blood intraoperatively and two units postoperatively. Her recovery was uneventful.

She was discharged 3 days later but without her baby who had a respiratory arrest a few hours after the delivery. Attempted resuscitation was unsuccessful. Parents declined a post-mortem.

Fig 1. Newborn shortly after passing away at SCBU

Discussion

Abdominal pregnancy is a rare form of ectopic pregnancy and is associated with a high maternal mortality, and perinatal morbidity and mortality[4]. This was a case of an advanced abdominal pregnancy, one that goes beyond 20 weeks with a live fetus, or showing signs of having once lived and developed in the mother's abdominal cavity[5]. The incidence of abdominal pregnancy appears to be increasing as a result of increasing use of assisted reproductive technology[6].

Signs and symptoms

Signs and symptoms of abdominal pregnancy vary greatly and one will need to have a high index of suspicion to make a diagnosis. The signs and symptoms may include abdominal pain, bleeding in pregnancy[7], and sometimes as intestinal obstruction[8]. Other presentations include painful fetal movement, abnormal lie, an unusual appearance or position of the placenta on the sonography, and failed induction[7]. In some parts of the developing world where access to ultrasound scans is difficult, the diagnosis is made late or during surgery to investigate the abdominal symptoms[2, 9].

Risk factors

About half of those with abdominal pregnancy have no known risk factors but when present may include tubal damage, pelvic inflammatory disease, assisted reproductive techniques, multiparity, previous history of ectopic pregnancy and tobacco smoking[10]. There was no significant risk factor in our patient.

Mechanism/Implantation

Implantation sites can be anywhere in the abdomen. Primary implantation refers to the implantation of the placenta directly into the peritoneum, and secondary implantation means it originated from the tube and re-implanted[12]. Suggested mechanisms of secondary implantation follows fimbrial abortion, uterine rupture and rupture of uterine rudimentary horn[4]. Implantation can be on the omentum, fallopian tubes, ovaries, bowel and its mysentary, mesosalpinx, peritoneum of the pelvic wall and abdominal wall[11,12]. In very rare cases it can get implanted on the liver and spleen[13]. For this case, the placenta was attached to the omentum, part of the mesentery of the transverse colon and left tube with the main blood supply coming from a left tubo-ovarian pedicle. Although we cannot state categorically whether it was primary or secondary, we think it is an advanced primary abdominal pregnancy because the uterus and tubes of this patient were intact, with no signs of uterine rupture.

Diagnosis

Diagnosis of abdominal pregnancy can be very difficult and challenging [14]. In a clinical case report from Cameroon on advanced abdominal pregnancies, only 45% of the cases were diagnosed pre-operatively[2]. Studdiford established three main criteria for diagnosing

primary peritoneal pregnancies[1] - normal bilateral fallopian tubes and ovaries [2]; absence of uteroperitoneal fistula and[3]a pregnancy related exclusively to the peritoneal surface[15]. Although x-rays can help in the diagnosis of abdominal pregnancy[12], diagnosis is usually made with an ultrasound scan[16] but that can be missed as it depends on the experience of the sonographer[17]. In abdominal pregnancy ultrasound scan can demonstrate the pregnancy as an extrauterine gestation, fetal parts close to the abdominal wall, absence of uterine wall around the fetus, oligohydramnios, abnormal lie of fetus, placental abnormalities and free fluid in the abdomen[18,19]. Also, the insertion of a balloon catheter into the uterus can help clarify the image if there is any ambiguity[20].

About 50 percent of diagnoses are missed on ultrasound[21] but MRI and CT are both excellent diagnostic tools[22]. Teng et al reported an interesting case in which MRI played a decisive role in diagnosis[23]. Unfortunately, these advanced imaging technologies are not readily available in most parts of Ghana and Africa, and even when it is available the fees tend to be exorbitant and out of the range of the average client.

Management.

The optimal management of abdominal pregnancy requires planning by a multidisciplinary team and availability of blood products. Sapuri and Klufio suggested a criteria to be met for a safe delivery: placental implantation is in the lower abdomen away from the liver and spleen, the fetus is alive, there are no major congenital malformations, there is careful monitoring of maternal and fetal wellbeing; and there is continuous hospitalization in a well-equipped and well-staffed maternity unit which has immediate blood transfusion facilities [24]. In our case, the lead surgeon, an Obstetrician, made sure that the general surgeon and anesthetists were present and ready. The blood bank was put on stand-by and made available three units of whole blood, all of which were in hand before making the decision to send the patient to theatre. It is generally recommended to perform a laparotomy when diagnosis is made[12].

Maternal deaths associated with abdominal pregnancy usually result from hemorrhage after removal of the placenta. Uterine contractions normally provide a powerful mechanism to control blood loss, however, in an abdominal pregnancy the placenta is located over tissue that cannot contract and attempts at its removal may lead to life-threatening blood loss[12]. There are however risks associated with leaving the placenta in situ, including sepsis, bowel obstruction, pre-eclampsia and fistula formation[25,26]. The placenta usually takes several months to regress[27]. Monitoring for the regression of the placenta is done by checking B-HCG levels and doppler ultrasound scan[27]. Blood transfusion is frequent in such cases. Others use tranexamic acid, recombinant factor VIIa, or angiographic embolization all of which minimize blood loss[7,28,29] .

Birth defects are frequently encountered in abdominal pregnancies [30]. The rate of deformations and malformations is estimated at 21% [30]. Facial and cranial asymmetries, joint abnormalities and limb defects are typical [30]. The baby had talipes equinovarus, a distended abdomen and a seemingly prominent forehead.

Conclusions

Advanced abdominal pregnancy is rare, and going past the estimated due dates is even rarer. Diagnosis can be very difficult thus a high index of suspicion, good clinical examination, and appropriate imaging in skilled hands can be very helpful. Haemorrhage is the single most important life threatening complication to the mother while some of the babies are born with fetal anomalies. Multidisciplinary planning and care is crucial for optimum management and outcome.

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CAESAREAN SCAR PREGNANCY: A MATERNAL NEAR- MISS IN THE SANDEMA DISTRICT HOSPITAL, GHANA.

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Abstract

Introduction: An ectopic pregnancy located in a caesarean scar could have more catastrophic sequelae due to abnormal placentation and early invasion of the myometrium. It has a high possibility of Placenta previa and antenatal uterine rupture as the pregnancy progresses with gestational age. It is very high risk for severe maternal morbidity and associated high maternal mortality.

The case: We presented a case reporting a few weeks after missing her period to the Sandema District Hospital with bleeding per vaginum and a positive urine pregnancy test. The initial diagnosis was a threatened miscarriage with a differential of possible cervicoisthmic pregnancy after ultrasound scan was done. She was managed conservatively as a case of threatened miscarriage to be reviewed weekly but she defaulted to review and presented four months later with hemodynamic instability after she collapsed at home at 18 weeks gestation. Laparotomy with wedge resection and reconstruction of the previous caesarean section scar was done on account of ruptured uterus and placenta percreta at 18 weeks.

Conclusion: In patients with previous caesarean scar, caesarean ectopic pregnancy should also be suspected when managing them for threatened abortions even in primary care facilities of low income countries**.**

Keywords: *Caesarean scar, ectopic pregnancy, ruptured ectopic, threatened abortion, near-miss*

Introduction

Caesarean scar pregnancy is a rare type of ectopic pregnancy occurring in 1/1800 to 1/2500 pregnancies[1,2,3]. It results from the implantation and development of the blastocyst in the scar of a previous caesarean section[4,5]. It is considered more aggressive than placenta previa or accreta due to the early invasion of the myometrium causing very high risk for uterine rupture with all of its related complications.

It is important because it is on the ascendency as a result of the increasing prevalence of caesarean section scars, improvement in transvaginal sonography and the use of assisted reproduction[3,4,6]. It is associated with adverse maternal and fetal outcomes if not recognized early such as major hemorrhage, morbidly adherent placenta and placenta praevia, uterine rupture and growth restriction[6]. Early diagnosis leads to prompt management and improves the outcome by allowing preservation of future fertility. Furthermore it has a tendency of being missed especially in developing countries with inadequate sonographic equipment and expertise as well as high risk of defaulting due to inadequate health systems[7]. It may then lead to maternal mortality especially where the surgical expertise/ blood transfusion is deficient. The odds of these deficiencies are worse in the rural parts of SubSaharan Africa.

Since its initial description as a uterine scar sacculus[8], it has generated a lot of discussion with varying opinions as to its exact aetiology and the best mode of treatment. It is thought that Caesarean Scar Pregnancy is due to damage to the endometrium and myometrium by previous cesarean section leading to microscopic tracts through which the trophoblasts burrow into the vesicouterine fold [4,9].

Vial classified caesarean scar pregnancy into two[10]:

Type 1 is endophytic, abserosal and grows towards the endometrial/ endocervical canal. It is associated with a myometrial thickness of more than 2 mm separating the gestational mass from the bladder. It carries a lower risk of penetrating the serosa. Type 2 is exophytic and grows towards the serosa with a reduced myometrial thickness (<2mm) separating it from the bladder or peritoneal cavity. It has a high risk of penetrating the serosa and bladder manifested by uterine rupture or placental percreta.

The main risk factor is a previous caesarean scar[10,11]. The number of caesarean sections has not been established to correlate with the risk of caesarean scar pregnancy[11]. Caesarean section for breech stands out as a significant risk factor for subsequent scar pregnancy[12].

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Presentation may range from asymptomatic in the endophytic type to initial painless vaginal bleeding with pain of increasing severity as the blastocyst burrows into the myometrium in the exophytic type. Physical examination may vary dependent on the degree of disruption of the myometrium and hemodynamic status. Peritoneal irritation may result from ruptured uterus or percreta as a result of late stage disease.

As with other types of ectopic pregnancy, slow rise in Beta Human chorionic gonadotrophin may not clearly define this disease[13]. Transvaginal sonography with color flow Doppler gives diagnosis with a sensitivity of 84.6%[3] in early disease and Magnetic resonance imaging is the gold standard imaging modality[2]. The criteria for diagnosis is as enumerated by Jayram and colleagues in Table 1 [12].

Table 1: Ultrasound criteria for diagnosis of caesarean scar pregnancy (CSP)[12]
1. Empty uterine cavity and closed and empty cervical canal
2. Placenta and/or a gestational sac embedded in the scar of a previous caesarean section
3. A triangular/round or oval-shaped gestational sac that fills the niche of the scar
4. A thin or absent myometrial layer between the gestational sac and the bladder
5.Yolk sac, embryo and cardiac activity may not be present
6. Evidence of functional trophoblastic/placental circulation on colour flow Doppler examination, characterized by high velocity and low impedance blood flow
7. Negative 'sliding organs' sign

Diagnostic laparoscopy may only be revealing when the bulge has occurred in the vesicouterine fold, which may not be in early disease. Operative laparoscopy should not be attempted during diagnostic laparoscopy if it had not been suspected earlier and appropriate preparations made given the risk of significant hemorrhage.

Management involves accurate diagnosis coupled with appropriate treatment. Conservative management is largely discouraged as a result of the morbidity and mortality associated with the condition with increasing gestational age[3]. Medical treatment may be systemic methotrexate or intra-lesion injection of embryocides (KCl or methotrexate)[4]. This may be used alone or as prelude to surgical evacuation when medical methods fail[14]. Surgical evacuation may be by transvaginal[5], hysteroscopic, laparoscopic or open methods with the ancillary application of bilateral hypogastric artery ligation, tourniquet, interventional radiologic methods of uterine artery embolization or balloon placement in order to reduce blood loss.

The risk factors for recurrence include myometrial thickness of less than 5mm, type 2 scar pregnancy, bulging into the uterovesical fold, delivery in a rural community Hospital, irregular vaginal bleeding and abdominal pain in the previous scar pregnancy[12].

The case

A 25 year old G2P1 reported to the Sandema District Hospital a few weeks after missing her period with bleeding per vaginam and had positive urine pregnancy test. She had a caesarean section 9 months earlier in the same Hospital on account of abruptio placentae, fetal demise and an unfavorable cervix. She was otherwise well. The abdomen was soft and moved with respiration with no tenderness or mass palpable. Vaginal examination revealed moderate vaginal bleeding with a normal looking cervix and closed external os with no cervical motion tenderness. A transabdominal ultrasound showed a small gestational sac in the lower uterine segment (Fig.1).

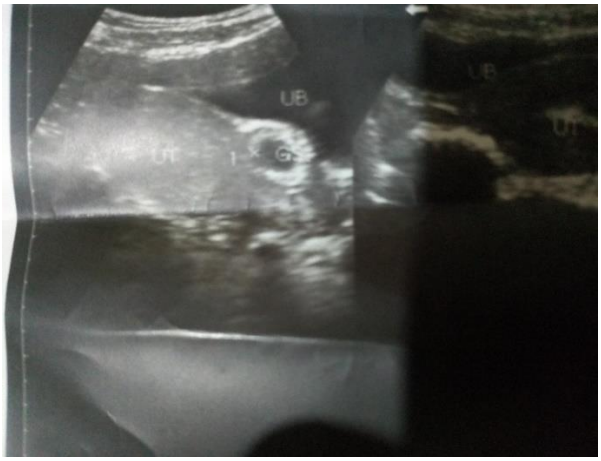

Fig. 1 transabdominal scan after bleeding per vaginam. UB=urinary Bladder, GS=gestational sac, UT= uterus

A diagnosis of threatened abortion or cervico-isthmic pregnancy was made and patient admitted and managed conservatively. The bleeding and abdominal pain stopped and after 2 days, patient was counselled on the possible outcomes and scheduled for review weekly. She however defaulted review and presented 4 months later after she collapsed at home. Assessment revealed a moderately pale woman with pulse= 120bpm blood pressure=100/70 mmHg and shock index=1.2. Abdomen was tender with rebound tenderness and guarding. Ultrasound showed fluid in abdomen with a live fetus in between the bladder and anterior lower uterine segment with no intervening myometrial tissue. Patient was counselled, resuscitated and laparotomy performed. The family was initially in denial and wished for continuation of the pregnancy at all costs. Persistent counselling while resuscitation continued finally yielded acceptance. The findings at laparotomy were: hemoperitoneum of 2 litres, normal tubes and ovaries, bulky uterus of about 14 weeks sized with a ballooned lower segment and placental tissue and fetal membranes penetrating the serosa on the right aspect of the caesarean scar and bleeding actively (Fig. 2).

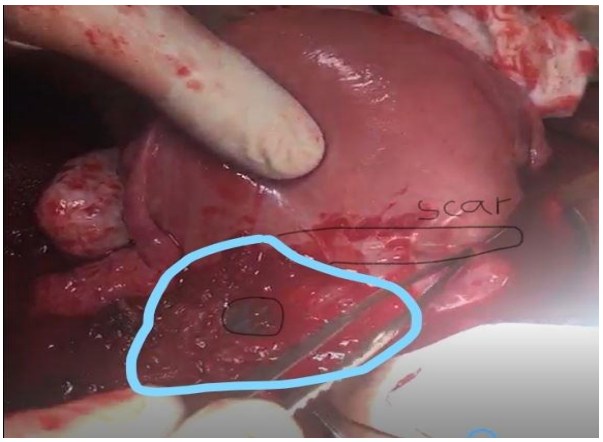

Fig. 2: Photograph of uterus at laparotomy with caesarean scar, vesicouterine bulge and placenta tissue and fetal membranes rupturing through the right aspect of the scar.

The placenta was morbidly adherent and with extensive placental stands throughout the entire scar. The fetus and membranes dissected through the vesicouterine fold and were covered by only that peritoneum beyond the left limit of the rupture. The resection of the gestation was approached by dissecting off the vesicouterine fold followed by encaul delivery of the 18 weeks fetus which died after 10minutes. The placenta was then delivered piecemeal after application of a tourniquet below the gestational mass and surrounding tissues to minimize haemorrhage. Hemostasis was secured completely with ligation of the right uterine artery. The scar was reconstructed using continuous first layer suturing and interrupted second layer suturing (Fig.3).

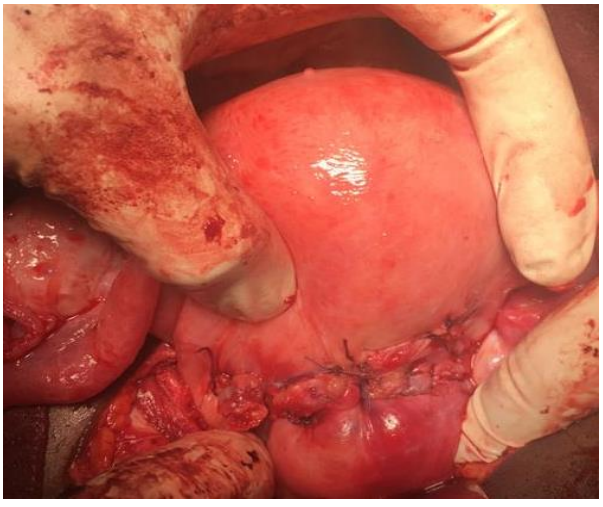

Fig. 3: lower segment of uterus after wedge excision and reconstruction of caesarean scar.

She was transfused 3 units of whole blood intraoperative and postoperatively. Post operative condition of patient was satisfactory and patient was discharged on postoperative day 3 when the full blood count report came back normal.

Discussion

The paucity of sonographic skill and equipment has affected the timing and accuracy of diagnosis of caesarean scar pregnancy in developing world[4]. In the initial presentation of the patient, a low implantation was noted on the ultrasound. However, the lack of transvaginal approach as well as doppler limited the value of that finding especially in the environment of vaginal bleeding.

The gestation (round) was in the region of the caesarean scar but could not have been used exclusively for the diagnosis since this could represent a low implantation or a miscarriage in process. A thin myometrial layer was seen between the gestational sac and the bladder. Functional trophoblastic tissue could not be demonstrated in the absence of Colour flow Doppler facilities. The negative sliding organ sign could not be used to distinguish the cervicoisthmic pregnancy from a miscarriage in process due to the absence of transvaginal sonography. With such initial diagnostic challenges, close follow up of the patient with more regular visits for review could have presented an opportunity for early confirmation of the diagnosis but as it turned out this patients failed to follow up for her weekly reviews.

The initial diagnosis in this case was a threatened miscarriage with a differential of cervicoisthmic pregnancy. Patient was admitted and upon cessation of bleeding, she was discharged and scheduled for weekly reviews with repeat ultrasound scans since neither Doppler sonography nor was magnetic resonance imaging was immediately available for further investigation. Unfortunately she defaulted partly because of fears of a termination of her pregnancy given the fact that the previous pregnancy ended in a fetal demise about nine months **previously** due to placental abruptio. These fears were born out of the effect of a pronatalist culture on the victim of adverse obstetric outcome and it is evidenced by the resistance for the definitive abortive procedure[15]. Delayed intervention accounted for the progression of the disease with worsening complication risks. A high index of suspicion especially in populations with the low health seeking behavior in the rural parts for developing countries should increase surveillance by admission until confirmation of complete abortion in situations of threatened abortion with the gestational sac in the cervicoisthmic region. However bed availability may limit the realization of this ideal necessitating the individualization of care in such situations. In a recent report from the Korle Bu Teaching Hospital, a tertiary Hospital, with similar initial management, the patient presented to the facility out of schedule because of better health seeking characteristics and better counselling[16]. In both patients, there was the diagnostic difficulty of threatened, cervical or caesarean scar pregnancy. Availability of transvaginal sonography helped in improving precision in the case from the teaching Hospital[16].

The management options that have currently been explored include medical, surgical (transvaginal[5], laparoscopic and open) even though no consensus has been reached for determining the optimal method for a particular situation[17]. Medical management with Methotrexate (local injection and systemic[4]) could have been contemplated at the initial presentation but not in the latter presentation. Systemic methotrexate is frequently associated with high failure rates even though its combination with aspiration and local injection has been commendable in the regression rate of the trophoblastic tissues[18]. Laparoscopic and transvaginal excision of the gestation could have been used in the initial presentation if the skill and equipment were available. None of these was done because of the stage at which diagnosis was made.

In our patient with hemodynamic instability, ruptured uterus and placenta percreta, the best approach was the open wedge resection and reconstruction of the scar[3,17]. This was similar to the treatment modality used in the case from the Korle Bu Teaching Hospital[16] as well as that by Deepika and colleagues[19]. It also bore morphological similarity with the initial description by Larsen and coworkers despite a later diagnosis[8]. This modality is favoured by the shorter duration of follow up and lower recurrence rate[19]. The availability of the surgical skill needed for definitive care at laparotomy significantly improved the outcome in this case.

Our patient has some risk factors for recurrence (primary surgery in a rural Hospital, type 2 caesarean scar pregnancy at an advanced stage with no myometrium intervening, intermittent pain and bleeding in the index pregnancy [12]). However the scar reconstruction in our treatment modality is likely to confer a lower recurrence risk[19]. We have therefore established the linkage though the district public health team for early detection in subsequent pregnancies for appropriate management.

Conclusion

Caesarean scar pregnancy is a recognized long term complication of caesarean section and its incidence is increasing worldwide with the rural communities of developing world not being **spared.** In patients with previous caesarean scar, caesarean ectopic pregnancy should also be suspected when managing them for threatened abortions even in primary care facilities of low income countries. A high index of suspicion with the requisite imaging, surgical expertise and equipment will go a long way to improve the outcome in the management of this rare type of ectopic pregnancy.

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Conflict of interest

None of the Authors has any conflict of interest to declare

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PROFESSOR STEPHEN ADDAE

Physician, Scientist, Historian

The majority of the material compiled in the textual exhibits in this museum is based on the research and documentation on the history of modern medicine in Ghana by Professor Stephen Addae. A resume of Professor Addae's credentials follows below:

1. MBBS (Hounours, London, 1962)
2. MD (London,1972)
3. MSC, PhD (Physiology, Rochester, New York, USA, 1968)
4. PhD (History, University of Ghana, 1995)
5. FRCP (Edinburgh 2000)
6. FGCP (Ghana College of Physicians 2007)
7. Fellow of Ghana Academy of Arts and Science (1980)
8. Fellow of Ghana Medical Association (1997)
9. Fellow of New Academy of Science (2000)
10. First National Awards in Medical Sciences (1998)

Professor Addae has done considerable research and published many papers and books on a wide variety of subjects. His research and publications included Kidney function in man, Kidney problems in sickle-cell disease, the behaviour of sickle cell disease at high altitude and at different environmental temperatures, the endocrinological and nutritional problems in sickle-cell disease, the transport of ions in sickle-cell disease.

Professor Addae is also an institutional historian. He has researched and written the standard work on the history of modern medicine in Ghana titled Evolution of Modern Medicine in a Developing Country Ghana 1880-1969. He has written a history of the Ghana Armed Forces (GAF) in six volumes, one of which is a seven-hundred page Reference Volume. These volumes constitute the official historical documentation the official historical documentation of the history of the GAF.

—THE FIRST AFRICAN DOCTORS—
WEST AFRICA MEDICAL SERVICE OF THE BRITISH ARMY

Dr. James Africanus Horton

The West Africa Medical Service of the British Army primarily served health needs of the British Army, but was also allowed to do some private practice among non-official British and African Communities.

There was high mortality and morbidity among the Europeans (including troops and doctors) in the Gold Coast and other West African settlements. The British decided to train British subjects of African descent as doctors because they would be able to stand the tropical climate and diseases better. The first two beneficiaries were Drs Africanus Horton and Broughton Davies.

In 1855 Dr. James Africanus Horton and Dr. William Broughton Davies were selected to train as doctors and were the first African medical officers to serve in the West African Medical Service of the British Army.

They were commissioned as staff assistant surgeons in 1859 for "duties only in West Africa" and were posted to the Gold Coast.

In 1866, Dr. Horton published his "Physical and Medical Climate and Meteorology of the West Coast of Africa". He described diseases associated with the cold season (Harmattan) as "the worst form of gout and rheumatism with flying pains all over the body, swollen joints, intense local pains." This must have been a description of sickle cell disease.

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