POSTGRADUATE MEDICAL JOURNAL OF GHANA

GHANA COLLEGE OF PHYSICIANS & SURGEONS

PRO VITA SCIENTIA

Vol. 12 No. 2 | ISSN: 2026-6790 | September 2023

GHANA COLLEGE OF PHYSICIANS & SURGEONS

Postgraduate Medical Journal of Ghana

Journal of the Ghana College of Physicians and Surgeons

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EDITORIAL

PREVENTING MATERNAL MORTALITY FROM HYPERTENSIVE DISORDERS OF PREGNANCY AND OBSTETRIC HAEMORRHAGE

Maternal deaths remain a major public health issue in Sub-Saharan Africa. From the days of safe motherhood initiative in 1987 through the MDGs and now to the SDGs, maternal death reduction has always been a target. Significant progress has been made from 1990s to date. However, the rate of progress has stalled. Ghana's maternal mortality ratio (MMR) in the 1990s has reduced from 760 per 100,000 live births to 319 at the end of 2015 (1). Beyond 2015, the rate of reduction has almost plateaued. The most current MMR as at 2017 is 310 (2). In the recent WHO workshop on Regional Accelerated Plan of Action to end deaths from pre-eclampsia/eclampsia and PPH, it was clearly stated that progress to reduce MMR in the African region is very slow and set targets have been missed. In order to reach the SDG 3.1 global target of 70 maternal deaths per 100,000 live births by 2030, the region must fast-track its Average Annual Rate of Reduction (ARR) from the current 2.9 per year to 10.4 per year (3). This is an obvious uphill task.

The evidence gathered over the past years in the region show that the two leading causes of maternal deaths are obstetric haemorrhage and pre-eclampsia/eclampsia accounting for 50% of all maternal deaths (3). At the Korle-Bu Teaching Hospital, hypertensive disorders alone accounted for nearly two-fifths of all deaths whilst haemorrhage accounted for one-fifth of all deaths, the two making up 60% of all deaths (4). The immediate causes of death in hypertensive disorders are eclampsia, acute kidney injury, pulmonary oedema and acute left ventricular failure, HELLP syndrome, cerebral haemorrhage among others. The immediate causes of death in obstetric haemorrhage are haemorrhagic shock, acute kidney injury, haemo-peritoneum following Caesarean Sections, DIC, multiple organ failure, severe anaemia among others.

The situation in most teaching/tertiary hospitals in Ghana is similar to that of the Korle Bu Teaching Hospital. In order to make any headway, we need to refocus and realign all efforts in dealing with these two. In fact, there are strategies and proven interventions to prevent and address these two leading causes of death. For the hypertensive disorders, these strategies include magnesium sulphate use, antihypertensives, early detection of pre-eclampsia and treatment, delivery of patients with severe pre-eclampsia, calcium supplements during the antenatal period and use of soluble aspirin for prevention. For PPH, the strategies include active management of the third stage of labour (AMSTL), uterotonics (oxytocin and misoprostol), tranexamic acid use, blood transfusion and PPH treatment protocols including both surgical and non-surgical modalities. These interventions are deployed through training, equipping and resourcing health facilities through Basic and Comprehensive Emergency Obstetric and Newborn Care (BEONC and CEONC) setting.

There are usually challenges and gaps with the implementation of these strategies. A very important approach to elucidating these challenges is the maternal death surveillance and response (MDSR). This involves carrying out a thorough review of every maternal death and implementing actionable recommendations to prevent a future similar occurrence. Every maternal death must generate a response action following lessons learnt from the review process. During the review process, it is imperative to determine where the gaps are in order to design innovative ideas and strategies to address the challenges in the management of patients. Behind every maternal death are several gaps, underlying and contributing factors which are all nested in the three-delay model advocated by Thadeus and Maines.

Unpublished maternal death reviews have revealed the following recurring contributory factors; financial barriers to maternal healthcare, ignorance and illiteracy on the part of patients, poor or lack of antenatal attendance, weak referral networks, poorly functioning referral systems (delayed referral to tertiary facilities), limited communication between facilities, inadequate and poorly functioning equipment and consumables, lack of ICU and theatre spaces, lack of blood and blood products, inadequate skills, poor attitudes and unavailability of healthcare providers , insufficient assessment and poor monitoring of patients (poor monitoring of patient's vital signs), misdiagnosis and mismanagement, inadequate follow-up of cases and poor adherence to protocols. These are the gaps in most reviews and these are not new.

To re-echo the former president of FIGO, Mahmoud Fathallah, "Women are not dying because of diseases we cannot treat. They are dying because societies have yet to make decisions that their lives are worth saving".

doi: 10.60014/pmjg.v12i2.332

Deaths from haemorrhage and pre-eclampsia/eclampsia are preventable. Everybody has a role to play. The government, healthcare providers, patients and their families must all increase their level of accountability, so that together we can end these preventable deaths.

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ORIGINAL ARTICLES

CHANGES IN BACTERIAL FLORA OF BURN WOUNDS AND THEIR ANTIBIOTIC SUSCEPTIBILITY PATTERNS AT A TERTIARY HOSPITAL IN GHANA

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Abstract

Objective: To determine the time-related changes in burn wound bacteria and to determine the antibiotic susceptibilities of these bacteria.

Methodology: The study was carried out over a 4-month period from September 2017 at the Burns Unit of the Korle-Bu Teaching Hospital in Accra. Wound swabs were taken weekly from burn patients on admission and each patient was followed-up for a month. The swabs were cultured, and antibiotic susceptibility testing done on isolated pathogens.

Results: A total of 214 wound swabs were taken from 59 patients enrolled with an overall isolation rate of 65%. Gram negative isolates predominated each week throughout the period of monitoring. The commonest bacterial isolate was *P. aeruginosa* which formed 51.8% of all isolates, followed by coagulase negative staphylococci 13.7%, *S. aureus* 10.1% and other Gram-negative bacilli. Sixty-four percent of *S. aureus* were resistant to cefoxitin (MRSA), and100% resistant to penicillin. Resistance to the cephalosporins and fluroquinolones was generally high among the Gram-negative bacteria. *P. aeruginosa* had moderate resistance to the anti-pseudomonal antibiotics. Resistance to amikacin among the Gram-negative bacteria was low.

Conclusion: Burn wounds are colonized by pathogenic bacteria, some highly antibiotic-resistant. There were no significant time-related changes in bacterial flora of burn wounds.

Key words: *Burn wounds, bacterial colonization, infection, antimicrobial resistance*

Introduction

Burn wounds, though sterile immediately following thermal injury, rapidly become colonized by bacteria, some pathogenic, and capable of causing wound infection, with its serious consequences.

The bacteria colonizing burn wounds initially come from the endogenous flora of the patient[1]. These are later replaced by more antibiotic resistant ones from the hospital environment and from the hands of healthcare personnel [1-3]. The open burn wound also increases the environmental contamination, making other patient's wounds an additional source of bacterial colonization and possible infection of the wounds of a freshly burnt patient. Outbreaks of cross colonization and infection are thus a major challenge on burn units[4]. Colonization of wounds often serves as a precedent to infection[5]. Depending on the numbers and virulence of colonizing bacteria, critical colonization may be achieved, beyond which wound infection becomes established[6].

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Conflict of Interest: None Declared

The burn patient is highly susceptible to wound infection because of multiple factors. First, loss of skin integrity allows micro-organisms to access and invade viable tissue. The highly proteinaceous avascular tissue, eschar, also serves as a favourable niche for micro-organisms to proliferate. Being avascular, the eschar, additionally prevents cells of the immune system and antibiotics from gaining access to these organisms promptly, thus giving them the opportunity to invade tissue and cause wound infection. Additionally, significant thermal injury causes a state of immunosuppression, allowing even bacteria with low virulence to cause wound infection in the burn patient. Bacteria colonizing burn wounds often exist in biofilms which make them difficult to eradicate[3,7].

Routine surveillance cultures are important to monitor the changing microbiota of burn wounds and determine their antimicrobial susceptibilities so that appropriate empirical treatment can be given in the event of burn wound infection. Surveillance cultures also help to monitor the effectiveness of current wound treatment and detect any cross-colonizations which occur quickly so that further transmission can be, prevented. Admission cultures are important, especially for patients transferred from other facilities, as they may be colonized by multidrug-resistant organisms and serve as reservoirs for cross-transmission to other patients in the unit[8].

doi: 10.60014/pmjg.v12i2.319

Most studies carried out in this area have been cross-sectional. This study, however, aimed at providing data on the common bacteria that colonize burn wounds during their management in the hospital environment, as well as their antibiotic susceptibility patterns. Such data is useful in determining the pathogenic bacteria to target during hospital management of burn patients.

Materials and Methods

Study Site and Design

The study, which was a prospective, longitudinal, observational study was carried out at the Burns Unit of the Korle-Bu Teaching Hospital, a tertiary hospital in Ghana. Patients admitted to this unit are typically started on systemic antibiotics right after admission. There are no specific local guidelines directing the use of antibiotics at the unit. Burn patients admitted to the unit from September to December 2017 who gave written or verbal consent to the study were enrolled using a convenient sampling method. Basic demographic information and information relating to burn injury were obtained from patients, close relatives and/or hospital records.

Specimen Collection

Wound assessment (with respect to wound site(s), appearance, discharge, and odour) was done during each wound dressing. Total body surface area burnt was estimated using Lund and Browder charts. Irrigation of wounds was done using normal sterile saline solution and it was ensured that no antimicrobial agent was applied to wounds before specimens were taken. Wound swab specimens were taken with sterile cotton-tipped swab-sticks for bacteriological analysis during first wound dressing, and subsequently, weekly over a 4-week period. Depending on which body areas where affected, swabs of burn wounds were taken from the head and neck, left upper limb, right upper limb, left lower limb, right lower limb, trunk, and perineum. The Levine technique of swabbing wound surfaces was used: A sterile cotton swab tip was rotated in a 1cm square area of wound tissue for a period of 5 seconds, using gentle pressure to release tissue exudate[9].

Laboratory procedures

Isolation of Specific Aerobic Pathogens

The swab specimens were cultured under aerobic conditions on blood agar and MacConkey agar for bacterial isolation.

Bacterial Identification

Preliminary identification of bacterial isolates was done using colonial morphology and characteristics such as pigmentation and haemolytic pattern on blood agar and by Gram staining. This was followed by conventional biochemical tests on bacterial isolates from primary cultures for final identification. Gram negative rods were identified using oxidase test, indole test, motility test, hydrogen sulphide (H_2S) production test, triple sugar iron (TSI) reactions, citrate utilization test, and urease test. Gram-positive cocci were identified by catalase test, oxidase test and coagulase test [10].

Antibiotic susceptibility testing

Antibiotic susceptibility testing was done on all significant bacterial isolates. This was done using the modified Kirby-Bauer disc diffusion method on Mueller-Hinton Agar[11]. Ceftazidime (CAZ, 30 µg), cefuroxime (CXM, 30 µg), ceftriaxone (CRO, 30 µg), ciprofloxacin (CIP, 5 µg), levofloxacin (LVX, 5 µg), gentamicin (GM, 10 µg), amikacin (AN, 30 µg), meropenem (MEM, 10 µg), penicillin (AM, 10 µg), and cefoxitin (FOX, 30 µg) from Becton Dickinson BBL, USA, were used in accordance with the Clinical Laboratory Standard Institute (CLSI) recommendations [12]. *S. aureus* ATCC 25923, *P. aeruginosa* ATCC 27853 and *E. coli* ATCC 25922 were used as control strains.

Data management and analysis

All data obtained from patients was entered into Epi Info version 7 and exported into the Statistical Package for Social Sciences (SPSS) version 20 for statistical analysis. Comparison of frequencies, mean and median values were made. Comparison of proportions was done using Chi-square test. The level of significance was determined at $p<0.05$.

Patient Consent

Written informed consent was obtained by the signature of the patient or the signature of the guardian/legal representative (in case a patient is a minor or is too ill to give consent) on the informed consent form or, if the patient or guardian/ legal representative is illiterate, their consent certified with a fingerprint accompanied by the signature of an impartial witness. For children of appropriate age, assent was obtained in addition to parental consent.

Ethical Approval

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki and in compliance with ICH-GCP, ISO 14155-1 and -2, and the applicable laws and regulations of Ghana. Ethical approval of this study was obtained from the Institutional Review Board of the hospital (approval number: KBTH-STC/IRB/00047/2016).

Results

Patient and wound characteristics

A total of 59 patients were enrolled in the study. These were made up of 39 (66.1%) males and 20 (33.9%) females, giving a male-female ratio of about 2:1. The ages of patients ranged from 3 months to 65 years with median and mean ages of 6 and 18.4 years respectively (Table 1). Forty-nine percent of all patients were children aged 5 years and younger.

Other patient and wound characteristics are summarised in Table 1.

doi: 10.60014/pmjg.v12i2.319

Antibiotic Use

All 59 patients enrolled had been put on systemic antibiotics (intravenous) from the time of admission as part of normal clinical practice at the burns unit. Cefuroxime was used either alone or with other antibiotics for 51 (86.4%) patients. Other antibiotics commonly used included ceftriaxone, ceftazidime and metronidazole.

Table 1: Demographic characteristics of patients

Characteristic	Value
Age (median)	6 years (49% ≤ 5 years)
Sex	
Male	39 (66.1%)
Female	20 (33.9%)
Type of burn	
Thermal	57 (96.6%)
Chemical	2 (3.4%)
Duration of burns before enrolment (median)	3 days
TBSA (mean)	23.8%
Burn thickness	
Superficial partial	38 (64.4%)
Mixed	20 (33.9%)
Full	1(1.7%)

Bacteriological profile of burn wounds

A total of 214 wound swabs were taken from the 59 patients enrolled. Of these, 139 yielded positive cultures, giving an overall isolation rate of 65%.

Qualitative bacterial analysis

The most predominant bacterial isolate from patients' wounds was *P. aeruginosa* which formed 72/139 (51.8%) of all isolates. This was followed by coagulase negative staphylococci (CoNS) 19/139 (13.7%), *S. aureus* 14/139 (10.1%), *Citrobacter* species 11/139 (7.9%), *Enterobacter* species 6/139 (4.3%), *Klebsiella* species 4/139 (2.9%), *E. coli* 2/139 (1.4%), *P. mirabilis* 1/139 (0.7%) and other Gram-negative bacteria which altogether formed 10/139 (7.2%) (Figure 1).

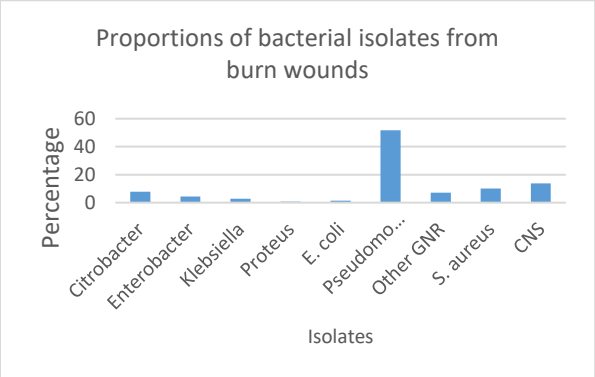

***Figure 1**: Proportions of bacterial isolates from burn wounds*

P. aeruginosa was isolated from all wounds clinically suspected to be infected. Two of these wounds additionally had *S. aureus* isolated.

Forty-four percent (44%) of patients had their wounds colonized by bacteria, without any signs of wound infection. Eight patients (13.6%) had clinical signs of wound infection.

Time related changes in bacterial isolates

Gram negative isolates predominated each week throughout the period of wound monitoring. They formed 66/90 (73.3%) of isolates in week one, and 22/29 (75.9%), 16/17 (94.1%), and 2/3 (66.7%) of isolates in weeks two, three, and four respectively. *P. aeruginosa* was the most predominant isolate each week.

Table 2: Percentage resistance of bacteria to systemic antibiotics

Organism (*n*) [N=120]	Percentage Resistance (%)				
	Gentamicin	Amikacin	Ciprofloxacin	Levofloxacin	Penicillin
Citrobacter (11)	54.5	18.2	27.3	27.3	NT
E. coli (2)	0	0	100	100	NT
Enterobacter (6)	66.7	16.7	50	33.3	NT
Klebsiella (4)	100	25	50	25	NT
P. mirabilis (1)	0	0	0	0	NT
P. aeruginosa (72)	52.8	34.7	48.6	47.2	NT
Other GNR (10)	60	10	60	40	NT
S. aureus (14)	42.9	NT	NT	NT	100
Organism (*n*) [N=120]	Percentage Resistance (%)				
	Cefuroxime	Ceftriaxone	Ceftazidime	Cefoxitin	Meropenem
Citrobacter (11)	54.5	54.5	36.4	NT	27.3
E. coli (2)	100	100	100	NT	0
Enterobacter (6)	50	50	50	NT	33.3
Klebsiella (4)	75	75	50	NT	25
P. mirabilis (1)	0	0	0	NT	0
P. aeruginosa (72)	NT	NT	56.9	NT	37.5
Other GNR (10)	100	100	100	NT	100
S. aureus (14)	NT	NT	NT	64.3	NT

Systemic Antibiotic susceptibility

Nine out of fourteen isolates (64.3%) of *S. aureus* were resistant to cefoxitin (Methicillin Resistant Staphylococcus aureus), and all 14 (100%) isolates were

doi: 10.60014/pmjg.v12i2.319

resistant to penicillin. Resistance to the cephalosporins was relatively high among the Gram-negative organisms, especially *E.coli* and *Klebsiella* species. There was relatively high resistance to the fluoroquinolones among *E. coli* isolates. *P. aeruginosa* had moderate resistance to the antibiotics it was tested against. Resistance to amikacin among the Gram-negative organisms was low (Table 2).

Discussion

Bacteriological profile of burn wounds

Predominance of *P. aeruginosa* among other bacterial isolates on burn wounds in the current study has also been reported by several other authors[13-16]. Some authors however reported a predominance of *S. aureus* [17,18]. The frequent association of *P. aeruginosa* with the hospital environment due to its ability to thrive in water containing only trace nutrients and to withstand disinfectants makes it a ready colonizer of burn wounds. The isolation of *P. aeruginosa* from all wound specimens of clinically diagnosed wound infections indicates the capability of the organism to cause invasive infections especially in immunocompromised individuals such as burn patients[19].

In the present study, there were no significant time-related changes in the bacterial isolates, as *P. aeruginosa* predominated each week throughout the study period. Proportions of the other bacterial isolates however changed over time but not significantly (p=0.175). This observation was also made by other authors who found P. aeruginosa to predominate isolates from burn wounds over the entire 4-week period of assessment[20,21]. It was however not in conformity with the trend observed by some authors, who found Gram positive organisms to predominate initially after burn injury and their replacement by Gram negative bacteria over time[14,22]. In our study P. aeruginosa may have heavily contaminated the immediate environment of the patients and served as a ready source of the organism for wound colonization. The persistence of *P. aeruginosa* on wounds after the first week, unlike the other bacterial isolates makes it necessary for antimicrobial interventions to target this organism mainly, especially, after the first week of admission.

Antibiotic susceptibility

Generally, there was significant resistance by burn wound isolates to the commonly used antibiotics at the burns unit. Most significant amongst these were methicillin-resistant *S. aureus* (MRSA) (64.3%), and the Gram-negative bacteria, notably, *Klebsiella* species and *E. coli* to the cephalosporins. Routine prophylactic use of systemic antibiotics may have contributed to this observation by causing selective pressure for resistant strains of bacteria. Resistance to the cephalosporins may have been because of the high usage of cefuroxime for burn patients on the ward. The mechanism of resistance may be by the production of extended-spectrum ß-lactamases (ESBL) or Amp-C ß-lactamases especially by *Klebsiella* and *E. coli*, since there was less resistance to the carbapenems. Those resistant to meropenem may additionally have produced carbapenemases. One author reported a high prevalence of ESBL-producing isolates from various samples taken from patients at the same hospital[23]. MRSA rate of 64.3% is very high compared to the 28% reported by another author at the same study site two years earlier[24]. The implication of this level of resistance to cefoxitin is that no beta-lactam antibiotic would be able to clear infections caused by a significant 64.3% of S. aureus isolates. For these, other antibiotics like the glycopeptides would have to be used. Almost half of all *P. aeruginosa* isolates would not respond to treatment by any of the commonly used antibiotics at the unit. This observation calls for concern as P. aeruginosa was the most predominant bacterial isolate at the unit. These high levels of antibiotic resistance by burn wound bacteria have been reported by other authors[13,25].

Resistance to amikacin was low. For serious or life-threatening infections of burn patients at this unit therefore, amikacin and/or vancomycin may be the most effective antibiotics for treatment. A limitation of this study is that it was conducted at a single centre. A multicentre study would have been more appropriate in determining the time-related changes of bacterial flora on burn wounds as the environmental contamination of these organisms play a significant role.

Conclusions

Burn wounds are heavily colonized by antibiotic resistant bacterial pathogens which may cause difficult to treat, invasive wound infections with Pseudomonas aeruginosa being the most predominant. This study however did not show significant time-related changes in the type of bacteria found on the wound surfaces.

Acknowledgement

We are grateful to the head and staff of the Burns Unit of the Korle-Bu Teaching Hospital for the support given in conducting this study, and to all patients who consented to the study and provided relevant information for this purpose. We are grateful also to Rev. Dr. Thomas Ndanu who helped greatly with the statistical work, as well as Mr. Amos Akumwena who provided technical assistance for the microbiological assessments.

Declarations

Author Contributions

All authors contributed to the conceptualization of the study design, drafting of the manuscript and revision for important intellectual content. NOA was responsible for data acquisition and statistical analysis. All authors have approved the final report.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

  doi: 10.60014/pmjg.v12i2.319

Transparency declarations

None.

Conflict of Interest Statement

The authors declare that there is no conflict of interest.

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doi: 10.60014/pmjg.v12i2.319

COMPARISON OF EFFECTIVENESS OF COUNSELLING ONLY, SUPPOSITORY DICLOFENAC AND LIDOCAINE SPRAY AT INTRAUTERINE DEVICE INSERTION IN A TERTIARY HOSPITAL IN GHANA

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Abstract

Objective: Perception of pain at IUD insertion is one of the main barriers of its uptake. Several pharmacological and non-pharmacological interventions have been studied but currently there is no consensus on the pain management at IUD insertion. The study aim was to compare the effectiveness of counselling only, 10% lidocaine spray of the cervix and 100mg suppository diclofenac in reducing pain at IUD insertion.

Methodology: A prospective study of 99 respondents were randomized into 3 study arms; suppository diclofenac, lidocaine spray and counselling only in a ratio of 1:1:1. All participants had a baseline counselling: while those in the diclofenac arm were given 100mg diclofenac suppository 30 minutes before the procedure, those in the 10% lidocaine spray arm were given 4 pumps on the cervix before the insertion. A 10cm- Visual Analog Scale was used to assess the pain experienced during and after IUD insertion. Chi-square test, one-way ANOVA and a Post-Hoc test were used for the statistical analysis. P value of < 0.05 and confidence interval of 95% were used.

Results: Suppository diclofenac was superior to counselling only at speculum insertion, tenaculum application, uterine sounding, IUD placement, immediately and 5 minutes after procedure. Lidocaine spray of the cervix was also superior to counselling only throughout the procedure and up to 4 hours post procedure. Lidocaine spray of the cervix was superior to suppository diclofenac at 5 minutes and 4 hours after procedure.

Conclusion: Lidocaine spray (10%) of cervix is more effective compared to 100mg Diclofenac Sodium and Counselling only in reducing pain at IUD insertion.

Key words: *Intrauterine Contraceptive Device, Lidocaine Spray, Suppository Diclofenac, Pain Experience*

Introduction

Globally, about 100 million women of reproductive age are using intrauterine contraceptive device (IUD).The rate of IUD use in Africa is quoted at 0.5% and in developed countries such as France and Finland they are estimated at 21% and 18% respectively[1,2]. In Ghana, 25% of married and 30.6% of unmarried women between the ages of 15 to 49 use modern contraception. However, only 0.8% of married and 0.4% of unmarried women use IUD as a form of contraception (GMHS 2017)[3].

Compared to other long-acting contraceptives, IUD has shown to be highly effective contraceptive method equal in efficacy to female tubal sterilization and is associated with lower discontinuation rates compared to other reversible methods. It also has several advantages such as long term effectiveness, no need for user interventions, reversible and immediate return to fertility once it is removed[2].

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Conflict of Interest: None Declared

It's use however, has continued to be low because of misperception by some health providers that IUD is associated with increased pelvic inflammatory disease (PID) and perceived technical challenges in its insertion for nulliparous women and user factors such as fear of having foreign body in the womb and fear of painful insertions[4]. The pain in IUD insertion has been attributed to the following processes: speculum placement, holding the cervix with tenaculum to straighten the uterus, sounding the uterus to determine the cavity depth, and IUD placement which causes irritation of the endometrium. Studies have shown that 17% of nulliparous[5] and 11% of parous[6] women experienced severe pain during IUD insertion. In a prospective study by Marions et al, 89% of women reported moderate to severe pain at IUD insertion[5]. Several studies have been done in the area of pain control during IUD insertions but currently there is no consensus on the most effective method of pain control at IUD insertion. Several pharmacological and nonpharmacological interventions have been used for such pain management. These include non-steroidal anti-inflammatory drugs (NSAIDs), anxiolytics and local anaesthetic agents. Examples of non-pharmacological interventions which have been used are pre-placement counselling and distractions during insertion[7]. Whilst some centres are using pharmacological agents such as analgesics and local

doi: 10.60014/pmjg.v12i2.303

anaesthetic agents for pain control, others like the Family Planning Unit of Korle Bu Teaching Hospital, Accra offer counselling only. A Cochrane review of all interventions aimed at reducing pain at insertion concluded that none of the interventions has been properly evaluated [8]. The aim of the study was therefore to compare the effectiveness of counselling only (standard of care), 10% lidocaine spray of the cervix and 100mg suppository diclofenac sodium in reducing pain at IUD insertion.

Materials and Methods

An open- labelled, randomised controlled trial to test the efficacy of 10% Lidocaine spray of the cervix, 100mg suppository diclofenac, and counselling only (standard of care) in reducing pain at insertion of IUD was used. The period of study was (6) six months (1st October, 2020 – 31st March, 2021). The study was conducted at the Family Planning Unit of the Gynaecology Department, Korle Bu Teaching Hospital. The family planning unit operates as an Out Patient Department (OPD) and is opened from 8:00am to 5:00pm from Monday to Friday. The Copper-T IUD uptake for 2018 was 267 for first ever users, 4,083 for continuing clients making it about 22 new IUD acceptors per months. The sample size calculation for multiple comparisons using one-way ANOVA was used.

$$n = \frac{2(Z\alpha + Z1 - \beta)^2\delta^2}{\Delta^2}$$

Where;
n= sample per arm
Zα is 95% confidence level = 1.96
Z1-β is the power of the study (80% power) = 0.8416
And δ is the standard deviation (estimated within each group) = 1.8 (Karabayirli et al 2012). Δ is the difference in the effect size (the minimally clinical significant difference in 10cm-Visual Analog pain Score) = 1.3. The effect size of the visual analogue is the mean pain score change divided by standard deviation of baseline score. So, inputting the above into the sample size formula gave, n=30. Therefore, sample size, n =30 for each of the three groups making a total sample size of 90. Adjusting for 10% loss to follow up and incomplete or inconsistent data a sample of 33 in each group and a total sample size of 99 was obtained[14]. Women aged 18 years and above and those who accepted the IUD as a contraceptive method were included in the study.

The exclusion criteria included;

i. Contraindication to Copper IUD insertion from Medical Eligibility Criteria
ii. Presence of known uterine anomaly or fibroid distorting the uterine cavity
iii. Known cervical stenosis which requires dilatation.
iv. Systemic conditions or medications that will affect perception of pain.
v. Ever use of narcotics, e.g., pethidine/morphine
vi. Inability to understand how to score a 10cm- visual analog scale.
vii. Women who are allergic to diclofenac and lidocaine.
viii. Women with history of chronic pelvic pain.

The primary outcome was the assessment of the overall pain score at IUD insertion measured by 10cm-VAS. Secondary outcomes included mean pain scores during speculum placement, tenaculum placement, sound insertion, IUD placement, 5 minutes and 4hours post insertion. The other secondary outcomes were the need for additional analgesics and the side effects of the medications used. Patients who have received contraceptive counselling on the method mix and have chosen IUD were recruited into the study after the research methodology had been explained to them by the principal investigator or research assistant and written consent obtained. Participants were randomized into one of the three arms of the study; lidocaine spray, suppository diclofenac and counselling only (standard of care/control group) in ratio of 1:1:1. Ninety-nine (99) computer generated random numbers were obtained from Randomization .com and assigned to participants consecutively as and when they joined the study. The randomization blocks each containing 33 numbers were generated by the computer and used for the study.

Those on diclofenac (100mg Voltarol suppository, Novartis Pharmaceutical, UK) were instructed to administer 1 hour before IUD insertion. Those on the lidocaine arm had speculum placement and then received 4 pumps (about 40mg) of 10% lidocaine spray (xylocaine 10% pump spray, 100mg/ml, Astra Zeneca) and waited for 3minutes (as suggested by the manufacturer) to allow for the anaesthetic effect to take place before IUD insertion. All participants in the study had a baseline counselling on the procedure and what to expect at each stage of the intervention. Before the IUD insertion, baseline data was collected with a questionnaire. The standard 10cm-VAS was then explained to the participants. The severity of the pain was quantified with 0 = no pain and 10 = worst possible pain imaginable. Each woman received copper T380A safe load IUD (Pregna International Limited, Dabhel, Daman, India). The IUD was inserted by an experienced Nurse using the standardized manufacturer approved technique. Medium size Cusco's bivalve speculum was used for all the participants. The tip of the speculum was dipped in sterile aqua for lubrication. The visual analog scale is a unidimensional measure of pain intensity. It is presented as a 10-cm or 100-mm line which is anchored by verbal descriptors such as "no pain" and "worst pain imaginable". The patient is asked to make a mark on the 100mm line to indicate pain intensity. The pain score is measured from zero to the patient's mark. Using the 100-mm scale, there are 101 levels of pain intensity.
The visual analog scale (chart) was shown to all the respondents and the explanation given. No pain was illustrated by a particular picture and maximal pains by

doi: 10.60014/pmjg.v12i2.303

a different picture. The chart also had a numerical rating scale on it with no pain corresponding to zero and that of maximal pain corresponding to 10cm. Therefore, during phone calls, respondents scored their pain out of 10 using the combination of the analog score and the numerical rating. Each step of the procedure was explained to the participants and then the pain scored immediately after. This was done by a research assistant who was blinded to the interventions received by participants, who asked the participants to rate the intensity of pain at 6 consecutive steps; at speculum insertion, at tenaculum placement, at metal sound insertion, at IUD insertion, 5minutes and 4 hours after insertion using the same 10cm- VAS with different sheet of paper at every point (0=no pains, and 10=the worst possible experienced pain). To prevent the pain of one step fading into the next step, participants were given one minute to recover from their pain after each step before proceeding onto next step. Immediate complications of IUD insertion such as uterine perforation, failure of insertion, and vasovagal reaction were recorded. Participants were contacted 4 hours and 24 hours after IUD insertion by phone to query about post insertion pain and any adverse effects of diclofenac and lidocaine such as nausea, vomiting, dizziness, dyspepsia, skin reaction and allergic reaction.

Data Management and Analysis

Data analysis was by intention-to- treat. Data collected was entered into an excel spread sheet and exported to IBM SPSS- Version 23 for analysis. Continuous demographic data was described using means and standard deviation while categorical ones was described using frequencies and percentages. Mean pain scores were compared using a one-way ANOVA and a Post-Hoc test used to compare which two groups are significantly different from each other. The Fisher's Least Significant Difference Post-Hoc test was used because it is relatively easy to calculate and interpret. It also has a good power to detect differences between means even when small sample sizes are used. It is relatively conservative, which means that it is less likely to find a significant difference when there is none.

Categorical variables between groups were compared using a chi-square test. The Fisher's Exact test was used instead of chi-square test when expected frequency in any cell was less than 5. Multivariate analysis was used to test for preferential effect of different variables on 10cm- VAS pain score during IUD insertion. The preferential effect had to do with the effect of various variables such as parity, type of analgesia used etc. on pain experienced by respondents during speculum insertion, tenaculum application to the cervix and IUD insertion into the uterine cavity. This was indicated by the pain score on the visual analog scale. The data was analysed using ANOVA and Fisher's Least Significant Difference Post-Hoc test. In all statistical tests, a p-value of less than 0.05 at a confidence interval of 95% was considered statistically significant.

Ethics Approval

Ethical clearance for the study was obtained from Korle Bu Teaching Hospital Institutional Review Board with identification number KBTH-IRB 00050/2020. Permission from the Obstetrics and Gynaecology Department of Korle Bu Teaching Hospital was sought for the study. The reason for the study, the benefits, the right of the participant and the procedure were explained to the participants and informed consent obtained from each participant. Participation was voluntary and patients were assured that there was no penalty for refusing to participate. Participants were also assured that their personal information were to be handled in a confidential manner and that there was safety and monitoring board comprising statistician, physician specialist and a pharmacist who in the event of adverse drug reaction were to be referred to for care at no cost to them.

Results

The average age of the participants was 33.8$\pm$ 6.2 years whilst the average BMI was 29.6$\pm$ 5.9kg/m^2. In all, 11/103 (10.68%) of the respondents were single. The rest were either married or cohabiting. Only 3/103 (2.91%) of the participants did not have formal education, the rest had some form of formal education. There were 42/103 (40.78%) of them who had tertiary education. In terms of occupation, 37/103 (35.92%) of the respondents were professionals. Traders and artisans represented 32/103 (31.07%) each. For the religious affiliations of respondents, only 6/103 (5.83%) were Muslims, the rest were Christians. There was no significance difference in the pain experience by respondents during speculum placement among the counselling only and suppository diclofenac (p=0.06). However, there was significant difference in the pains experience by respondents at tenaculum insertion (p=0.005), uterine sound (p=0.046), during IUD placement (p=0.002) and immediately after procedure (p=0.008) using counselling only, suppository diclofenac and lidocaine spray. Moreover, pain experience by respondents after 5 minutes and 4 hours after procedure in all the three arms of the study was also significant, p< 0.001 for both. The pain score at speculum insertion for lidocaine spray was omitted because lidocaine spray of the cervix could only be done after the insertion of the speculum.

Counselling only versus suppository diclofenac during IUD insertion

There was significant difference between counselling only and suppository diclofenac at tenaculum insertion (p= 0.006), uterine sound insertion (p= 0.037), IUD placement (p= 0.003), over all pain immediately after the procedure (p= 0.002) and 5 minutes after the procedure (p=0.004). However, there was no significance difference in pain experienced by respondents who had counselling only compared to

doi: 10.60014/pmjg.v12i2.303

those who had suppository diclofenac 4 hours after procedure (p=0.06).

Since the mean pain score for suppository diclofenac was lower than counselling only at tenaculum insertion (3.6 versus 4.9), Suppository diclofenac was better at pain control at tenaculum insertion compared to counselling only. Again, suppository diclofenac was superior to counselling only in pain control during uterine sound insertion (3.1 versus 4.1), IUD placement (2.2 versus 3.4), immediately after procedure (p= 2.2 versus 3.5) and 5 minutes after procedure (1.4 versus 2.4).

Counselling only versus lidocaine spray.

The difference between the pain experienced by respondents at counselling only and lidocaine spray at tenaculum insertion (p= 0.04), uterine sound (p= 0.028), IUD placement (p= 0.001), over all pain immediately after the procedure (p= 0.041), 5 minutes after the procedure (p< 0.001) and 4 hours after the procedure (p< 0.001) were significant. Lidocaine spray of the cervix was superior in pain control compared to counselling only during tenaculum insertion (3.5 versus 4.9), uterine sound (3.1 versus 4.1), IUD placement (2.1 versus 3.4), immediately after procedure (2.7 versus 3.5), 5minutes after procedure (0.6 versus 2.4) and 4 hours after procedure (0.1 versus 1.3).

Suppository Diclofenac versus Lidocaine spray.

There was no significant difference between suppository diclofenac and lidocaine spray of the cervix at tenaculum insertion (p= 0.850), uterine sound (p= 0.920), IUD placement (p= 0.774) and immediately after the procedure (p= 0.299). However, there was significant difference in pain experience at 5 minutes after procedure (p= 0.011) and 4 hours after procedure (p= 0.004).

Lidocaine spray of the cervix was superior to suppository diclofenac at pain control 5 minutes after procedure (mean pain score 0.6 versus 1.4) and 4 hours after procedure (0.1 versus 0.8). The study intended to compare the 3 arms at post-Hoc and since lidocaine spray could only be done after speculum insertion, pain score at speculum insertion was omitted at post-Hoc analysis.

Table 1: The Socio-demographic characteristics of the respondents

Characteristics	Counselling only group (N=33)	Suppository Diclofenac Group (N=33)	Lidocaine Spray Group (N=33)	Total (N=99)	P-Value
Marital status					0.052
Single	1 (9.1)	3 (27.3)	7 (63.6)	11 (100.0)	
Married	26 (41.3)	18 (28.5)	19 (30.2)	63 (100.0)	
Cohabiting	6 (24.0)	12 (48.0)	7 (28.0)	25 (100.0)	
Educational level					0.570
No formal education	1 (33.3)	1 (33.3)	1 (33.3)	3 (100.0)	
Primary	2 (22.2)	4 (44.4)	3 (33.3)	9 (100.0)	
JHS	7 (46.7)	4 (26.7)	4 (26.7)	15 (100.0)	
SHS	10 (30.3)	15 (45.5)	8 (24.2)	33 (100.0)	
Tertiary	13 (33.3)	9 (23.1)	17 (43.6)	39 (100.0)	
Occupation					0.436
Professional	10 (29.4)	9 (26.5)	15 (44.1)	34 (100.0)	
Artisan	19 (29.0)	11 (35.5)	11 (35.5)	31 (100.0)	
Trader	13 (41.9)	11 (35.5)	7 (22.6)	31 (100.0)	
Unemployed	1 (33.3)	2 (66.7)	0 (0.0)	3 (100.0)	
Religion					0.203
Christian	29 (31.2)	32 (34.4)	32 (34.4)	93 (100.0)	
Muslim	4 (66.7)	1 (16.7)	1 (16.7)	6 (100.0)	

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Table 2: Visual Analog Score (VAS) of pain experience by respondents during and after IUD insertion using counselling only, Suppository Diclofenac and Lidocaine spray.

Procedure	Treatment	N	VAS (Mean)	Standard Deviation	P-value
Pain estimated at speculum insertion	Counselling only	33	5.1	2.2	0.041
	Suppository diclofenac	33	4.9	2.0	
	Total	66	5.0	2.1	
Pain estimated at tenaculum placement	Counselling only	33	4.9	2.0	0.010
	Suppository diclofenac	33	3.7	1.9	
	Lidocaine spray	33	3.5	1.9	
	Total	99	4.0	2.0	
Pain estimated at uterine sound insertion	Counselling only	33	4.1	2.1	0.049
	Suppository diclofenac only	33	3.2	1.4	
	Lidocaine spray only	33	3.0	2.3	
	Total	99	3.4	2.0	
Pain estimated during IUD insertion	Counselling only	33	3.4	2.0	0.004
	Suppository diclofenac only	33	2.2	1.3	
	Lidocaine spray only	33	2.1	1.7	
	Total	99	2.6	1.8	
Overall pain estimated immediately after procedure	Counselling only	33	3.5	2.1	0.013
	Suppository diclofenac only	33	2.2	1.3	
	Lidocaine spray only	33	2.7	1.7	
	Total	99	2.8	1.8	
Pain estimated 5 minutes after procedure	Counselling only	33	2.4	1.9	<0.001
	Suppository diclofenac only	33	1.5	1.2	
	Lidocaine spray only	33	0.6	0.7	
	Total	99	1.5	1.5	
Pain estimated 4 hour procedure by telephone	Counselling only	33	1.2	1.5	<0.001
	Suppository diclofenac only	33	0.9	1.0	
	Lidocaine spray only	33	0.1	0.2	
	Total	99	0.7	1.2	

Table 3: The Post Hoc analysis of pain experience at IUD insertion using counselling only, suppository diclofenac and lidocaine spray.

Dependent Variable	(I) Group	(J) Group	Mean Difference	Std. Error	P-value
Pain estimated at tenaculum placement	Counselling only	Suppository diclofenac	1.303*	0.473	0.007
		Lidocaine spray	1.455*	0.473	0.003
	Suppository diclofenac	Counselling only	-1.303*	0.473	0.007
		Lidocaine spray	0.152	0.473	0.749
	Lidocaine spray	Counselling only	-1.455*	0.473	0.003
		Suppository diclofenac	-0.152	0.473	0.749
Pain estimated at uterine sound insertion	Counselling only	Suppository diclofenac	1.182*	0.470	0.014

doi: 10.60014/pmjg.v12i2.303

		Lidocaine spray	1.242*	0.470	0.010
	Suppository diclofenac	Counselling only	-1.182*	0.470	0.014
		Lidocaine spray	0.061	0.470	0.898
	Lidocaine spray	Counselling only	-1.242*	0.470	0.010
		Suppository diclofenac	-0.061	0.470	0.898
Pain estimated during IUD insertion	Counselling only	Suppository diclofenac	1.212*	0.395	0.003
		Lidocaine spray	1.515*	0.395	<0.001
	Suppository diclofenac	Counselling only	-1.212*	0.395	0.003
		Lidocaine spray	0.303	0.395	0.445
	Lidocaine spray	Counselling only	-1.515*	0.395	<0.001
		Suppository diclofenac	-0.303	0.395	0.445
Overall pain estimated immediately after procedure	Counselling only	Suppository diclofenac	1.364*	0.421	0.002
		Lidocaine spray	1.061*	0.421	0.013
	Suppository diclofenac	Counselling only	-1.364*	0.421	0.002
		Lidocaine spray	-0.303	0.421	0.473
	Lidocaine spray	Counselling only	-1.061*	0.421	0.013
		Suppository diclofenac	0.303	0.421	0.473
Pain estimated 5 minutes after procedure	Counselling only	Suppository diclofenac	1.000*	0.334	0.003
		Lidocaine spray	1.879*	0.334	<0.001
	Suppository diclofenac	Counselling only	-1.000*	0.334	0.003
		Lidocaine spray	.879*	0.334	0.010
	Lidocaine spray	Counselling only	-1.879*	0.334	<0.001
		Suppository diclofenac	-.879*	0.334	0.010
Pain estimated 4 hour procedure by telephone	Counselling only	Suppository diclofenac	0.515	0.266	0.055
		Lidocaine spray	1.303*	0.266	<0.001
	Suppository diclofenac	Counselling only	-0.515	0.266	0.055
		Lidocaine spray	.788*	0.266	0.004
	Lidocaine spray	Counselling only	-1.303*	0.266	<0.001
		Suppository diclofenac	-.788*	0.266	0.004

*represents significant differences. The (I) represent the treatment group in the first column whilst the (J) represents the other treatment groups being compared to (I) in the second column.

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Counselling only versus lidocaine spray.

The difference between the pain experienced by respondents at counselling only and lidocaine spray at tenaculum insertion (p= 0.04), uterine sound (p= 0.028), IUD placement (p= 0.001), over all pain immediately after the procedure (p= 0.041), 5 minutes after the procedure (p< 0.001) and 4 hours after the procedure (p< 0.001) were significant. Lidocaine spray of the cervix was superior in pain control compared to counselling only during tenaculum insertion (3.5 versus 4.9), uterine sound (3.1 versus 4.1), IUD placement (2.1 versus 3.4), immediately after procedure (2.7 versus 3.5), 5minutes after procedure (0.6 versus 2.4) and 4 hours after procedure (0.1 versus 1.3).

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Discussions

As shown in table 1, there was no difference in the sociodemographic characteristics of the respondents of all the three arms of the study. The key findings from the work were that 10% percent Lidocaine spray was more effective compared to 100mg Diclofenac Sodium in reducing pain at IUD insertion and both 10% lidocaine spray of the cervix and suppository diclofenac were superior to counselling only (standard of care).

From this study the level of pain experienced by respondents were significant during speculum placement among the counselling only compared to suppository diclofenac (mean VAS 4.9 versus 5.1, p=0.041). This is shown in table 2. This may be because after one hour administration of the suppository diclofenac, its analgesic effect would have started and therefore those in the suppository diclofenac arm of the study had less pain during speculum passage compared to those in the counselling only arm.

There was also significant difference in the pain score experienced by respondents at tenaculum placement (4.9 $\pm$ 2.2; 3.7 $\pm$ 1.4; 3.5 $\pm$ 1.9; p=0.010), uterine sounding (4.1 $\pm$ 2.1; 3.2 $\pm$ 1.4; 3.0 $\pm$ 2.3; p=0.049), IUD placement (3.4 $\pm$ 2.0; 2.2 $\pm$ 1.3; 2.1 $\pm$ 1.7; p=0.004) and immediately after procedure (3.5 $\pm$ 2.1; 2.2 $\pm$ 1.3; 2.7 $\pm$ 1.7; p=0.013) using counselling only, suppository diclofenac and lidocaine spray. From the study by Collins et al, the mean VAS of less than 3.0cm corresponds to mild pain , 3.0cm to 5.3cm corresponds to moderate pain and 5.4cm or more represents severe pain[24]. It is therefore obvious that whilst respondents who had counselling only had moderate to severe pains during the procedure, the diclofenac and lidocaine arms of the study only experienced mild to moderate pains. Generally, the mean pain score for 10% lidocaine spray was smaller at each point of the procedure, implying that 10% lidocaine was better at pain control compared to suppository diclofenac and counselling only. Moreover, at 4 hours the mean pain score for both suppository diclofenac and 10% lidocaine spray were below 1.0 which implied that respondents had mild to no residual pain 4 hours after the procedure. Pain assessment at 5minutes and 4 hours after the procedure evaluated the delayed prostaglandin related cramping pain that is experienced after IUD insertion. Therefore, it was expected that since diclofenac, an NSAID reduce pains and inflammation by blocking cyclooxygenase enzyme activity and consequently the formation of endogenous prostaglandins, it would have had lower mean VAS than lidocaine but the opposite effect was observed.

Various work on the use of NSAIDs and Lidocaine for pain control at IUD insertion has been done but this is the first time Suppository diclofenac, lidocaine spray of the cervix and counselling only has been compared in one study. In the study by Abbas et al comparing the use of oral diclofenac and buscopan prior to insertion of copper IUD, the diclofenac was superior to buscopan in pain reduction at speculum placement (1.73 versus 2.13, p=0.044) and tenaculum insertion (1.85 versus 2.3, p=0.033)[20]. In another study by Chor et al, comparing ibuprofen and control in IUD insertion, there was no difference in pain score during tenaculum insertion (3.81 versus 3.86; p=0.90) and IUD placement (3.34 versus 3.69; p=0.91) between the Ibuprofen and control[26]. From the above studies, NSAIDs have generally given consistently low VAS compared to controls at IUD insertion which was consistent with our current study.

The probable explanation is that irrespective of the route of administration of NSAIDs, the mechanism of action is the same. In other studies, where suppository diclofenac has been used, its analgesic effect has been proven. For instance, preoperative use of suppository diclofenac in cleft palate repair in children have been shown to be effective and reduces significantly the use of opioids postoperatively compared to controls (1.67 versus 6.08; p<0.001)[27].

In a recent randomized, double-blind placebo-control study by Aksoy et al, 10% Lidocaine spray of the cervix during IUD insertion was associated with significant reduction in pain perception immediately after the procedure compared to the controlled group (1.01 versus 2.23, p <0.001)[28]. This is comparable to our study where mean pain score immediately after the procedure was lower for the lidocaine group than those of the control

  doi: 10.60014/pmjg.v12i2.303

(2.7±1.7 versus 3.5±2.1, p=0.013). In both of the studies 4 pumps of lidocaine spray (40mg) were used; however, in the study by Aksoy et al, nulliparous women were not included in their study and the control group were given isotonic saline spray of the cervix. This might have accounted for the differences in the mean pain scores between the two studies.

In contrast to our study where both parous and nulliparous women were included, the study by Aksoy et al did not include any nulliparous woman. Meanwhile, parity has been shown to be associated with pain perception at IUD insertion[15]. In the current study, both 10% lidocaine spray and suppository diclofenac were superior to counselling only at pain control during tenaculum insertion, uterine sound use, IUD placement and immediately after procedure but there were no significant differences between them. This is demonstrated in table 3. However, 10% lidocaine spray was superior to suppository diclofenac at pain control 5minutes ($p<0.001$) and 4 hours ($p<0.001$) after the procedure. Since the terminal half-life of diclofenac is 1-3 hours and that of lidocaine is 10 – 15 minutes[31,32], it was expected that suppository diclofenac would be superior at pain control hours after the procedure. However, the above observation maybe due to the fact that lidocaine acts locally on the nociceptors, and once they were blocked, they gave a longer lasting pain control compared to the diclofenac which acts systemically.

There were no medical complications recorded in the study with the use of lidocaine spray and suppository diclofenac and the two (1 nausea, 1 dizziness) that were reported by respondents after 4 hours of the procedure were associated with the counselling only arm of the study. In both cases, the symptoms were mild and transient and had resolved without any intervention when the 4 hour-call was made.

Strength of the study

This is one of the first few comparative studies evaluating the effectiveness of pain control at IUD insertion using 10% lidocaine spray of the cervix, suppository diclofenac and counselling only. The participants were randomized and the intervention (lidocaine spray and suppository diclofenac administration) and IUD insertion was done by an experienced nurse who was different from the research assistant who did the pain scoring using the Visual Analog scale. The Visual Analogue score was done in Korle Bu Teaching Hospital by one person (research assistant) to avoid inter assessor variations in the VAS estimations.

Study limitation

This is an institution-based study which was done in Korle- Bu Teaching Hospital, in the Accra Metropolitan area which is a tertiary referral Centre and therefore this places a limitation on the generalization of the findings.

However, it is worth noting that the hospital receives varied clients from different parts of the Greater Accra and other regions of the country. The study involved the use of Visual Analogue Scale for pain assessment which is noted to be associated with subjectivity in the reporting of pain, however this is a widely accepted and validated instrument for pain assessment[18].

Acknowledgement

The research was solely sponsored by the authors We acknowledge the support given by the Department of Obstetrics and Gynaecology, Korle Bu Teaching Hospital for this work. We are also grateful to the midwives of the Reproductive Health Centre who helped to collect the data and to Mr. Maxfield Okere for helping with statistical analysis.

Data availability

The datasets generated during the current study are available from the corresponding author on reasonable request.

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EXPLORING THE PSYCHOLOGICAL EXPERIENCES OF WOMEN WITH INFERTILITY IN URBAN GHANA: A QUALITATIVE STUDY

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Abstract

Objective: To explore experiences of women seeking treatment in Ashanti region of Ghana regarding infertility and its effect on daily living.

Methodology: A qualitative study utilizing content analysis approach. Purposive sampling of 18 women with infertility who sought infertility treatment as referral cases in Kumasi, Ashanti Region were selected for a semi-structured in-depth interview after giving informed consent.

Results: Four main themes emerged as participants' perception of infertility and its consequences on their daily lives. These include: "abuse", "marital instability", "social isolation", and "loss of self-esteem." The most predominant theme was "loss of self-esteem". Infertility was found to influence both psychological and social well-being of affected women.

Conclusion: Infertility imposes significant impairment on the emotional, psychological and social well-being of women in Ghana. These include isolation, abuse, loss of self-esteem, and marital instability. *What is already known*? Infertility may impose psychological distress on affected couples. *What did study add*? This study reveals the extent to which infertility-related distress affects the daily living experience of women in Ghana, including physical abuse. *How this study might affect research, practice, or policy*? The severity of the psychological burden of infertility is worse on women and this could be mitigated if the associated high costs of infertility treatment are subsidized.

Key words: *infertility, Ghana, women, psychology, social suffering.*

Introduction

Infertility is highly prevalent and constitutes a major reproductive health problem in developing countries but this has been significantly under-appreciated.[1,2] Infertility rates are high on the African continent where it has reportedly been associated with serious social consequences. There is however, scanty research data on the psychological issues relating to infertility.[1] Infertility affects 10% - 32% of couples in Africa.[3] In the Sub-Saharan African Region, the prevalence of infertility is higher (15% - 30%) than many other regions of the world.[4] Secondary infertility is predominant in Africa, while most other regions have predominance of primary infertility.[5,6] The World Health Organization (WHO), defines infertility as a failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse.[7] In the African socio-cultural setting, infertility often becomes a tragedy for the affected family. In African culture, womanhood has been equated to motherhood, so that women are blamed for a couples' infertility.[8] Many couples would usually first seek traditional or spiritual treatment for infertility, others would consider adoption, re-marriage, or even divorce as solutions. Women with infertility tend to worry and suffer loneliness because infertility and its treatment affect their daily lives and livelihoods.[9]

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Conflict of Interest: None Declared

Understanding infertility as a socially constructed problem enables affected individuals to define their inability to conceive as such, determine its nature and subsequently formulate the needed course of action towards a solution. Because infertility is primarily an inability to achieve a desired social role and goal, it often becomes associated with psychological distress. From the early twentieth century, the concept of equal reproductive roles of both men and women in achieving pregnancy became known and indicates the importance of normal reproductive function in both partners for conception to occur.[10] This knowledge has since informed clinicians to approach infertility as a couple issue and not only a woman's issue.[11]

The health belief model (HBM)[12] demonstrates how individuals take steps to treat and prevent diseases. The original HBM concept states that: "*an individual's health behaviour is determined by personal beliefs and perceptions about a disease and strategies available to minimize their occurrence*." [12.13]

The Ghanaian society is traditionally pronatalist with the average woman desiring four children.[14] Within the Ashanti cultural context, which is typical of the Ghanaian culture, childbearing is so highly desirable that its absence with a first wife may lead to the husbands marrying a second wife. Further, childbearing

  doi: 10.60014/pmjg.v12i2.336

enhances family stability, promotes marital satisfaction and gives families recognition in the Ghanaian society.[15] In the Ashanti Region infertility remains a major social and reproductive health problem for approximately a quarter of couples.[14]

Although previous studies demonstrated the relationship between physical and psychological suffering and infertility, different aspects of infertility remain unclear and require further research in our setting.[16] The limited qualitative data on this subject in the Ghanaian context necessitated this study.

Materials and Methods

A qualitative design based on content analysis approach was used to gain in-depth understanding and describe the world of human experiences that participants live through. Using a purposive sampling method, women in Ghana seeking fertility treatment at the gynaecology department of Trustcare Specialist and Fertility Centre, Kumasi were approached, and study protocol explained to them. Women 18years and above, seeking fertility treatment who consented to participate in the study were subsequently recruited consecutively. These were patients for whom the cause of infertility had been previously established as female factor. Women whose partners had male factor infertility, and those for whom the cause was not determined were excluded. The interviews took place at the study site on alternate days from November 2021 to January 2022.

Semi-structured in-depth interviews were conducted individually in a private and confidential setting to ensure participants were relaxed and felt at rest in answering interview questions. Each interview session lasted averagely one hour. At the point of saturation, a total of eighteen women seeking treatment for female factor infertility had been interviewed.

The interview questions focused on: (i) the women's infertility experiences; (ii) understanding of infertility, and (iii) their perspective on infertility. Data on the participants' sociodemographic characteristics were also obtained. In addition to asking about the educational background of participants, their husbands' educational background was also determined. The interviews were conducted by the first author in the Twi local language which all the participants understood and preferred, and then translated into English. Each interview was recorded and transcribed verbatim and then analyzed concurrently.[17]

Drawing on study by Graneheim & Landman (2004), the following five steps were taken to analyze the collected data with the help of trained research assistants and a qualitative research analyst: transcribing the interviews verbatim and reading through several times to obtain a sense of the whole; dividing the text into meaningful condensed units; abstracting the condensed units and labelling with codes; sorting codes into sub-categories and categories based on comparisons regarding their similarities and differences; formulating themes as the expression of the latent content of the text. Trustworthiness, certainty of the evidence collected were ensured through member checking, done by asking the respondents to verify the preliminary findings from the earlier interviews. The researchers independently analyzed the data by identifying and categorizing codes for the participants' responses to each question, and then the two authors' codes and their latest analysis development as themes were compared.

Ethical Approval

Ethical approval was obtained from the College of Humanities, University of Ghana (ECH-220/21-22).

Results

The participants' ages ranged from 25–45years (mean: 34years; SD=5.90). The participants' husbands' ages ranged 28–55years (mean: 41years; SD=6.50). Duration of infertility ranged between 3-18years (mean: 9years; SD=6.62). Three participants (17%) attained tertiary education, four (22%) had secondary education, and eleven (61%) had only basic education. The educational statuses of the participants' husbands were similar to the participants.' During data analysis, four main themes emerged: "abuse", "marital instability", "social isolation", and "loss of self-esteem". The meaning of each theme is presented using participants' direct quotations. Abuse: One of the extracted themes from the data was abuse. It consisted of two sub-themes: "psychological abuse" and "physical abuse". Abuse occurred with infertility and interrupted the mutual understanding between couples in most cases. Psychological violence was commonly reported among infertile women, inflicted by their husbands and husbands' relatives. Three women (17%) experienced physical violence from their husbands due to their infertility.

Psychological abuse*:* One participant said**,** "My husband sometimes humiliates me due to my infertility and he insults me and my family." Another participant: "I am an educated woman and have a master's degree in Arts, but my husband always begins to cry and curse me for my infertility. I feel that my personality is lost in these situations." One participant expressed**,** "My husband always reminds me that if he had married another woman, he would already have had a child." The interactions of infertile couples' relatives were also affected by the condition. When pregnancy was delayed, the relatives began to blame the couples. The blame and pressure of the relatives was actually considered one of the significant concerns in the infertile couples' lives. One participant disclosed, "My husband's family, particularly my mother-in-law and sister-in-law, provoke my husband against me." Another explained, "My sister-in-law always tells my husband: 'divorce your wife and re-marry with another woman who can bring you a child.'" In Ghana, some couples live in the husband's family house with members of the husband's family. This leads to interference of by husband's family

  doi: 10.60014/pmjg.v12i2.336

in the private lives of couples in such situations. In cases of infertility, the man's family becomes more involved in the couple's lives, putting more pressure on the women involved. (Dyer, 2007). "I suffer the humiliations and rebukes of my mother-in-law and I feel helpless and cannot do anything."

Physical abuse: Besides psychological violence, three women also talked about physical violence. One woman said: "My husband sometimes beats me. I stay silent because I do not want anybody to be aware of my problems." Another participant, "My husband is very bad tempered; he tells me that 'you were an old girl when I married you. You are infertile too; you deserve to be beaten.' Then he beats me and tells me that 'if you feel uncomfortable here, go to your father's house."

Marital instability: When couples realized that they could not have a child, difficulties increased and the distance between the couples broadened. The mental pressure weakened the marriage and even caused divorce. Most participants felt they had lost trust in their husbands, and thought their husbands were no longer interested in them. "I think that my husband is betraying me. He may marry another woman to have a child. This issue always worries me." "My husband comes to the house and says that 'I want to have a child, and until when should I wait to have a child?' He is right because if he would have married another woman, she would have given him a child by now." The fear that their husbands may re-marry other women was consistent in all narratives of participants. One explained, "For a woman like me who is infertile, and her husband can legally re-marry another woman, it is obvious that living only as a couple becomes boring and causes the couples to lose their patience, and their affectionate relationship is interrupted." Culturally, procreation is believed to help sustain a generation and stabilize the family. Also, as a form of social security, the child would support the parents in their old-age. (Dyer, 2007) One participant explained, "My husband tells me that he will die without having heirs to look after him and inherit him. I feel that it is his right to have a child, but I cannot bring him a baby."

Social isolation: For most participants, infertility had negative social consequences and bothered them. Most of the infertile women asserted that they did not like to participate in social activities and preferred being alone: "I like to be alone at home and do not like to go anywhere. A woman who does not have a child must stay at home." "I am really tired because people always ask me 'When are you going to have a kid?' For this reason, I prefer to stay at home. It is a fact that people talk about their children at parties, and a woman like me who suffers from infertility cannot talk about this issue and I find it very painful." In some cases, relatives avoided the infertile couples and have limited contact with them. "Ever since my relatives understood that I suffered from infertility, they have not invited me to birthday celebrations of their children."

Loss of self-esteem: one of the objectives of marriage is to have a child in society. It is believed that having a child maintains and preserves the generation. According to Gerrits et al, when a woman understands she is infertile, she loses her self-esteem and feels that she is inadequate as a person. [25] Respondents said, "I would never have married if I knew that I could not bear a child. Now, I feel useless and think that my works are futile." "One of the characteristics of the female is to bear, breastfeed and raise a child. If a woman fails to do these, then she is not a proper woman." Others expressed, "I believe that a woman can reach her final evolution when she can bear a child." Some participants asserted that they did not deserve to become mothers and thought that their infertility was a type of punishment from God, "'Mother' is a sacred word and not everybody deserves to be a mother. Perhaps I am one of them."
"I sometimes feel that I am not a woman because I cannot bear a child. I think that I have one thing less than other women."

Discussion

This study provides infertile women's perspectives about infertility in the Ashanti culture which is one of the typical Ghanaian cultures. Infertility is a common reproductive health problem in developing countries, which frequently carries negative psychosocial implications. It has been reported that infertility and its treatment among affected women lead to mental, physical, and social distresses.[18] Our study found that negative experiences of infertile women include: "abuse", "marital instability", "social isolation", and "loss of self-esteem". The results of a similar qualitative study conducted in Africa among infertile women found loss of self-esteem, anxiety, depression, hopelessness, guilt, marital difficulties, loss of social status, and abuse as consequences of infertility[19] Our findings agree with this previous study. Infertility has been suggested as a major cause of divorce and abandonment.[20] In the present study, childbearing was seen as the purpose of marriage and the absence of children might cause marital problems. The result of a similar study in the urban Muslim population in Bangladesh showed that infertile women experienced a loss of purpose in life, instability in their marriages, stigma, and partner violence.[21] In accordance with the cultural marriage practice in Akan, Ghana, if it is identified that a man or woman is infertile after marriage, they can be separated from each other.[26] However, the woman rarely separates from her husband due to his infertility. In contrast, when infertility is attributable to the woman, there are more possibilities for divorce, physical and psychological punishments. Husbands sometimes take a second wife, if the first wife does not desire to separate from her husband. The present study revealed that physical and psychological violence were suffered by participants

  doi: 10.60014/pmjg.v12i2.336

because of their infertility."My husband is not supportive at all. He knows he could have more children from other relationships if he wants," says a participant, who sold her inheritance (a plot of land) to pay for one cycle of in vitro fertilization (IVF) treatment that cost about six thousand United States Dollars in the city were this study was conducted. Unfortunately, her treatment was unsuccessful. The public Hospitals in Ghana do not provide assisted reproductive technology services; hence patients receive care only from private facilities where payments are made out of pocket.

"At this rate, it will take me another ten years to save enough money for a second IVF treatment cycle, and by then I will be too old," she cried out of despair. "We cannot afford it. I am going to die without my own biological child." Previous research indicate that infertile women constitute a particularly vulnerable group with poor reproductive health and deserve attention and care in their own right.[22] Our study found that couples' relatives interfered in the marriages of infertile couples. Families' interferences, negative attitudes towards infertile couple, and behavior of persons around them cause psychological problems for affected couples.[23]

Consistently, the index study showed that infertile women avoid participating in parties and social gatherings because of fear that relatives might enquire about their infertility. Isolating behaviors reported during situational crises related to infertility include self-talk and sleep. Reportedly, women experience the feeling of social isolation more than their male counterparts in infertile marriages .[24] Our study also found that infertile women lost their self-esteem due to their infertility. Self-esteem is very important for infertile women because it plays a role in the development of the personality. In the absence of high self-esteem, infertile women may suffer depression and the dreaded feeling of facing unpleasant circumstances due to their infertility.[25]

Conclusion

Infertility imposes significant impairment on the emotional, psychological and social well-being of women in the Ashanti region which is a reflection of what pertains in other Ghanaian cultures. These include isolation, abuse, loss of self-esteem, and marital instability. Psychological supportive counseling and subsidizing infertility treatment costs may be helpful interventions to mitigate the psycho-socio-emotional distress among women with infertility.

Declarations

Limitations of this study

This study focused on infertile women and infertility with female factors. Therefore, future studies are recommended to explore the perspectives of infertile women's husbands and address the situation among couples with male factor infertility. Recruiting women with infertility attending the gynaecology clinics at the Trustcare hospital has the inherent limitation of a single center study.

Conflict of Interest

The authors have no conflicts of interest to declare.

Funding

The study received no funding.

Acknowledgement

Special appreciations to the Management and Staff of the Trustcare Specialist Hospital, Kumasi for their assistance in the conduct of this study.

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  doi: 10.60014/pmjg.v12i2.336

ESTIMATION OF THE CORRECTION FACTOR TO ASSESS THE CHRONOLOGICAL AGE OF GHANAIAN CHILDREN AND ADOLESCENTS USING THE DEMIRJIAN METHOD

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Abstract

Objective: To ascertain the correction factor for age estimation using the Demirjian method applicable to the study population in Accra, Ghana.

Methodology: It is a cross-sectional study of a secondary data involving 255 participants made up of 115 boys and 140 girls age between 5 and 18 years, attending the University of Ghana Dental School Clinic, Accra, Ghana. Their medical records were scrutinized for chronological age and their dental orthopantomograms analyzed for dental maturity scores and converted to dental age.

Results: Statistically, there was no significant difference between chronological age on one hand and both Demirjian age estimate and corrected factor predicted age. Factor predicted age however more closely matched chronological age. Above 15 years, the Demirjian method could not be applied to ascertain dental ages for boys.

Conclusion: Application of the factor predicted estimate to the Demirjian method can reliably predict the chronological age in the study population.

Key words: *Demirjian, Dental age, Ghana*

Introduction

Age is an individual's property, determined by date of birth. It confers assessment of biological growth progression and demographically as a means to personal and national identity. Skeletal and other hard tissue developments are used as bases for age assessment [1,2,3] and identification as in forensics. Ghana has a social void for age determination in situations of undocumented birthing especially in the rural communities and in children released from bondage of modern-day child slavery, a practice that exists in areas of Ghana [4]. These children will grow up with no social and doubtful national identity. The scope extends through qualification for age-limiting events in sports, determination of age-associated legal culpability and in identification exercises in mass disasters.

Different protocols for age assessment exist. They could be based on skeletal examination especially of long bones, odontological, anthropological or psychological studies[1,2,3]. These allow for an approximation of age assessment. In this study, one of the odontological methods, the Demirjian Method[5] is used. It was conducted originally within a French-Canadian Caucasian ethnic grouping. It is generally accepted to yield a good approximation of dental maturity from which age estimation can be derived. It involved the sub-adults' group (children and adolescents) between 5 to 18 years of age. This methodology is predisposed to population genetic variations, however. To increase its predictive value and accuracy, it's application in different ethnic groupings has had to go through ascertaining an appropriate correction factor, which is the primary aim of this study. This has not been conducted in Ghana before and it is hoped that future reviews will be undertaken to improve upon a consensus correction factor for age determination based on the Demirjian method for the Ghanaian population.

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Conflict of Interest: None Declared

Materials and Methods

Study design

This is a retrospective study.

Study Site

Is the University of Ghana Dental School Clinics and it is a facility for undergraduate and clinical dental specialty training. Patients attending the clinics routinely have OPGs taken as part of baseline investigations especially if presenting for the first time and stored in a database at the records unit. Those who met the inclusion criteria had their films included as part of the study. Between 100- 150 patients are seen daily at the clinics.

Study Population

Ghanaian children and adolescents aged 5-18 years attending our clinics. Inclusion criteria are clear panoramic radiographs of adequate diagnostic quality without blurring or artefacts in the region of the lower left quadrant with permanent teeth present (with the

doi: 10.60014/pmjg.v12i2.300

exception of third molars) and free of pathology that might affect tooth maturation. Healthy growth with no reported incidence of amelogenesis imperfecta, regional odontodysplasia, nutritional deficiency, Down's syndrome *etc*. Presence of all permanent mandibular teeth, specifically on left side, whether erupted or un-erupted, on OPG taken for diagnostic and/or treatment purposes.

Exclusion criteria are OPG of patients with caries and periapical pathologies, developmental anomalies bilaterally, congenitally missing teeth or missing due to extractions, patients with image distortions due to over/under exposure. Children undergoing orthodontic treatment and identical twins.

Study sample

The study sample consisted of 255 digital orthopantomographs taken from children and adolescents aged 5-18 years and made up of 115 boys and 140 girls. The final selection excluded 6 boys and 1 girl whose determined dental maturity scores did not have an equivalent dental age on the Demirjian chart because they were far above the 18 years limit.

The sample population was stratified by gender into males and females and also by age into 13 subgroups of increments of one year. The dental ages of the children were obtained based on their dental maturity scores and read off the Demirjian chart. A regression model was deployed to obtain an estimated correction factor. The model provided the coefficient of the dental age and the intercept of the line. These two parameters were used to predict the chronological age(CA) with an improved accuracy as shown in the results (Table 4). Using the regression equation and the correction factor, each child's age was estimated to give the factor predicted ages.

Data collection Tool

A data extraction form was developed to collect demographic information from folders of dates of birth and sex and the outcomes of the OPG analysis for dental maturity scores.

Quality Control Measures

Three examiners self-trained and calibrated using 20 radiographs by following the schematic description of the Demirjian stages to improve inter- and intra-examiner reliability. Each examiner analyzed 20 sets of data by calculating the actual chronological age from the recorded date of birth compared with the OPG at the exposure date.

The dental developmental information analysis as per the Demirjian protocol was undertaken separately by each examiner. The data gathered by each examiner on each radiograph were compared and any differences if any were discussed and a consensus result arrived at. This was done to improve inter and intra-examiner reliability without estimating kappa coefficient of agreement.

Data Analysis Plan

Chronological and dental ages were summarized by means and Standard deviation. The two ages were compared using paired t-test. Pearson's correlation coefficient R was used to estimate the linear association between the chronological and the estimated dental age for both boys and girls. Regression model was used to test how well the dental age predicts the chronological age. The correction factor was derived from the coefficient of the independent dental age to the chronological age. Analysis was done using SPSS version 25.0 (IBM, Armonk, New York, USA).

Ethical Approval

The study was approved by the College of Health Sciences Ethical and Protocol review committee with approval number – ***CHS-Et/M5-5.8 /2020-2021.***

Results

A total of 255 participants involving 115 boys and 140 girls took part in the study (Table 1).

Demographic characteristics of participants

Table 1: Distribution of Age group by sex

Age	(Age range)	Sex		Total %
		Male %	Female %	
5	5.0 -5.99	8 (47.10)	9 (52.9)	17 (100)
6	6.0 - 6.99	12 (44.1)	15 (55.6)	27 (100)
7	7.0 - 7.99	18 (50.0)	18 (50.0)	36 (100)
8	8.0 - 8.99	20 (51.3)	19 (48.7)	39(100)
9	9.0 -9.99	11 (42.3)	15 (57.7)	26 (100)
10	10.0 - 10.99	14 (48.3)	15 (51.7)	29 (100)
11	11.0 - 11.99	12 (66.7)	6 (33.3)	18 (100)
12	12.0 - 12.99	6 (35.3)	11 (64.7)	17 (100)
13	13.0 - 13.99	5 (45.5)	6 (54.4)	11 (100)
14	14.0 - 14.99	7 (41.2)	10 (57.8)	17 (100)
15	15.0 - 15.99	2 (18.2)	9 (81.8)	11 (100)
16	16.0 - 16.99	0 (0.0)	5 (100)	5 (100)
17	17.0 - 17.99	0 (0.0)	2 (100)	2 (100)
	Total	115 (45.1)	140 (54.9)	255 (100)

Six boys with ages varying from 15.43 to 17.15 years and 1 girl aged 16.28 years were excluded from the analysis because their dental maturity values fell outside the upper limit of 18 years on the Demirjian chart. Therefore, no boy above 16 years (CA) qualified to be in the analysis. Generally, there was overestimation by both Demirjian and factor-corrected methods. For males, the mean over-estimation (MOE) by Demirjian was 0.93 years and factor predicted by 0.12 years. For females, there was overestimation by 0.83 for Demirjian only but not for the factor predicted. (Table 2).

doi: 10.60014/pmjg.v12i2.300

Table 2: Descriptive summary of the chronological, dental and factor predicted ages by sex

Sex	Chronological Age (CA)	Predicted Age Using Demirjian Method (DAE)	Factor predicted Age (FPE)
Male (n=115)	9.48 ± 2.64	10.41 ± 2.74	9.60 ± 2.67
Female (n=140)	10.23 ± 3.25	11.06 ± 3.20	10.23 ± 3.12
Total (n=255)	9.89 ± 3.01	10.77 ± 3.01	9.94 ± 2.90

The correlation between the chronological age (CA), the Demirjian age estimate (DAE) and the factor predicted ages(FPE) are shown as follows, CA and DAE was 0.963,p<0.001; CA and FPE was 1.000, p<0.001. The comparison of mean ages for each age group of the three categories of CA, DAE and FPE ages are shown in Figures 1 and 2 for boys and girls. For both boys and girls, the graphs indicate that the FPE ages were closer to the CA than the DAE. There was therefore significant improvement on the estimates of the ages by FPE over DAE. For boys, just before 14 years of CA, there is a dip to underestimation by FPE but soon after at CA of 15.4 years, a gross increase in dental maturity scoring occurs making DAE impossible.

This may signify a spurt in dental maturity at this period for the boys. For girls, by 15 years, a general underestimation occurs for both DAE and FPE but more deeply for the later. However, the difference between overestimation and underestimation was not statistically significant (Table 3).

Comparisons of over and under estimation between males and females

Table 3: Over and under estimation categories

	Over-estimation		Under-estimation	
Row Labels	**N**	**percent**	**N**	**Percent**
Boys	60	52.17%	55	47.83%
Girls	80	57.14%	60	42.86%
Grand Total	**140**	**54.90%**	**115**	**45.10%**

Test for significant: χ^2= 0.44491, df = 1, p= 0.5048

Table 4. Regression model for males and females

Coefficients		Unstandardized Coefficients		Standa-rdized Coefficients	t	Sig.
		B	Std. Error	Beta		
Male Model	(Constant)	-.285	.237		-1.206	.230
	Predicted Age Using Demirjian Method	.938	.022	.970	42.676	<.001
Female Model	(Constant)	-.556	.284		-1.955	.053
	Predicted Age Using Demirjian Method	.975	.025	.958	39.475	<.001

a. Male, Dependent Variable: Chronological Age. With Adjusted R-square value = 0.942

b. ***Female, Dependent Variable: Chronological Age with Adjusted R-square value = 0.919***

The degree of over and under estimation for the males and also for females were not significant. However, there was more overestimation for the girls (57.14%) whilst the underestimation (47.83%) was more in the boys. (Table 3)

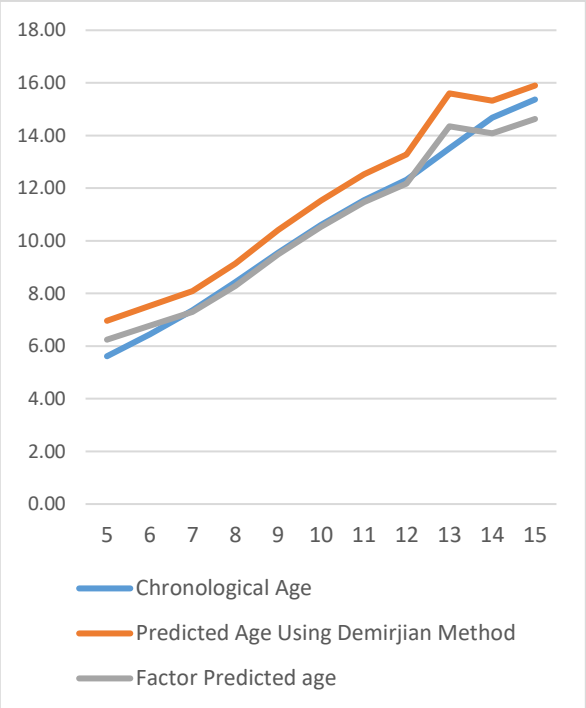

Figure 1: Comparison of the three estimated mean ages for Boys.

Regression models to estimate the correction factor for Males and Females

Using the CA as dependent variable and predicted ages as independent variables the Table 4. shows the coefficients of the independent variables with significant r-square value of 0.942 for boys and 0.919 for girls. The model for the prediction of the corrected factor for males is given by the equation: **Chronological Age= 0.938 x Dental Age - 0.285** That for females is given by: **Chronologic Age = 0.975 x Dental Age – 0.556**

Relationship between the three age categories

There was significant correlation among all the three age categories as shown in Figures 1- and 2-line graphs and scatter plots depicted by Figures 3 to 6, all with r-square values greater than 0.9.

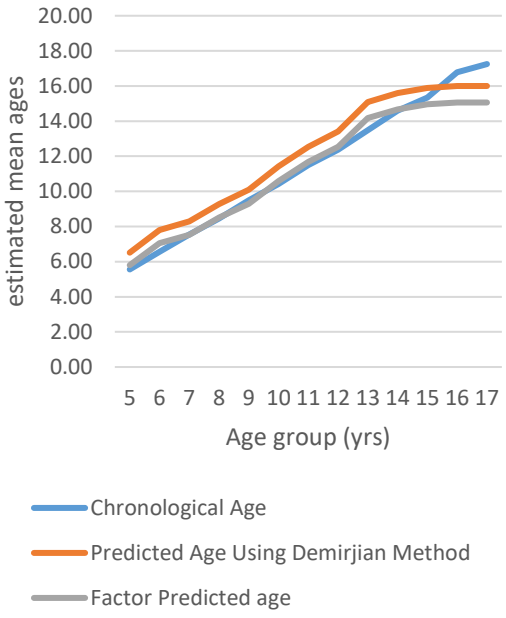

Figure 2: Comparison of the three estimated mean ages for Girls.

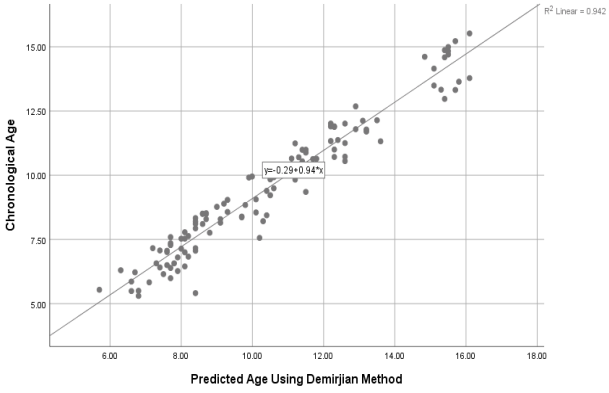

Figure 3: Scatter plot for CA and DAE- Boys

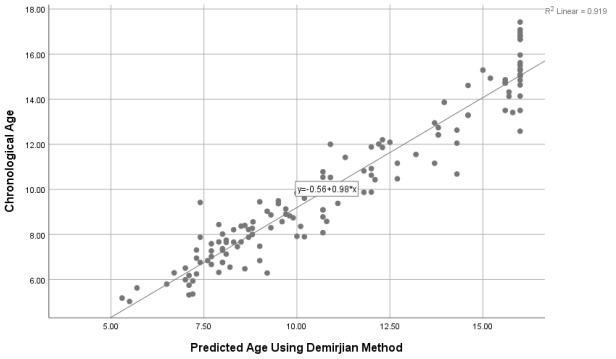

Figure 4: Scatter plot for CA and DAE- Girls.

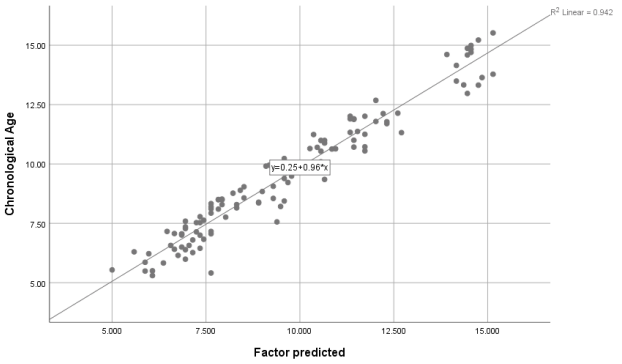

Figure 5. Scatter plot for CA and FPE - Boys.

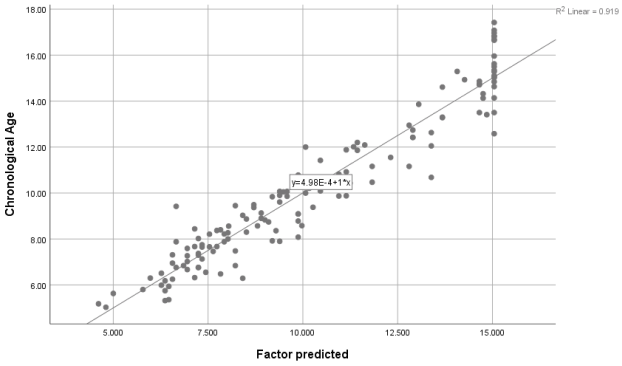

Figure 6: Scatter plot for CA and FPE - Girls.

Discussion

The Demirjian method for age-estimation is based on dental developmental stages and is accepted generally for this purpose[5].The initial study was conducted on a French-Canadian population and the outcome is known to be population-type and ethnic-origin dependent. A systematic review and meta-analysis conducted by Jayaraman et al[6] in 2013 on the initial Demirjian methodology concluded that there is an inherent tendency towards dental age overestimation. In the original French-Canadian standards, the difference between the dental age and chronological age ranged from .17 to .33 years in the boys and from -.02 to .48 in the girls. In our study, the respective differences ranged from .02 to 2.64 in boys and .01 to 3.62 in girls. In (Table 2), there was an overestimation of 57.14% in girls

doi: 10.60014/pmjg.v12i2.300

compared with 52.17% in boys and underestimation of 47.83% in boys as against 42.96% in girls. These over and underestimations were however not statistically significant. A Norwegian study[7], found that both sexes were more advanced in dental maturity except in the 8.5 years old girls. In that study still, the largest discrepancy between estimated age and chronological age was observed amongst girls in the 12-year age group. Similar studies undertaken by Moness Ali et al[8] on Egyptian children, Prabhakar et al[9] on Indian children in Davangere, as well as a comparative study by Davidson et al[10] on Somali and White Caucasian children living in Sheffield recognized an overestimation using the Demirjian method. Likewise, results observed in studies on children from Western China[11], Turkey[12] and of Dutch origin[13] indicated advanced dental age. A recommendation to adapt an applicable correction factor to different population types and ethnicity was advanced when using the Demirjian method. However, studies on Kuwaiti[14] and Hungarian[15] children reported delayed dental maturation and age relative to CA. In a study to compare the Demirjian and Willem's methods for age assessments, Essan et al[16] working on a Black Southern African population noted a significant overestimation of age with the former in both male and females. Still in a meta-analysis study by Essan et al[17] comparing different populations using the two assessment methods, significant overestimation was noted in the males 3-15 years and 4-16 years female brackets by the Demirjian methodology. The conclusion in this study was that whereas Willems method provided a more accurate estimate of CA, Demirjian method had a broad application in terms of determining dental maturity scores. Two important conclusions to be derived from this meta-analysis are that for end results dependent on dental maturity as in orthodontic decision-making, Demirjian may be preferable and for higher accuracy chronological age estimation, population-specific correction factor need be applied.

Our study was designed to calculate the correction factor applicable to Ghanaian children and adolescents. This is the first such study from Ghana. The sample population employed from Accra, is representative of the Ghanaian population due to its cosmopolitan nature. A bias however would exit based on socio-economic stratification and health behavioural pattern. Unlike in the higher socio-economic group that would tend to attend the Dental School clinic for regular dental care, the lower social group would prefer to go to the government general hospital clinics mainly for acute care.

A strong correlation was exhibited between chronological and dental age and even more so between factor-corrected and chronological age. Both the overestimations in this study as compared to the Demirjian and the underestimations observed were statistically insignificant. Across the spectrum for boys, from above 15 years, dental maturity scores were above the upper limit of the Demirjian chart readings for 18 years. This may be interpreted as a period of accelerated dental maturity or growth spurt in boys. The pattern shown in girls after 15 years is however that of a dip and underestimation by both Demirjian and factor-corrected estimates but still remain within limits of statistical insignificance. This may be indicative of slowing of growth spurt or dental maturation for girls above 15 years of age. Our observation on boys above 16 years was not reported on in the original Dermirjian method which was designed for children and adolescents of up to 18 years globally. This raises the question of an additional age limitation on the applicability of the Demirjian methodology on our study population probably as a result of variability in population-type.

Compared with similar studies done in sub-saharan Africa by Rizig et al[18] in Sudanese children from Darfur, Demirjian underestimated the mean ages by .70 years in males and 1.42 in females. This under-estimation significantly manifested in the age group of 10-11 and 9-10 in males and females respectively. In the study conducted in Cotonou, Benin by Bigot et al[19] there was an overestimation of .68 years in boys and 1.07 in girls using the Demirjian method and it remained stable for between 3 – 15 years for both gender. A correction factor was subsequently applied. For a study population of Kenyan children using the Willem's method however (Kihara et al, 2017)[20] a statistically significant over-estimation was reported in boys but not in girls. In that study, it was however concluded that the overestimation was well within the ranges found in other populations and also applicable for estimation in the study population. From the review so far, the general conclusion is that the Demirjian method is accepted as a standard for age-estimation. However, for even population groups of similar origins as in sub-saharan Africa, there can arise unpredictable differences as noted with the study in Darfur[18.] Research methodology variations, ethnicities and still subtle environmental factors may account for these observations and hence the need for individual population-based correction factor estimations.

Socially in Ghana, age estimation services are needed in cases of child labour and trafficking after these children are rescued and being rehabilitated back into society. Deployment for purposes of age corroboration in sports and critically for differentiating between participants for age-limiting events pegged at below or above 18 years remain highly desirable services. For this study, age estimation by the Demirjian method closely matched the chronological age. The overestimation and underestimation profiles were not statistically significant. The factor-predicted estimates however more closely matched the chronological age profile and highly recommended. The Demirjian method was not applicable to boys above 16 years due to dental maturity scores far above the dental age chart. It is recommended that more studies be conducted for 15 to 18 years boys' group to test this observation. Other large city population studies in Ghana are needed to test the

  doi: 10.60014/pmjg.v12i2.300

validity and applicability of the predicted correction factor as arrived at in this study nationwide. Summary of limitations in this study includes the socio-economic background of the study population attending our clinics mainly for orthodontic considerations in this age group. They are in the mid-level and above social grouping. Ghana historically has a multi-ethnic population but despite no hinderance to inter-marriage, may still harbour significant ethnic variations as confounding factors.

Conclusion

For this study, age estimation by the Demirjian method closely matched the chronological age. The overestimation and underestimation profiles were not statistically significant. The factor-predicted estimates obtained even more closely matched the chronological age profile and highly recommended. The Demirjian method was not applicable to boys above 16 years due to dental maturity scores far above the dental age chart. It is recommended that more studies be conducted for the 15 to 18 years boys' group to test this observation. Other large city population studies in Ghana are needed to test the validity and applicability of the predicted correction factor as arrived at in this study nationwide.

Declaration

Conflict Of Interest

No author had any conflict-of-interest situation to disclose.

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  doi: 10.60014/pmjg.v12i2.300

EAR, NOSE AND THROAT SPECIALTY AS A FUTURE CAREER PREFERENCE FOR MEDICAL STUDENTS IN NORTHERN GHANA

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Abstract

Objective: There is a limited number of Ear, Nose, and Throat (ENT) specialists in Ghana with only three ENT specialists in Northern Ghana. This study examined the factors that influenced fifth and final year medical students at the University for Development Studies (UDS) preference for ENT specialization.

Methodology: A self-developed semi-structured electronic questionnaire was used to collect data. The study involved a total of 114 medical students.

Results: The majority of the study participants were males (64.9%) and were between the 21-35 age bracket (91.2%) with a mean age of 28.20 ± 8.05. Comparatively, less than 1% and 15.8% of study participants indicated a preference for ENT specialty before and after the ENT clinical rotation respectively. Significant motivating factors for ENT preference included good income ($p < 0.001$), quality of life ($p < 0.001$), work not too demanding ($p=0.030$), personal liking ($p= 0.027$) and having ENT specialist as a role model ($p =0.012$). Having a family relation as a medical doctor was a predictor of ENT specialty preference (OR 0.001, 95 % CI =5.357E-6-0.361: $p=0.020$).

Conclusion: The study demonstrated a very low preference for ENT career specialty among fifth and final year medical students in our setting. However, exposure during ENT clinical rotation greatly influenced their preference for a career in ENT.

Key words: *ENT, Career Preference, Factors, Medical Students, Specialty*

Introduction

The medical profession education in Ghana and other countries is structured in a way that requires medical students to read compulsory courses till their final year where they are expected to branch into one of the several specialties in the medical field after school [1]. Previous studies have maintained that even before some students apply to study in medical schools, they have a preconceived preference for a particular medical specialty [2–5]. Other studies that had attempted to look at the factors that influenced medical students' career preferences in the medical field had indicated that medical school curricula[6–9], quality of life, remuneration[10] and gender[11,12] are factors that would influence their future choice of a specialty in medicine.

It is important to emphasize that medical students' career preferences vary among countries and within countries[13]. As maintained by Abdul-Rahman and colleagues[14], Ghana has an appreciable number of specialists in some areas of the medical practice, with many doctors preferring those specialties over the other ones. This situation tends to affect the medical workforce in some important areas of the healthcare delivery system in Ghana.

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Conflict of Interest: None Declared

Current studies on medical career preferences by medical students for specialties in medical practice in Ghana have been limited to specialties such as anesthesia [14] and family medicine[15]. This demonstrates the low level of attention given to other important specialties in the medical practice including the ENT specialty. This is not surprising as Ghana currently has about 50 ENT specialists with only 2 in Northern Ghana. The growing number of ENT cases in Ghana and especially in the northern parts of Ghana (16,17) has the potential to overwhelm the few ENT specialists currently in Ghana.

Understanding the underlying factors that motivate or demotivate medical students' career preference in ENT could help provide the preliminary information needed to address the low number of ENT specialists in the country, including the northern parts of Ghana. The study examined the factors that influenced fifth and final year medical students at the School of Medicine, University for Development Studies (UDS) preference for ENT medical specialization.

Materials and Methods

Study Setting

The study was conducted at the School of Medicine (SoM), University for Development Studies (UDS). The

doi: 10.60014/pmjg.v12i2.335

University is currently the only public tertiary educational institution in the Northern Region of Ghana that trains medical students.

Study Design

This was a school-based cross-sectional study with a quantitative approach to research, conducted between November 2020 to April 2021.

Study population

The study was conducted among fifth and final year medical students of SoM-UDS, who have completed their clinical rotation in the ENT Department.

Data Collection

An electronic self-designed semi-structured questionnaire was used to survey the study participants. The semi-structured questionnaire was developed based on what has been described elsewhere (18,19). The semi-structured questionnaire was circulated to fifth and final year medical students' class WhatsApp pages. The questionnaire was designed to include socio-demographic data, student's preferences, and factors that might influence their choice of ENT as a future career specialty.

Data analysis and presentation

The data entry and analysis were performed using Microsoft Excel and Statistical Package for Social Science (SPSS) version 25 (Chicago, IBM, 2017). Descriptive statistics such as frequencies, percentages, and tables were used initially to summarize and describe important study characteristics.

A Chi-square test was performed to test the association between ENT preference and motivating and demotivating factors. Multinominal logistic regression models were used to predict factors that influence the preference for ENT specialty among study participants. P-value less than 0.05 was considered statistically significant for the study.

Ethical Approval

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of UDS. Permission to conduct the study were obtained from the Registrar, UDS, and the Dean of SoM. Written informed consent was sought before their recruitment into the study. Participating in this study was strictly voluntary and participants had the liberty to choose to withdraw at any point in time.

Equally, the confidentiality of the study participants was maintained by using codes for the identification of the data instead of using their names. The electronic data have been secured and password protected with only access to only the researchers.

Results

A total of 114 (48.7%) fifth and final-year medical students participated in the study out of 235 students. Their ages ranged from 23 to 56 years with a mean age of 28.20 ± 8.05. Study participants in the 21-35 age bracket constituted the majority (91.2%). Males and participants in their final year constituted the majority with proportions of 64.9% and 60.5% respectively (Table 1).

Table 1. Social Demographic Characteristics

Characteristics	Mean	SD
Age (years)	**28.2**	**8.05**
	N (114)	**(%)**
Age(years)		
21-35	104	91.2
36-50	2	1.8
51-65	8	7.0
Sex		
Female	40	35.1
Male	70	64.9
Course level		
500	45	39.5
600	69	60.5
Marital status		
Married	9	7.9
Single	105	92.1
Nationality		
Ghanaian	111	97.4
Indian	3	2.6
Ethnicity		
Akan	36	31.6
Dagomba	25	21.9
Ewe	11	9.6
Gujarati	3	2.6
Zanbrama	6	5.3
Others	33	28.9

Other Ethnicity Groups: Bimoba, Builsa, Busanga, Dagao, Frafra, Ga, Gonja, Hausa, Kessena, Waala, Moshi, Kusasi, and Sissala

The majority of the study participants (69.3%) had a family history of a healthcare professional with the nursing profession (47.4%) being the most common, followed by the medical profession (19.3%) and other health professionals (13.2%).

Less than 1% of study participants indicated a preference for the ENT specialty before the clinical rotation in ENT. After ENT clinical rotation, approximately 16% of the study participants indicated a preference for the ENT specialty. Major preferences before and after clinical rotations included General Surgery (before 33.3% and after 20.2%), Obstetrics & Gynaecology (before 14.9% and after 12.3%), and Internal Medicine (before 9.6% and after 5.3%) (Table 2).

doi: 10.60014/pmjg.v12i2.335

Table 2. Medical Career Preferences Before and After Clinical Rotations

Specialty	Preference Before Clinical Rotations N (%)	Preference After Clinical Rotations N (%)
Anaesthesia	1 (0.9)	0(0.0)
Dermatology	4 (3.5)	2 (1.8)
Ear, Nose, & Throat*	1(0.9)	18 (15.8)
Emergency Medicine	1 (0.9)	3 (2.6)
Family Medicine	3 (2.6)	3 (2.6)
Internal Medicine	11 (9.6)	6 (5.3)
Obstetrics & Gynaecology	17 (14.9)	14 (12.3)
Ophthalmology	4 (3.5)	11 (9.6)
Orthopaedics	4 (3.5)	3 (2.6)
Paediatrics	2 (1.8)	2 (1.8)
Psychiatry	5 (4.4)	5 (4.4)
Public Health	6 (5.3)	3 (2.6)
Radiology	1 (0.9)	2 (1.8)
General Surgery	38 (33.3)	23 (20.2)
Urology	2 (1.8)	0(0.0)
Undecided	14 (12.3)	19 (16.7)
Total	**100.0(114)**	**100.0(114)**

ENT = Ear, Nose and Throat

Preference for ENT was found to be significant with age (*p=0.001*) and ethnicity (*p=0.038*). However, the majority of participants (87.5%) who were between the ages of 21-35 years had no preference for ENT as a medical specialization. Sex (p= 0.713), marital status (p= 0.176), nationality (p= 0.447), family history of health profession (p= 0.412) and type of health profession (p= 0.653) were not significant for ENT preference.

Good income (p < 0.001), quality of life (p < 0.001), work not too demanding (p= 0.030), personal liking (p= 0.027) and having ENT specialist as a role model (p= 0.012) were significantly associated with preference for ENT specialty. However, prestige of specialty (p= 0.092), curriculum (p=0.321), family and friends influence (p= 0.791) and exposure during ENT clinical rotation (p= 0.304) were not significantly associated with preference for ENT specialty.

The work of ENT specialists as too demanding, was a significant (p =0.035) demotivating factor for choosing ENT as a preferred specialty, whereas ENT still evolving in Ghana (p= 0.432), evolving and not interesting (p= 0.911), complex and difficulty specialty (p= 0.363) and not prestigious (p= 0.343) were not demotivating for choosing ENT as a preferred specialty.

Having a family relation as a medical doctor was a good factor to influence medical students' preference for ENT medical specialty (*p= 0.020*). However, these students are less likely to select ENT medical specialty compared to those without family relations as a medical doctor (OR **0.001**, 95 % CI =**5.357E-6**-**0.361**) (Table 3).

Table 3. Predictors of Ear, Nose & Throat Preference

Characteristics	P-value	Odds Ratio	95% Confidence Interval	
			Lower Bound	Upper Bound
21-35	0.996	5.952E-10	0.000	-
36-50	-	3.005E-10	3.005E-10	3.005E-10
51-65 (R.C)	-	-	-	-
Female	0.076	12.402	0.772	199.305
Male (R.C)	-	-	-	-
Married	0.998	1.782E-8	0.000	-
Single (R.C)	-	-	-	-
Akan	0.966	0.951	0.091	9.951
Dagomba	0.453	0.375	0.029	4.870
Ewe	0.997	9.238E-9	0.000	-
Gujarati	-	13.168	13.168	13.168
Zanbrama	0.967	0.897	0.005	165.588
Others (R.C)	-	-	-	-
FHP No	0.086	0.048	0.001	1.543
Yes (R.C)	-	-	-	-
Medical doctor	**0.020***	0.001	5.357E-6	0.361
Nurse	0.067	0.033	0.001	1.265
Others	0.155	0.043	0.001	3.283
None (R.C)	-	-	-	-
Good income (Yes)	0.554	0.386	0.017	9.022
No (R.C)	-	-	-	-
Quality of life (Yes)	0.157	0.088	0.003	2.549
No (R.C)	-	-	-	-
Work is not too demanding (Yes)	0.270	0.290	0.032	2.622
No (R.C)	.	-	-	-
Exposure during ENT clinical rotation (Yes)	0.879	1.178	0.142	9.748
No (R.C)	-	-	-	-
Family and friends influence (Yes)	0.689	2.490	0.029	215.814
No (R.C)	-	-	-	-
Curriculum (Yes)	0.996	1.303E-9	0.000	-
No (R.C)	-	-	-	-
Prestige of specialty	0.193	0.102	0.003	3.173
No (R.C)	-	-	-	-
Personal liking (Yes)	0.227	4.244	0.407	44.286
No (R.C)	-	-	-	-
ENT specialist as role model (Yes)	0.136	5.828	0.575	59.026
No (R.C)	-	-	-	-

E=Exponent, R.C.=Reference Category, Pseudo R-Square (Cox and Snell=0.399; Nagelkerke; 0.684; McFadden; 0.581)

doi: 10.60014/pmjg.v12i2.335

Medical students who indicated ENT as still evolving in Ghana were about 2.2 times more likely not to prefer to choose ENT as a career specialty compared to those who did not indicate ENT as evolving in Ghana (OR 2.249, 95% CI 0.624-8.101). Similarly, medical students who perceived that ENT was evolving and not interesting were about 2 times not likely to prefer ENT as a career specialty compared to students who did not indicate ENT as evolving and not interesting (OR 2.074, 95%CI 0.547-7.857) (Table 4).

Table 4. Predictors of Ear, Nose, and Throat Demotivating Factors

Preference for ENT	P-value	Odd Ratio	95% Confidence Interval	
			Lower Bound	Upper Bound
Still evolving in Ghana (Yes)	0.215	2.249	0.624	8.101
No (R.C)	-	-	-	-
Evolving and not interesting (Yes)	0.283	2.074	0.547	7.857
No (R.C)	-	-	-	-
Work is too demanding (Yes)	0.082	0.147	0.017	1.272
No (R.C)	-	-	-	-
Complex and difficult specialty	0.085	2.764	0.871	8.775
No (R.C)	-	-	-	-
Does not come with prestige (Yes)	0.411	0.368	0.034	3.981
No (R.C)	-	-	-	-

R.C.=Reference Category, Pseudo R-Square (Cox and Snell=0.080; Nagelkerke; 0.137; McFadden; 0.095)

Discussions

Medical career preferences are important indicators to guide human resource management and planning in healthcare systems and development. Our study presents the maiden findings on factors for ENT preference in a medical school in Northern Ghana.

Majority of our study participants were within the 21-35 age category, similar to a study in Nigeria by Akpayak et al.,[18]. with the majority of students within the age group of 21-30 years. However, the slight variations in the age range might stem from the difference in our age structure combined with the categorizations made. Males constituted the majority in our study, consistent with analogous studies described elsewhere [14,19]. This observation might describe the male-female distribution in SoM-UDS and other medical schools in Ghana.

Most of the study participants had family members who were healthcare workers such as nurses and medical doctors, consistent with a previous study that reported that medical students had relations in the medical or health profession [1].

Previous studies have consistently demonstrated an exceptionally low preference for a career in the ENT specialty[1,18,20,21]. In our study we found out that, before the ENT clinical rotation, only one student indicated a preference for ENT as a medical career specialty. Comparing the findings to the results reported by Khader et al.,[1] among medical students in their second, fourth, and sixth years, ENT preference was low. Only three and two students preferred ENT in years two and six respectively with no student in year four indicating interest in the ENT specialty[1]. The results reported by Akpayak et al.,[18] on medical career preferences showed that not even a single student indicated a preference for the ENT specialty. Similarly, Cleland et al.,[20] study among first and fifth year medical students' career choices showed that none of the students indicated a preference for the ENT specialty. These observations portray a general lack of interest in the ENT specialty among many regions of the world, Ghana not being an exception. Addressing the seeming lack of interest in ENT specialty by medical students will play a critical role in increasing the small number of ENT specialists in the country.

After the ENT clinical rotation, we found that approximately 16% of the study participants indicated a preference for the ENT specialty. This observation is good news, but not surprising since most of them indicated that the exposure during the ENT clinical rotation increased their awareness of the existence of such a specialty and their understanding of it and what it can do for their future growth and mankind in general. Multiple studies have equally reported exposure as a key influencer in medical career preference[1,14]. This finding can be employed by stakeholders, including lecturers in the field of ENT to positively lure more medical students to take ENT as a preferred career specialty.

Our findings further showed that medical students are about 1.2 times more likely to select ENT medical career specialty after being exposed to the specialty. This emphasizes the role of the few ENT specialists and lecturers to build the interest of medical students in the opportunities in ENT. The findings in our study showed significant association among factors that swayed medical students to choose the ENT specialty. These factors included: good income, quality of life, work not too demanding, personal liking, and ENT specialist as a role model. Boyd et al.,[22] reported significant factors including “mentors and role models” , and “salary expectations” to be associated with the selection of medical specialty among medical students. Similarly, Khader et al.,[1] study showed that the factors such as “flexibility of the specialty” , and “anticipated income” as significantly associated with their participants' medical specialty preference. As reported in our study and elsewhere, these elements could be factored into the design of policies to attract medical students to select

  doi: 10.60014/pmjg.v12i2.335

ENT as a medical career specialty. Incentives such as increased allowances, and improvement in conditions of service for improved quality of life could serve a great deal to attract more medical students to the field of ENT. Addressing positively the demotivating factor for medical students' refusal to venture into the ENT specialty such as a demanding workload would equally attract them to specialize in ENT. This factor was also reported in a study by Abdul-Rahman and colleagues[14]. Dispelling the notion that ENT is still evolving in Ghana and also that it is evolving and not interesting will greatly impact students' preference for ENT career specialty. One sure way of achieving this is to introduce a housemanship rotation in ENT to whip up interest in house officers as was done for some selected deprived specialties such as anaesthesia and psychiatry[23]. It is therefore important that all stakeholders in the medical profession education (including the Ministry of Health, Ghana Health Service, Ghana College of Physicians and Surgeons, Teaching Hospitals, Ghana Medical Association and Ghana Medical and Dental Council) find ways to address the human resource challenges in ENT in Ghana. It is recommended that ENT should be included as a six-month rotation option in the curriculum for housemanship training as being done currently for other deprived specialties.

This study considered only one medical school (SoM-UDS), hence generalization among the other medical schools would be difficult.

Conclusion

The study demonstrated a very low preference for ENT medical career specialty among fifth and final year medical students in our setting. However, exposure during ENT clinical rotation greatly influenced the preference for ENT medical career.

Acknowledgments

We wish to acknowledge students who took some time to participate in this study.

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  doi: 10.60014/pmjg.v12i2.335

DETERMINANTS OF INTENTION TO EMIGRATE AMONG FINAL YEAR MEDICAL STUDENTS AND JUNIOR DOCTORS IN GHANA

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Abstract

Objective: Historically, doctors left the shores of Ghana for professional development and greener pastures; however, the institution of Ghana College of Physicians and Surgeons to train postgraduate doctors locally significantly reduced the rate of emigration.

Methodology: A cross-sectional survey-based study of final year medical students of the University of Ghana Medical School, house officers and medical officers working at the Korle Bu Teaching Hospital. Demographic data, Push Factors (poor conditions of service, lack of equipment and facilities, and economic instability) and Pull Factors (better career opportunities, shorter length of training programmes, family or spouse living abroad and improved conditions of service) were collected and analysed.

Results: Of the 189 respondents, 94.18% intended to pursue postgraduate medical education, with greater than half wanting to go outside Ghana due to push factors. The existence of a well-established postgraduate training programme in Ghana, was a consideration that could influence their decision to stay for 24.27% of the participants who wished to emigrate, however for 65.05%, this did not influence their decision. Other factors like the Covid-19 pandemic had no impact on the decision to emigrate among most respondents.

Conclusion: Physician emigration, although dynamic, is not as rife as it was two to three decades ago in Ghana. This study recommends a review of existing policies and strategic planning among all stakeholders to ensure that postgraduate training is locally attractive to stem the possibility of another cycle of brain drain.

Key words: *Emigration, Junior doctors, Ghana, Medical students.*

Introduction

In 2030, the global deficit of healthcare personnel is expected to be 14 million (2.3 million being doctors). Current health worker production and employment patterns will not be sufficient to address the overall shortfall of healthcare workers, with Sub-Saharan Africa expected to be badly affected as it bears 24% of the world's disease burden, but only 3% of the global health workforce[1,2]. In addition, the population has risen dramatically and is faced with a pandemic of non-communicable diseases, existing communicable illnesses, and economic difficulties that impact its health systems through poor funding and infrastructure [2]. Any physician emigration is detrimental.

The "push factors", classified as economic, social, and political, are some of the reasons why doctors leave their country of origin. Importantly, the lack of residency training programs in the country of origin has traditionally been a significant reason for medical graduates to move to developed countries. Between 1985-1994, 60.9% of locally trained physicians in Ghana were lost to migration[3]. "Brain drain" is known to cause scarcity of healthcare workers; weakened healthcare systems; economic loss and waste, with Ghana losing an estimated 415 million US dollars due to physician migration[4]; and endangering the well-being of vulnerable populations [5].

On the other hand, the "pull factors" are strategic interventions and policies put in place by the destination country. Adovor et al. showed that destination countries become 132% more attractive when they implement a point-based system, 124% more appealing when it offers a path to permanent residence, 65% when tax cuts are targeted toward immigrants, 54% when visa restrictions are eased, and 28% when medical diplomas are recognized[6].

A study conducted in 2013 showed that the retention rates of locally trained Ghanaian physicians improved from 54.2% in 1998 to 86.3% in 2008 and 78.5% of the retained doctors were in postgraduate training programmes[7]. The retention of locally trained physicians could be attributed in part to establishing residency training as basic postgraduate medical/surgical training for fully certified medical doctors and dental surgeons in a particular specialty in Ghana. Africa's health workforce growth initiatives have centered on increasing the number of primary care providers, resulting in a higher demand for medical specialists [8]. Since its inception in 2003, the Ghana College of Physicians and Surgeons has produced 1200 graduates at the membership level; 140 of these graduates furthered their training to the fellowship level[9].

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Conflict of Interest: None Declared

doi: 10.60014/pmjg.v12i2.318

The nature of physician emigration is dynamic; therefore, there is a need to review current trends. The purpose of this study was to identify and evaluate the factors that influenced final year students of the University of Ghana Medical School and junior grades of doctors, notably House Officers and Medical Officers, at Korle Bu Teaching Hospital, to emigrate to other countries.

Materials and Methods

This was a cross-sectional, quantitative study that used a well-structured, self-administered questionnaire to collect data. The participants were selected based on convenience sampling. The study was conducted at the University of Ghana Medical School and Korle Bu Teaching Hospital. The study population consisted of final-year medical students, house officers, and medical officers working across different specialties at the Korle Bu Teaching Hospital. The exclusion criterion was Participants who did not provide consent to participate in the study were excluded. Data collected included sociodemographic information, level of training, details about intentions to migrate and the reasons fueling the intentions, whether the participants had considered postgraduate training programme in Ghana, and if they decided to remain in Ghana – reasons for this decision. The data were entered and analyzed using RStudio version 2022.07.0 and Microsoft Excel version 16.72. Descriptive statistics were used for frequency counts and percentages. Ethical approval was obtained from the Community Health Dissertation Review Committee.

Results

A total of 436 participants were targeted for the study using the Yamane formula. Completed questionnaires were received from 189 participants, resulting in a response rate of 43.34% (189/436). Ninety-eight males represented 51.85% of the sample. The number of females who participated in the study was 91, representing 48.15%. Table 1 shows the distribution of final year medical students, house officers and medical officers who participated in the study.

Table 1. Distribution of Final Year Medical Students, House Officers and Medical Officers

Current Level of Training	Frequency (N=189)	Percentage (%)
Final Year Medical Students	134	70.90
House Officers	50	26.5
Medical Officers	5	2.6

Intention to Pursue Post-Graduate Medical Training

The majority of the participants, 178 (94.18%), intended to pursue postgraduate medical training; however, two participants (1.06%) did not intend to pursue postgraduate training, and nine participants (4.76%) were unsure. Fig.1 The most popular choice of specialty reported by 56 participants (29.63%) was general surgery; however, 34 (17.99%) participants were undecided about the specialty they intended to pursue. Table 2.

Table 2. Choice of Specialty

Choice of Specialty	Frequency (N=178)	Percentage (%)
General Surgery	54	30.34
Undecided	27	15.17
Obstetrics and Gynaecology	16	8.99
Internal Medicine	21	11.80
Paediatrics	12	6.74
Anaesthesia	9	5.06
Family Medicine	8	4.49
Ophthalmology	7	3.93
Psychiatry	5	2.81
Ear, Nose and Throat	5	2.81
Community Health	4	2.25
Radiology	3	1.69
Orthopedics	2	1.12
Cardiology	1	0.56
Urology	1	0.56
Maxillofacial Surgery	1	0.56
Dermatology	1	0.56
Public Health	1	0.56

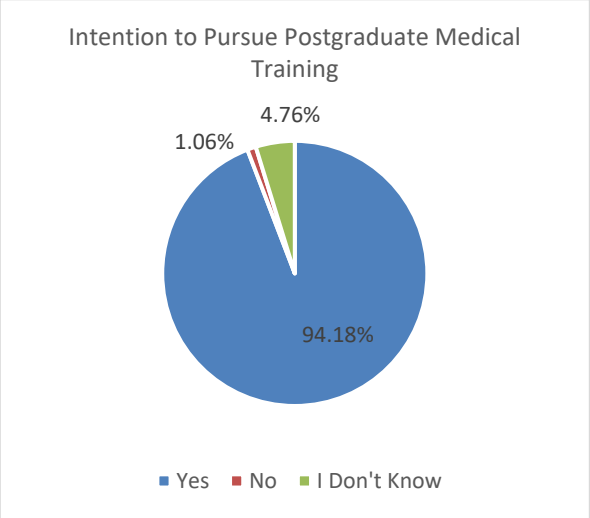

Figure 1 Intention to Pursue Postgraduate Medical Training

The total number of respondents who intended to pursue postgraduate medical training abroad was 103 (57.87%), whereas 49 (27.52%) intended to pursue postgraduate medical training in Ghana. Twenty-six

participants (14.61%) were undecided about where they wished to pursue postgraduate medical education. For those who wished to emigrate, the existence of a well-established postgraduate training program in Ghana was a consideration that could influence their decision to stay in 25 (24.27%) of the participants; however, 67 (65.05%) said that this did not influence their decision and 11 (10.67%) were unsure.

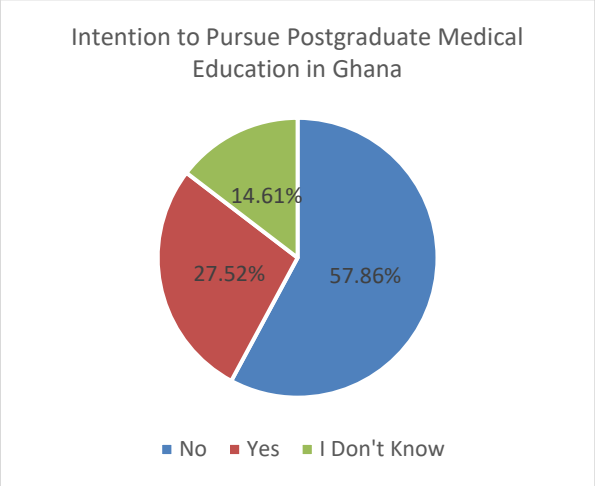

Figure 2 Intention to Pursue Postgraduate Medical Education in Ghana

Of the 103 participants who intended to emigrate, 54 (52.43%) planned to emigrate to the United States of America and 21 (20.39%) intended to emigrate to the United Kingdom. Table 3.

Table 3. Country of Choice for participants who Intend to Emigrate (N=103)

Country of Choice	Frequency(N=103)	Percentage (%)
United States of America	54	52.43
United Kingdom	21	20.39
Canada	11	10.68
Australia	3	2.91
Germany	9	8.74
France	1	0.97
Netherlands	1	0.97
I Don't Know Yet	2	1.94
Anywhere Outside Ghana/Africa	1	0.97

Finally, of the 103 participants who intended to emigrate, 58 (56.31%) had intentions to return, 18 (17.48%) did not intend to return, and 28 (26.21%) were unsure about their intention to return to Ghana.

Push and Pull Factors

Multiple factors were stated as reasons for the intention to emigrate among the participants. These included better career opportunities (90.48%), better equipment and facilities (86.67%), and improved service conditions (87.62%). Other factors were shorter length of training programmes, family/spouse living abroad, and financial remuneration. Fig.3

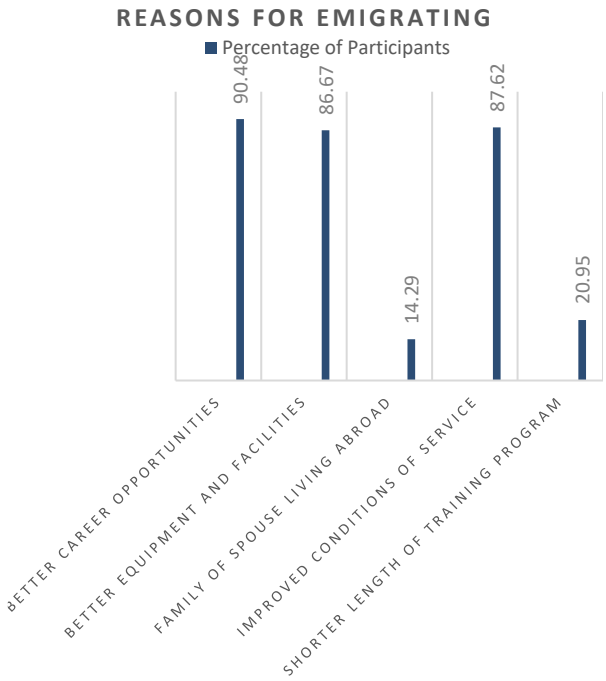

Figure 3 Reason for Emigrating

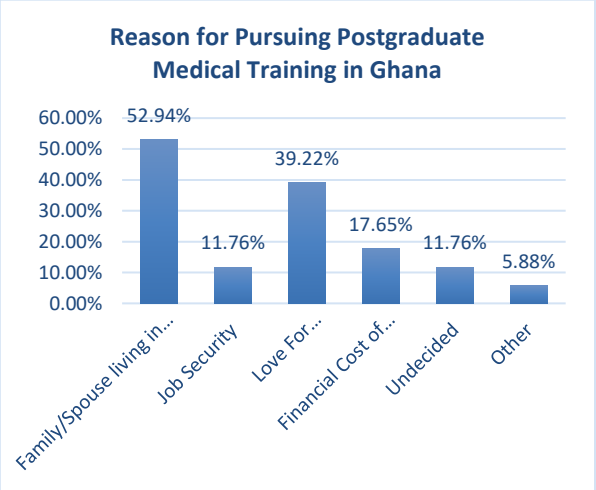

Figure. 4 Reasons for Pursuing Postgraduate medical training in Ghana

doi: 10.60014/pmjg.v12i2.318

Reasons for Staying

For the participants who intended to stay in Ghana, 27 (52.94%) sited family/spouse living in Ghana as a reason for pursuing postgraduate education in Ghana; for 12 (23.53%), it was the sole reason for choosing to pursue postgraduate medical training in Ghana. This was followed closely by respondents who enjoyed living in Ghana and were patriotic about their country (39.22%). Fig 4.

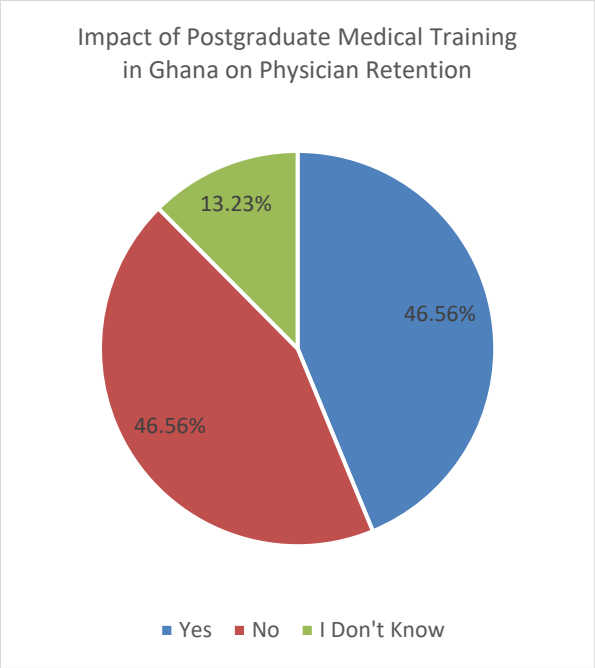

Figure 5 Pie Impact of Postgraduate Medical Training in Ghana on Physician Retention

Of the 189 respondents, 88 (46.56%) clearly stated that the availability of postgraduate medical training in Ghana was not a sufficient reason for them to stay in Ghana; however, 76 (40.21%) said it could influence their decision to stay in Ghana.

The Impact of the Covid-19 Pandemic

Of the 189 participants, 164 (86.77%) said that the Covid-19 Pandemic did not influence their decision to emigrate or stay in Ghana; however, 14 (7.41%) said it had influenced their decision to emigrate. Eleven respondents (5.82%) were undecided.

Discussion

This study shows current trends among final year medical students and junior doctors regarding postgraduate medical training and highlights that a greater majority of the final year students, house officers and medical officers interviewed had intentions to pursue further postgraduate training in various areas of medical specialization. In view of this, the Ghana College of Physicians and Surgeons has been successful in its mandate, alongside the national healthcare plan to increase the number of specialists who will provide improved healthcare across the country.

However, over half of the participants showed clear intent to emigrate, and only 27.52% intended to pursue postgraduate medical training in Ghana. The latter being much lower than 51.7% of participants who indicated that the availability of training programmes was the reason they had decided to stay in Ghana in an earlier study in 2014 [10]. In this current study, the availability of local programmes was not enough to prevent those who wished to leave from pursuing postgraduate training outside Ghana. For those who wished to stay, family or spouse living in Ghana were indicated as the chief reasons.

Ghana may face significant physician shortfalls if the current phenomenon of physician emigration persists. According to current trends, there will be a physician shortage of approximately 7,876 in Ghana by the year 2025[11], which could put significant strain on an already inadequate healthcare system. This study showed that 57.86% of participants intended to emigrate; the key pull factors were noted as better career opportunities, followed closely by improved service conditions and better equipment and facilities. Adeniyi et al in a Nigerian study also showed that 60.1% of doctors starting out early in their careers planned to emigrate with similar reasons for better quality of life followed by better quality of postgraduate training and, finally, better remuneration [12]. Gouda et al showed similar findings among Irish medical students that better career opportunities, working conditions, lifestyle were the main reasons for the intention to emigrate.[13]

The duration of training was also another significant factor influencing the decision to emigrate with shorter training programs abroad, being an attractive pull factor among a fifth of the medical students and doctors. Overall, established postgraduate training programmes, a broader selection of sub-specialty disciplines, the advent of newer investigative and therapeutic interventions coupled with research opportunities, and perceived quality of life make the practice of medicine very attractive in high-income countries.

Over half of the participants indicated a preference to move to the United States of America, which is unsurprising, as the United States of America assimilates majority of the world's physicians.[14] As a country, the United States of America is proactive in reducing deficits in the healthcare workforce to cater to the aging population and aging healthcare workforce through various policies and incentives that make it attractive for International Medical Graduates, who, for example, contribute 41% of primary care doctors [11,12]. Additionally, a common language significantly influences the migration destinations of physicians [17]. As shown in this study, over 80 % of the respondents planned to emigrate to a country with English as the official language, commonly in the United States of America, the United Kingdom, Canada, and Australia.

doi: 10.60014/pmjg.v12i2.318

Arah (2007) concluded that the combination of developed countries with an anglophone-based healthcare system was very attractive to English-speaking African countries such as Ghana[19].

In recent times, the Covid-19 pandemic has had a massive impact on health systems across the world and has strained even the most robust systems and healthcare workforce. As a result, some governments have put in place measures to enhance their response to the pandemic, such as relaxing visa requirements for medical professionals to allow migration. In this study, junior doctors and final year medical students were not generally aware of these policies and thus had no major influence on their decisions.

However, emigration should not only be viewed negatively. Skilled migration has three feedback effects, reflected in brain gain or circulation. Return migrants enhance the local landscape through knowledge sharing of their skills and job experience from abroad, thereby contributing to development.[19] Generally, some doctors who emigrate return to their home countries. This is reflected in the study, which showed that over half of the participants had intentions to emigrate and plans to return at some point in their careers, thus strengthening the notion that they are not lost to the developed world but will contribute to the development of their home country. In a positive light, a recent study in South Africa, showed that 45.4% of physicians who had emigrated returned back to their native country. [20] Though, it is clear that the intention to return does not necessarily result in one returning as the factors and circumstances change, there is still a risk that physicians who intend to return may never return. [21]

This study selected participants at the start of their careers and provided a clear description of intentions for postgraduate medical training held by the final year medical students and junior doctors. It indicates clearly the wish to pursue specialized training, however brings to the fore the shifting norm that majority wish to pursue training abroad. The impact of covid-19 infection on the decision to emigrate is also a new facet that is important in driving migration patterns that has not been studied before. As a limitation, the participants were captured from only one training site in Ghana. A survey covering a wider population would be helpful for obtaining the views of many other medical students and junior doctors.

Conclusion

The emigration of physicians is a dynamic phenomenon. Previously known determinants are still present and remain consistent drivers of physician emigration. The introduction of Postgraduate Medical Training significantly stemmed physician emigration in the past; however, the effect of its existence in preventing locally trained doctors from emigrating may be waning. A review of existing policies and strategic planning among all stakeholders, including the Ministry of Health, Ghana Health Service, Ghana College of Physician and Surgeons, Training Institutions and doctors, must tackle recurring issues and address newer challenges, such as the length of training, as an exodus of doctors and brain drain may be upon us again. Local governments must create a receptive environment that encourages doctors trained abroad to return home.

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doi: 10.60014/pmjg.v12i2.318

KNOWLEDGE, ATTITUDES AND PRACTICES OF PAEDIATRICIANS ON THE MANAGEMENT OF CHILDHOOD EYE DISEASES IN GHANA

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Abstract

Objective: To explore the knowledge, attitudes and practices of paediatricians on the management of eye diseases among children in Ghana.

Methodology: This was a mixed model study, both quantitative and qualitative methods were employed among paediatricians practicing in hospitals across Ghana who consented to the study. Consecutive sampling was used to select participants. Self-administered, semi-structured questionnaires, in-depth interviews and focused group discussions were used to collect relevant data. Analysis was carried out with STATA version 14.

Results: More than half (53, 60.2%) of Paediatricians practicing in Ghana had good knowledge of childhood eye diseases. Although almost all (89, 98.9%) paediatricians disagreed with the statement that 'eye examination in children should be done only when the caregiver complains' and a majority (79, 87.8%) of paediatricians responded "yes" to the question 'do you do eye examination in children?', fifty four (59.3%) indicated that in practice they only examined a child's eye when the caregiver reports that the child has an eye problem, and only 24 (26.4%) indicated it was a routine part of every child's examination in their practice. In addition, all paediatricians disagreed with the statement that 'eye examination in children can only be done by an eye care worker'. These assertions were clarified during the in-depth interviews and focused group discussions where paediatricians conceded that only general inspection of the eyes is done when examining the eyes of children.

Conclusion: Paediatricians had satisfactory knowledge and good attitude towards childhood eye diseases. However, their practices regarding childhood eye disease management were poor.

Key words: *Attitude, Childhood Eye Disease, Knowledge, Practice, Pediatricians*

Introduction

Globally, childhood eye diseases constitute a momentous foundation for future visual morbidities. Potentially, a large portion can be prevented and/or cured when detected early. This is critical as visual indispositions have an impact in all domains of a child's development.[1–3] A paediatrician's day-to-day work encompasses treating children with all kinds of maladies including those that affect the visual system.[2] Early management of visual morbidities among children is imperative to circumvent irremediable conditions such as amblyopia.[2,4] To this end, timely diagnosis and management is critical and thus, obliges all medical professionals taking care of children to be abreast with the recommendations on screening for visual disorders among children set forth by the American Academies of Paediatrics and Ophthalmology and the American Associations for Pediatric Ophthalmology & Strabismus and of Certified Orthoptists.[2,3,5–7]

Timely recognition and management of childhood eye diseases by paediatricians is crucial to forestall visual loss which might be irreversible even with the best of treatment as in the case of amblyopia.[2,3] There is paucity of information on this despite the central role paediatricians play in this field. Studies in India[8] brought to the fore some shortcomings on the part of paediatricians with regards to routine visual system screening for visual disorders. paediatricians' understanding and assertiveness of visual disorders in children were by and large satisfactory, nevertheless, multi-disciplinary management of these challenges with ophthalmologists was deficient as reported in Jordan.[9]

A study done in Kenya reported that paediatricians' awareness of children with visual challenges was inadequate. Nonetheless, their practice and assertiveness were appropriate.[10] Ethiopian paediatricians' assertiveness were reported as constructive. However, their understanding was frequently low and their practice deficient.[11] Our research aimed to examine the Ghanaian paediatricians' role in early detection of childhood visual morbidities and to ascertain their knowledge, attitude and practices regarding management of childhood eye diseases which may delay discovery and referral of visual morbidities to the ophthalmologist.

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Conflict of Interest: None Declared

Materials and Methods

This study was a cross-sectional, mixed model design. We performed both quantitative and qualitative methods of investigation among paediatricians

doi: 10.60014/pmjg.v12i2.334

practicing in public and private hospitals and clinics in Ghana. Paediatrician in this study is a medical practitioner with at least, specialist training/ postgraduate qualification in paediatrics to the level of Membership and above from the Ghana College of Physicians and Surgeons or its equivalent and is registered with the Ghana Medical and Dental Council as a Member/Specialist and above.

The email addresses and telephone numbers of paediatricians working in Ghana were retrieved and contacted. The study team visited the facilities where the paediatricians contacted were practicing to collect data from 6th December 2018 to 30th July 2020 across the country. Data was also collected at the Paediatric Society of Ghana (PSG) Annual General Scientific Meeting (AGSM) in Kumasi 2019, Komfo Anokye Teaching Hospital, Directorate of Child Health (KATH, DCH) Paediatric Conference 2019 and at the Korle Bu Teaching Hospital, Directorate of Child Health (KBTH DCH) Morning meetings. All practicing paediatricians that consented were included. However, paediatricians who were no longer in active practice were excluded. Data collection was done in three phases: a self-administered questionnaire, an in-depth interview (IDI) and focused group discussion (FGD). The first section of the questionnaires probed the demographic characteristics of paediatricians. Secondly, level of knowledge on some common eye diseases including their symptoms, signs and management was explored. The third part of the questionnaire investigated paediatricians' attitudes towards eye diseases. Finally, the questionnaires ended with interrogations into paediatricians' practice with regards to childhood eye morbidities.

IDI and FGD were done following the administration, completion and collection of responses to all questionnaires. Participants for the IDI were selected by consecutive sampling. The interviews were one-on-one between an investigator and a participant and questions bordered on eight structured open-ended questions based on knowledge, attitude and practice of the participant with regards to common eye diseases. IDIs were halted at the 24th consecutive participant as there was no new information forthcoming, a stage of data saturation or a saturation point after the first 16 consecutive IDI. This was based on a study conducted by Hennink et al on 'code saturation versus meaning saturation: how many interviews are enough'[12]. The FGD involved groups of six participants in three sessions conducted at the KATH Paediatrics Conference in 2019. We selected the participants by convenience sampling based on their availability and willingness to participate. The discussion was based on the same questions used for the IDIs. The investigators participated in the focus group discussions as the moderators. The IDIs and FGDs were done to further explore the practitioners' knowledge, attitudes and practices with respect to ocular morbidities in children they attend to. Questions in the questionnaires left unanswered were addressed at this stage. The discussions were captured on a tape recorder.

Ethical Approval

Ethical authorization for this research was acquired from the Ghana Health Service Ethical Review Committee (GHS-ERC 006/05/2018) and the Korle Bu Teaching Hospital Scientific and Technical Committee (KBTH-IRB/000102/2019). The study followed the Declaration of Helsinki (DoH) set of ethical principles.

Data analysis

Microsoft excel data base was used to compile and clean up the data. The evolving sets of information was used to code responses received for open-ended questions. A mark of one was assigned to accurate answers and zero to wrong answers to questions on knowledge of common eye diseases. Aggregated marks were converted into percentages and catalogued into level of knowledge: 80 – 100%; 60- 79% and <60%, as "Good"; "Moderate" and "Poor", respectively as per the Original Bloom's cut off points.[10,13] "Satisfactory knowledge" was a sum of good and moderate. STATA version 14 was used to analyze the data. A p-value of less than 0.05 was statistically significant at 95% confidence level. Conceptualization, coding, and categorization of qualitative data were done during and following administration of questionnaires. The IDIs, FGDs and other qualitative data obtained were reviewed and explored to create initial codes. The codes were reviewed and revised or combined into themes, which were presented in a cohesive manner. Patterns and relationships were identified and linked to the research aims and objectives.

Results

Ninety (90) paediatricians participated in this study. The median age was 36.5 (IQR= 34 – 41) years. The M:F = 1:2.9. The median duration of practice was 36 (IQR= 12 – 84) months. The probabilities of eye examination in children presenting to paediatricians practicing in Ghana was not related to age, gender, nature of practice and/or duration of practice as shown in Table 1, which demonstrates the background characteristics of paediatricians practicing in Ghana. The sum of knowledge on paediatric eye condition by the Bloom's cut-off points among participants was as follows: Fifty-three (60.2%) scored 80 – 100 % representing Good Knowledge; 33 (37.5%) scored 60 – 79% representing Moderate Knowledge and two (2.3%) scored below 60% representing Poor Knowledge. The average Bloom's score in this study was 79.0% (SD=9.1%). Almost all (86, 97.7%) paediatiricans practicing in Ghana had satisfactory knowledge of paediatric eye diseases, which is defined as the sum of good and moderate knowledge. The knowledge of paediatricians on selected paediatric eye conditions was generally impressive. All participants answered yes to the question 'is retinoblastoma treatable?'

  doi: 10.60014/pmjg.v12i2.334

Table 1: Background characteristics of paediatricians practicing in Ghana.

Characteristics		Performs Eye Examination in Children		
		No	Yes	
	N	n (%)	n (%)	χ^2 (p-value)
All Participants	90	11 (12.2)	79 (87.8)	
Gender				
Male	23	1 (4.4)	22 (94.7)	1.786 (0.181)
Female	67	10 (14.9)	57 (85.1)	
Age (in years)				
30 – 35	41	7 (18.9)	34 (82.9)	1.71 (0.429)
36 – 40	21	2 (9.5)	19 (90.5)	
Above 40	28	2 (10.0)	26 (92.9)	
Nature of Practice				
CHAG*	4	1 (25.0)	3 (75.0)	0.895 (0.639)
Private	2	0 (0)	2 (100.0)	
Public	84	10 (12.9)	74 (88.1)	
Years of Paediatric Practice				
Less one year	17	3 (17.7)	14 (82.4)	0.690 (0.875)
1 – 5 years	42	5 (11.9)	37 (88.1)	
5 – 10 years	19	2 (10.5)	17 (89.5)	
More than 10 years	12	1 (10.0)	11 (91.7)	

CHAG* - Christian Health Association of Ghana (faith-based mission hospitals)

Table 2: Multiple response analysis of response to knowledge of selected paediatric eye conditions

Eye condition (N=78)	Frequency	*Percent of Responses	#Percent of cases
Causes of Leucocoria			
No response/ don't know (n=0)			
Responded (n=90)	N=212		
Retinoblastoma	84	39.6	93.6
Cataract	79	37.3	87.8
ROP	24	11.3	26.7
Toxocariasis	2	0.9	2.2
Coat Disease	2	0.9	2.2
Others	21	9.9	23.3
Signs of Retinoblastoma			
No response/Don't know (n=4)			
Responded (n=86)	N=186		
White reflex	78	41.9	90.7
Proptosis/swelling	46	24.7	53.5
Poor Vision	5	2.7	5.8
Squint	43	23.1	50.0
Red eye	14	7.5	16.3
Systemic illness in children associated with congenital cataract			
No response/Don't know (n=9)			
Responded (n=81)	N=171		
Congenital Rubella syndrome	66	38.6	81.5
Toxoplasmosis	28	16.4	34.6
Cytomegalovirus	24	14.0	29.6
Galactosaemia	17	9.4	21.0
Diabetes	7	4.1	8.6
Other Metabolic Disorders	5	2.9	6.2
Down syndrome	2	1.2	2.5
Others	22	12.9	27.2
Risk factors for Retinopathy of Prematurity			
No response/Don't know (n=11)			
Responded (n=79)	N=153		
Prematurity	70	45.8	88.6
Prolonged high Oxygen exposure	71	46.4	89.9
Low birth weight	11	7.2	13.9
Others	1	0.7	1.3
Signs and Symptoms of Congenital Glaucoma			
No response/Don't know (n=32)			
Responded (n=58)	N=103		
Big Eye	31	30.1	53.5
Poor vision	6	5.8	10.3

doi: 10.60014/pmjg.v12i2.334

Cloudy Cornea	19	18.5	32.8
Excess tearing	19	18.5	32.8
Photophobia	7	6.8	12.1
Red eye	15	14.6	25.9
Blepharospasm	1	1.0	1.7
Others	5	4.9	8.6
Causes of Painful Red eye			
No response/Don't know (n=7)			
Responded (n=83)	N=174		
Trauma	44	25.3	53.0
Conjunctivitis (unspecified)	47	27.0	56.6
Allergy	9	5.2	10.8
Infection (unspecified)	26	14.9	31.3
Chemical	2	1.2	2.4
Glaucoma	9	5.2	10.8
Foreign body	9	5.2	10.8
Keratitis	5	2.9	6.0
Uveitis	10	5.8	12.1
Corneal ulcers	4	2.3	4.8
Retinoblastoma	9	5.2	10.8

***Percent of Responses:** express these counts relative to the total number of times that each question was answered.
[#]**Percent of cases:** reports the percent of respondents who answered yes to each option in the question.

Table 3: Practice of paediatricians with regards to childhood eye disease management

Practice	N (%)
Do you do eye examination in children?	
No	11 (12.2)
Yes	79 (87.8)
If Yes, how often/ when do you do eye examination?	**(n=78 responded, multiple responses analysed 91)**
When caregiver reports child has eye problem	54 (59.3)
At every MCH/FP visit	2 (2.2)
As a routine part of every child's examination	24 (26.4)
Others	11 (12.1)
Which tests do you do	**(n=61 responded; multiple responses analysed 83)**
Pupillary Light reflex	42(50.6]
Visual Acuity	15(18.1)
Funduscopy	9 (10.8)
Eye movement Examination	15 (18.1)
Other Physical examination of Eye	2 (2.4)
Reasons for not doing eye examinations	**(n=14 responded; multiple responses analysed 20)**
Don't have enough time	1 (5.0)
No equipment	11 (55.0)
Don't know how to	4 (20.0)
children uncooperative	4 (20.0)
How do you manage children with painful red eye?	**(n=90 responded; multiple responses analysed 98)**
Refer immediately to eye care worker	33 (33.7)
Give eye drops	5 (5.1)
Give eye drops and refer immediately to eye care worker	10 (10.2)
Give eye drops and refer if no improvement	45 (45.9)
Other	5 (5.1)
How do you manage a child with white pupillary reflex?	
Refer to eye care worker immediately	85 (95.5)
Follow up and refer if it doesn't resolve	1 (1.1)
Other	3 (3.4)
How do you manage children with squints?	
Refer to eye care worker immediately	84 (93.3)
Follow up and refer if it doesn't resolve	5 (5.6)
Other	1 (1.1)
What do you do with children who you suspect might be at risk of ROP?	
Refer to eye care worker immediately	75 (93.8)
Correct Oxygen therapy	4 (5.0)
Funduscoy	1 (1.3)
How do you manage children with ophthalmia neonatorum?	**(n=88 responded; multiple responses analysed 119)**
Refer to eye care worker immediately	6 (5.0)
Thorough irrigation of the eye	39 (32.8)
Give eye drops	32 (26.9)
Give eye drops and refer immediately to eye care worker	25 (21.0)
Give eye drops and refer if no improvement	17 (14.3)

doi: 10.60014/pmjg.v12i2.334

How do you manage children you suspect have glaucoma?	
Refer to eye care worker immediately	88 (100)

Table 4: Logistic Regression evaluating the sociodemographic characteristics of paediatricians versus understanding of visual morbidities in children.

Characteristics	Odds Ratio	95% Confidence interval
Gender		
Male	1.3	0.5 – 3.5
Female	ref	
Age (in years)		
30 - 35	1.3	0.5 – 3.5
36 - 40	0.6	0.2 – 1.8
Above 40	ref	
Nature of Practice		
All others	ref	
Public	8.6	1.0 – 77.7
Years of Paediatric Practice		
Less one year	1.4	0.3 – 6.3
1 – 5 years	1.9	0.5 – 6.8
5 – 10 years	1.4	0.3 – 5.9
More than 10 years	ref	
Performs Eye Examinations		
Yes	ref	
No	1.2	0.3 – 4.4

On the question 'when should a child with congenital cataract be referred to an eye care worker?' virtually all (89, 98.9%) participants indicated immediately. Sixty-eight (77.3%) participants indicated that retinopathy of prematurity is treatable. However, 10 (11.4%) indicated that it was not treatable whilst another 10 (11.4%) indicated they did not know if it was treatable or not. Whilst 77 (85.6%) participants knew that congenital glaucoma was treatable, 13 (14.4%) did not know.

Though all paediatricians knew children could get refractive errors, only 27 (30%) indicated that it could be detected by refraction. Eighty-seven (96.7%) participants did not know that squints are treatable, only three (3.3%) knew they are treatable. Eighty-eight (97.8%) participants knew that ophthalmia neonatorum is preventable whilst two (2.2%) did not know. **Table 2** shows the multiple response analysis of responses to knowledge of selected paediatric eye conditions among paediatricians practicing in Ghana.

The attitude of paediatricians to childhood visual morbidities was generally exceptional as detailed below. Virtually all (89, 98.9%) participants disagreed with the statement that 'eye examination in children should be done only when the caregiver complains'. Only one (1.1%) did not now. All participants disagreed with the statement that 'eye examination in children can only be done by an eye care worker'. However, they all agreed that 'children with white pupillary reflex should be reviewed by an eye care worker'. Though 68 (79.1%) participants agreed with the statement that 'you can adequately inform caregivers on the consequences of squints in children', 10 (11.6%) disagreed and eight (9.3%) did not know. Eighty-two (91.1%) participants agreed that 'children can use spectacles effectively' however, three (3.3%) disagreed and five (5.6%) did not know. Whilst 56 (62.2%) participants agreed with the statement that 'congenital glaucoma is an important issue in your paediatric practice', 22 (24.4%) disagreed and 12 (13.3%) did not know. Sixty-three (70.0%) participants agreed with the statement that 'your training adequately equips you to diagnose, manage and refer children with eye diseases' whist 25 (27.8%) disagreed and two (2.2%) did not know. All participants agreed that 'children with cataracts require a thorough systemic review by the paediatrician' and that 'eye examination by a paediatrician could help in early detection of retinoblastoma'. Thirty-five (39.7%) participants agreed with the statement that 'retinopathy of prematurity is a big problem in your practice', however, 28 (31.8%) disagreed and 25 (28.4%) did not know. Whilst 87 (96.7%) participants agreed with the statement that 'good antenatal and immediate postnatal care can help reduce the burden of ophthalmia neonatorum', three (3.3%) did not know. Table 3 demonstrates the practice of paediatricians with regards to eye disease management in Ghana. There was no statically significant association between good knowledge on childhood eye disease, sociodemographic characteristics (age, gender, and nature of practice and duration of practice) and the chances of eye examination in children presenting to paediatricians practicing in Ghana as demonstrated in Table 4.

IDIs and FGDs with regards to knowledge of childhood eye diseases.

In response to the question, 'It has been shown that many paediatricians do not recognize children with poor vision. Why do you think so?' Paediatricians' responses were as follows; 'poor history taking techniques, lack of routine eye tests and limited ophthalmology rotation during medical school and paediatric residency training may be a reason'. Paeditricans also mentioned that lack of routine eye examination could be a culprit, thus, 'If patient or caregiver do not complain you do not bother examining the eyes', and that 'you do not go looking for

  doi: 10.60014/pmjg.v12i2.334

something if you do not know about it'. All paediatricians responded, 'yes' to the interrogation 'in your facility, do you know where you can refer children with poor vision?' Paediatricians reiterated that 'Almost all patients with eye complaints are referred to the eye clinic.'

IDIs and FGDs with regards to attitude of paediatricians towards childhood eye diseases.

In response to the question, 'What are some of your beliefs towards eye diseases in children?' Paediatricians practicing in Ghana thought that 'attention is not given to eye care in Ghana', and that there is 'no focus on eye care in Ghana'. They also indicated that 'medical school training and paediatric residency training in ophthalmology were very inadequate'. Paediatricians attested to the fact that 'Early detection and diagnosis of eye disease is crucial and that prognosis is good if detected early, but eye diseases are not being picked up as they should,' and that 'Newborn eye examination should be a routine, all doctors, especially paediatricians should be able to examine the eyes properly and this should be a priority in medical school and paediatric residency training.'

IDIs and FGDs on practices of Paediatricians regarding childhood eye disease management.

All Paediatricians responded 'yes' to the questions; 'Have you ever had a child with eye disease? 'and 'Have you ever examined the eyes of children?' They however, conceded that 'only inspection is done when examining the eyes of children' and that 'Though pallor and jaundice of the conjunctiva is examined routinely', 'detailed eye examination is not done'. 'Not even pupillary reactions are checked for routinely,' 'No red reflex and/or ophthalmoscopy is routinely done during the examination of the eyes of children.' In response to the question, 'Why don't you examine the eyes of children?' Paediatricians responded that they 'lack expertise,' and have 'no time and equipment to examine the eyes of children', and 'would rather refer to an eye health care provider'. When asked; 'What are some of the reasons that make examining the eyes of children unpopular among paediatricians?' Paediatricians indicated that children's eye examination is 'Generally not a routine' and that 'Children do not cooperate for their eyes to be examined as some children refuse to open their eyes'. The situation is aggravated by the fact that most of them indicated that 'they do not have the expertise, time and equipment needed for proper eye examination of children at the clinics and wards. The IDIs and FGDs revealed the following, which filled in the cracks in some questions avoided by paediatricians in the self –administered questionnaires. In response to the question, 'what are some of the reasons that make examining the eyes of children unpopular among paediatricians?' paeditricians responded: 'lack expertise' 'no equipment', 'no time,' and 'children do not cooperate for their eyes to be examined as some children refuse to open their eyes'. Other responses were: 'you have to go an extra mile to even check vision as it was generally not a routine'; 'Visual acuity is not checked in routine paediatric examination, not to talk of checking for red reflex or doing ophthalmoscopy/ fundoscopy.' They further disclosed the following: 'Generally, there is lack of focus on eye examination during residency training in paediatrics.'; 'the use of ophthalmoscope to check for red reflex is done sparingly usually in the newborn due to lack of expertise, equipment and/or time' in their practice; 'If patient or caregiver do not complain you do not bother examining the eyes.'

Discussion

A child under nine years has an immature visual system and is predisposed to developing amblyopia. The visual pathway must be uninterrupted to allow it advance to its full potential and thus visual morbidities in youngsters must be managed properly.[4,14] A paediatrician's daily routine includes managing various illnesses among children including eye conditions and involves the use of validated techniques and effective mechanisms to detect potentially treatable visual system disorders and may subsequently refer to an ophthalmologist for timely diagnosis and treatment to avert a lifetime of ophthalmic morbidity with its attendant unacceptable disability-adjusted life years (DALYs).[2,15–17] In this circumstance, one DALY means one lost year of healthy life owing to visual impairment and/or blindness[16,17]. This study, therefore, set out to evaluate the knowledge, attitudes and practices of Ghanaian paediatricians with regards to the management of visual morbidities among children.

According to the Original Bloom's cut-off point, more than half (53, 60.2%) of paediatricians practicing in Ghana had good knowledge of childhood eye diseases and it is worth noting that almost all (86, 97.7%) had satisfactory knowledge. The average Bloom's cut-off score on knowledge was 79.0% (SD=9.1%), which is categorized as 'moderate knowledge'. In contrast to a similar study done by Wanyama et al. among Kenyan paediatricians, 69.60% exhibited poor knowledge.[10] In addition, studies done in Kenya and Brazil had their averages in the category of 'poor knowledge' with average scores of 54.82% (SD 10.7%) and 58%, respectively.[10,18] It is possible that more emphasis is placed on many more ophthalmic conditions during the training of paediatricians in Ghana, which might be due to improvement of curriculum as compared to the older Brazilian and Kenyan studies. However, an overwhelming 87 (96.7%) paediatricians practicing in Ghana did not know if squint/ strabismus is treatable while 32 (35.56%) either did not know the answer to or did not provide a response to a question on the signs and symptoms of congenital glaucoma. It is worth noting that, early detection of these two conditions in the paediatric patient is critical in order to avert loss of vision and so it is imperative that paediatricians' knowledge on them is adequate.

  doi: 10.60014/pmjg.v12i2.334

The majority (84, 93.6%) of paediatricains in our study cited retinoblastoma as a likely cause of leucocoria. This is consistent with the 90.6% reported by Wanyama et al in Kenya[10] and 83.3% reported by Ababneh et al in Ethiopia.[9] In disparity with a similar study done by Michel et al. in Brazil, only 37% declared retinoblastoma as a likely cause of leucocoria.[18] The credit could be attributed to the general awareness creation activities to promote childhood cancers over-all amidst heightened mass media drive on retinoblastoma in Ghana at a time the country seeks to develop a National Retinoblastoma Data Base. This supposes that more paediatricians will potentially refer affected children for ophthalmic attention. The proportion of respondents who mentioned retinopathy of prematurity (ROP) as a cause of leucocoria was 24 (26.7%). This is relatively higher than the Kenyan study (17.95%), however, it is lower than that of the Brazilian study (37%).[10,18] The Brazilian study was carried out in an urban health system with advanced equipment to cater for premature neonates and perhaps paediatricians as a whole were more likely to encounter children with ROP. Our research which was analogous to that of the Kenyan study was carried out among practicing paediatricians along the length and breadth of the country most of whom were found in settings where there were no advanced and /or modern equipment to support premature infants and accordingly limiting the acquaintance of participants to ROP[10].

Consequentially, with regards to ROP's risk factors, only 11 (13.9%) and 22.8% paediatricians cited low birth weight in Ghana and Kenya, respectively. However, 68 (77.3%) Ghanaian paediatricians said ROP was treatable as compared with 62.8% of Kenyan paediatricians[10] which was commendable. The cardinal trio indicator of congenital glaucoma, namely, photophobia, excessive tears and blepharospasm were mentioned by only 26.3% of paediatricians who responded to this question in our study. This is consistent with that reported by Wanyama et al in which less than a fifth of the respondents mentioned the triad of symptoms.[10] These responses are much lower than those reported by Michel et al. in which more than 48% of respondents stated the trio of symptoms.[18] Nevertheless, acquaintance with the cardinal trio indicator of congenital glaucoma in all the studies was inadequate. One might ascribed these findings to the comparative scarcity of congenital glaucoma, which affects 1 in 10,000 children globally.[19]All paediatricians in this study knew that children could get refractive errors, however, only 27 (30%) indicated that it can be detected by refraction.

This concurs with the Kenyan study which reported that virtually all participants (98.4%) discerned that refractive errors can occur in children. However, merely 19.2% stated how to detect it correctly.[10] In both studies, paediatricians could not correctly state that refractive error can be detected by refraction and this is worrying considering the fact that ametropia is the foremost and needless cause of visual impairment among children worldwide and yet the most easily and cost effectively correctable.[20] Paediatricians demonstrated outstanding awareness about squints as all respondents stated that squints/ strabismus are correctable. Our findings agrees with studies in Kenya and Brazil in which 93.6% and 85% knew that squints are treatable.[10,18] Paediatricians' attitude in this study was generally positive as almost all (89, 98.9%) paediatricians disagreed with the suggested statement that eye examination in children should be done only when the caregiver complains. All the respondents disagreed with the statement that 'eye examination in children can only be done by an eye care worker.' In addition, all respondents agreed that eye examination by paediatricians could aid with timely recognition of retinoblastoma. These findings concurs with Wanwama et al. in which almost all paediatricians (98.4%) interviewed disagreed with these two statements while 99.2% agreed that eye examination by paediatricians could aid with prompt recognition of retinoblastoma.[10] Sixty three (70.0%) of the respondents established that their training was sufficient to identify and refer children with visual indispositions while 68 (79.1%) indicated they could advise caregivers on the imports of squints/ strabismus. Our figures are higher than those reported by Wanyama et al which were 60.8% and 70.4%, respectively[10]. In both studies, there is the need for an avenue to be fashioned out to plug these gaps identified. These indicate an acknowledgement by the respondents of their indispensable role in the management of childhood visual disorders and consequently offers a golden opportunity to seal the cracks found in this study.

Evaluation of paediaricians' practices was encouraging as majority (79, 87.8%) of paediatricians responded suggested they do examine the eyes of children. Nonetheless, in a multiple response with a follow up question 54 (59.3%) said they would examine a child only when the caregiver reported the child had an eye problem, and only 24 (26.4%) would routinely examine the eyes as part of every child's examination. In a similar study in Kenya, 87(69.6%) disclosed performing eye examination in youngsters whilst 43.5% carried it out as a routine and an equivalent proportion examines the eye when the guardian gives information that child has a visual difficulty.[10] These responses in both studies are unsatisfactory. This is because a significant number of visual challenges in children turn to be asymptomatic in the early stages without any discomposure that might draw the custodians and/or paediatricians' attention and stands the chance of being missed in the mist of lack of standard visual examination protocols. In the course of IDIs and FGDs, paediatricians conceded that only inspection is done when examining eyes of children and that though pallor and jaundice of the conjunctiva is examined routinely, detailed eye examination was not done. This was confirmed in a multiple response to the question where 42 (50.6%) participants said they performed pupillary

  doi: 10.60014/pmjg.v12i2.334

light reflex and 15 (18.1%) only visual acuity routinely. Only nine (10.8%) mentioned fundoscopy and none mentioned corneal light reflex, cover test or red reflex test. This is similar to the Kenyan study where tests mentioned included visual acuity (42.5%), fundoscopy (33.3%) and pupillary light reflexes (23.0%).[10] Similar surveys carried out in the United States of America (USA) reported higher proportions ofpaediatricians who examines the eye routinely than in our study as 83% and 75% of participants in that study performed the fundal reflex and the cover test, respectively and approximately 97% of paediatricians indicated that they included a minimum of one element of ocular tests during any routine preschool medical screening among children.[5] These commendable findings might be attributable to the mandatory guiding principles issued by the American Academy of Paediatrics that enjoins all paediatricians to follow during their routine practice in the USA.[2,3,7] In this study, 76 (84.4%) paediatricians did not give reasons for not doing eye examination in children in the self-administered questionnaires. There were only 20 multiple responses to this question. 'No equipment' was mentioned by 11 (55.0%), 'do not know how to' by four (20.0%), 'children uncooperative' by three (15.0%) and 'do not have enough time' by two (10.0%) paediatricians. These responses are analogous to those found by Wanyama et al where 87 (69.6%) avoided the question. The utmost collective explanation for failure to perform visual assessment in children were insufficient time as mentioned by 39.5% whilst 31.6% disclosed that they did not know how to perform eye examination in children.[10] Similar studies in the US, reported hurdles to visual assessment as too time consuming and that children are difficult to examine,[5] a drift that agrees with comparable reports by Terry et al and our findings.[6]

Weakness and strengths of the study

This study did not include an observational component and thus some responses especially on the practice's aspect could not be verified and confirmed. The strength of the study lies in the fact that we conducted IDIs and FGDs, which clarified and interrogated the participants on some of their responses. This was lacking in previous studies.

Conclusion

According to the original Bloom's cut-off point more than half of paeditricians practicing in Ghana had good knowledge of childhood eye diseases and it is worth noting that almost all paediatricians had satisfactory knowledge. Paediatricians practicing in Ghana were found to have good attitude towards childhood eye diseases but their practices were hampered by inadequate clinical skills and lack of ophthalmic equipment.

Recommendation

Residents in paediatrics should rotate through paediatric ophthalmology. Eye examination should be enshrined into the routine general paediatric examination of all children. Basic ophthalmic equipment such as ophthalmoscopes should be made readily available at all paediatric clinics. Further studies should include observational studies to explore reasons for not examining children's eyes routinely.

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  doi: 10.60014/pmjg.v12i2.334

OCCUPATIONAL INJURIES AMONG ROAD CONSTRUCTION WORKERS IN GHANA: BURDEN, MECHANISM AND SEVERITY

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Abstract

Objective: Road construction work involves diverse activities relying on the use of both skilled and unskilled manpower, posing serious risks to workers. This study sought to determine the burden, mechanism and severity of occupational injuries among road construction workers.

Methodology: The study design was institution-based descriptive cross-sectional using a questionnaire with closed- and open-ended questions. From Ashanti, Ahafo and Western North regions, 353 road workers reported on work-related injuries, types of injury, body parts injured, day(s) lost to activity and cause of injury from 27th January, 2020 to 4th March, 2020.

Results: The workers were primarily young (mean age 32.4 years) and male (97.7%). Most (70.2%) workers were contract/casual staff. Nearly 88% experienced injury the past year with 67.5% experiencing multiple injuries. The body parts most affected included waist/low back (29.9%), forearm/palm (18.9%), leg/foot (17.5%), chest (8.9%) and joints (7.1%). Mechanism of injury included slips/trips (18.5%), use of tools/equipment (13.8%) and overexertion during lifting (10.2%). For injury severity, 88.0% of workers had minor injuries, 8.8% moderate and 3.2% severe injuries.

Conclusion: There is high burden of injury among road construction workers in Ghana. Most experienced injury during the past year, with over 4-in-5 having minor injuries. Leading mechanisms were slips/trips, use of tools/equipment and overexertion during lifting. Limitations include biases like memory decay, purposive selection of construction sites and driver over-representation. Hence, recommendations deriving from this study include enforcement of personal protective equipment use, proficiency training in use of tools/equipment and inter-lacing manual handling-related activities with activities that vary worker-postures.

Key words: *Occupational injury, mechanism of injury, road construction workers, injury severity.*

Introduction

Work affords economic and other benefits to workers who may at some point, be faced with a variety of hazards which could predispose them to injury, disease, disability or death. These hazards may be attributable to chemicals, biological agents, physical factors, adverse ergonomic conditions, allergens, a complex network of safety risks and varied psychosocial factors. Occupational accidents and diseases not only cause great pain, suffering and death to victims, but also threaten the lives of other workers and their dependants. The diverse activities of the construction industry make it very dependent on the use of manpower (skilled and unskilled) which makes the issue of health and safety key. Based on the world's statistics, the accident rate in the construction industry is almost three times higher than that of the manufacturing sector.[1] Construction work involves serious occupational risks, such as work at heights (use of scaffolding, gangways and ladders), excavation works (use of explosives, earth moving machines), lifting of materials (use of cranes, hoists) and others which are specific to the sector. Thus, construction is often classified as a high-risk industry as it has historically been plagued with much higher and unacceptable injury rates compared to other industries.[2,3]

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Conflict of Interest: None Declared

About 350 million workers currently work in this industry around the world.[4] In developed countries, approximately 6-10% of the workers are employed in the construction industry and 20-40% of work-related deaths are attributed to this industry.[5] For example, despite the fact that 7.7% of the workers in the United States are employed in the construction industry, 22.2% of work-related mortalities occur in this industry.[6] According to the statistics presented by the Hong Kong Labour department, the highest work-related fatality rate over the past decade has been related to the construction industry so that in 2015, 32.4% of industrial accidents and 79.2% of total work-related deaths occurred in the construction industry.[7] It seems that injuries among

  doi: 10.60014/pmjg.v12i2.338

construction workers happen more frequently in developing countries compared with developed countries.[8] For example, in Turkey, annual work-related accidents have reached the threat level and 400 deaths as well as 400 total disabilities have emerged out of 6,000-9,000 work-related accidents.[9] In Iran, almost 37% of industrial accidents occur in the construction industry, while only 14% of the workers work in this industry [8]. Gebremeskel and Yimer found a high annual prevalence of injury among construction workers in Ethiopia (33%).[10.] The Ghanaian construction industry represents a major economic force as it creates job opportunities for both literates and non-literates in the society.

In the year 2000, the Labour Department of the Ministry of Employment and Labour Relations reported that the construction industry in Ghana accounted for the highest rate of occupational deaths as compared to other industrial sectors, with 56 out of a total of 902 occupational accidents that occurred in construction being fatal.[11,12] A study on building construction workers in Ghana found that the proximal factors (age, sex of worker, income) and distal factors (e.g. work structure, trade specialisation, working hours, job/task location, and monthly off days) were risk factors for occupational injuries among frontline construction workers.[13] In Ghana, the available information is about injuries to workers involved in building construction. However, there is currently no empirical data specific to road construction work-related injuries. In order to address the gap in knowledge, this study sought to determine the burden, mechanism and severity of occupational injuries among road construction workers and body parts affected.

Materials and Method

Methods for this study have been previously reported [14,15] and summarised below.

The Setting

The 18 road construction firms working actively on 19 roads (one firm worked on two different roads) were purposively selected from three middle zone regions of Ghana, namely, Ashanti, Ahafo and Western North for the study. Eight firms were excluded due to having only skeletal (the work camp had closed with no road construction-related activity going on and only the security men and less than five workers were idling about) work crew[3], being on break[3] or did not allow the study to be conducted at all[2].

Profile of Study Participants

At each firm's site, workers working in any of the following crafts were selected: excavation, site supervision, steel bending, masonry, carpentry, welding, driving, automechanics, daily labourership, safety officers, architecture, land surveying, quantity surveying and civil engineering. Every worker in each craft who gave consent was included in the study.

Study Design

The study, which was carried out between 27th January, 2020 and 4th March, 2020 was institution-based cross-sectional.

Sample Size Determination and Sampling Technique

The desired sample size, n, was estimated based on the following assumptions: *Population size*: This refers to the denominator or population from which the sample was drawn. Total number of road construction workers working actively on site in Ghana between January and March, 2020 was approximately 1000 (based on the staff strength of the firms that were busy on site at the time, according to the Ministry of Roads and Highways). Anticipated percentage of workers who have had an injury in the past year: 3% (Based on prior study of occupational injuries in Ghana by Mock *et al.*).[16] *Acceptable margin of error*: 1.5 %. The estimated minimum sample size needed to detect the anticipated proportion at 95% confidence was determined to be 333, using Raosoft (Raosoft Inc., 2004). Overall, 353 road construction workers were studied using structured questionnaire survey.

Data Collection Procedure

All data collected were anonymised without names or identifiers of participants. The data was collected using a semi-structured questionnaire with both closed- and open-ended questions and was administered in either English or Asante Twi (a widely spoken Ghanaian local dialect), depending on the preference of the participants. Part one of the data collection tool consisted of unidentifiable demographic data such as age, sex, education level, marital status, profession/designation, years of experience in the construction sector, status of employment (permanent or casual), shift workers, in-service or on-the-job training received, working hours per day, working days per week and number of projects in which each interviewee had been involved. Part two had questions on burden of injury, comprising any injury sustained in the prior year, pain or discomfort, types of injuries, part of body where injury occurred, cause of injury and day(s) of lost activity. Other questions concerned. Injury here included abrasions, blisters, bruises, splinters, open wounds, open and closed fractures, dislocations, ruptures, tears, penetrating injuries, burns, repetitive strain injuries, lower back and waist pain, crushing injuries and spinal cord injuries. The Open Data Kit (ODK) app and hard copies of the questionnaire were used to collect the data. Information from the hard copies, used at places where internet connectivity was poor, were entered into the ODK app after collection.

Data Quality Assurance

Data collection assistants and field supervisors received three days intensive training by the principal investigator. Data collected were checked for accuracy, completeness and uniformity at the end of each day's activity.

  doi: 10.60014/pmjg.v12i2.338

Data Analysis

Data analysis was done using Stata/SE version16.0. Descriptive statistics such as means, frequency distribution, and percentage were used for a number of variables. Statistical significance was set at $p<0.05$. Relationship of dependent and independent variables was assessed using Chi-square test.

Ethical Approval

The Committee on Human Research, Publications and Ethics (CHRPE) of the Kwame Nkrumah University of Science and Technology, Kumasi – Ghana, approved the study (Ref. CHRPE/AP/510/20). Agencies under the Ministry of Roads and Highways (MRH), namely, Ghana Highway Authority (GHA), Department of Urban Roads (DUR) and Department of Feeder Roads (DFR) as well as construction companies also gave approval for the conduct of the study at the construction sites. Verbal consent was obtained from study participants.

Table 1: Profession, Employment Status, Education and Age (n=353)

Profession	Frequency	Percentage (%)
Labourers	111	31.5
Drivers/Heavy duty equipment operators	55	15.6
Carpenters	41	11.6
Masons	28	7.9
Steel benders	22	6.2
Site supervisors	21	6.0
Civil/Materials engineers	16	4.5
Others	14	4.0
Flagsmen	10	2.8
Surveyor/Surveyor assistants	8	2.3
Mechanic	7	2.0
Safety officers	7	2.0
Concrete mixer operators	6	1.7
Quantity surveyors	4	1.1
Welders	2	0.6
Electrician	1	0.3
Status of Employment		
On contract	155	43.9
Permanent	105	29.8
Casual	93	26.3
Gender		
Male	342	96.9
Female	11	3.1
Education		
JHS/Middle	169	47.9
Secondary / SHS / Technical	100	28.3
Tertiary	38	10.8
No schooling	24	6.8
Primary	22	6.2
Age Distribution		
26 -35	144	40.8
16 - 25	94	26.6
36 -45	72	20.4
46 - 55	36	10.2
≥ 56	7	2.0
Marital Status		
Single	220	62.3
Married	126	35.7
Divorced	7	2

***Work experience, working hours, working days per week, in-service training and number of projects*.**

Results

Characteristics of the study sample

The 353 road construction workers interviewed were aged between 16 and 66 years with the mean, median and modal ages being 32.4, 30.0 and 27.0 years respectively. Majority of the workers were male (96.9%). The leading category of workers was labourers (31.5%) followed by drivers operating trucks and other construction equipment such as excavators, dumpers, bulldozers or pavers (15.6%), carpenters (11.6%) and masons (7.9%). About a third (29.8%) of respondents were permanent staff while the rest (70.2%) were either contract or casual workers. Junior High/Middle School education was the most common education level; 47.9% of the respondents had this level of education. Almost 2 out of 3 workers were unmarried (Table 1). Out of a total of 353 respondents, 51.3% (181) had practiced their trade in the construction sub-sector for more than 5 years, while 13.9% had 1-3 years of experience. About 57% of the respondents had a daily work schedule ranging from 8 to 10 hours and nearly 83% working 6 days per week. Approximately 86% of the respondents had at least one day off-work per week with nearly 80% having been involved in between 1 and 5 construction projects. A little over half (52.4%) of the respondents had ever received training on-the-job (Table 2).

Table 2: Work experience, working hours, working days per week, in-service training and participated number of projects (n=353)

Variable	Frequency	Percentage (%)
Construction Work Experience		
> 5years	181	51.3
< 6 months	65	18.4
1 – 3 years	49	13.9
3 – 5 years	41	11.6
6 months – 1 year	17	4.8
Working Hours		
8 -10	200	56.7
11 - 13	149	42.1
<8	2	0.6
>13	2	0.6
Working Days per Week		
6 days	292	82.7
7 days	45	12.8
< 6 days	16	4.5
In-Service/On-the-Job Training		
Yes	185	52.4
No	168	47.6
Number of Projects Participated		
1 – 5	282	79.9
6 – 10	50	14.2
11 – 15	11	3.1
>16	10	2.8
Day Off Work		
Yes	302	85.5
No	51	14.5

doi: 10.60014/pmjg.v12i2.338

Burden of Injury

Nearly 88% experienced work-related injury. Among those who had been injured, 32.5% sustained single injuries with 67.5% experiencing multiple injuries (i.e., those involving two or more body regions) (Table 3).

Table 3: Burden of Injury

Characteristic	Frequency	Percentage
Injury Sustained/Burden of Injury* (n=352)		
Yes	308	87.5
No	44	12.5
Number of Injuries Sustained (n=308)**		
2	101	32.8
1	100	32.5
3	58	18.8
≥5	32	10.4
4	17	5.5

***missing data = 1**

****More than one injury sustained implies either more than one body part injured during one injury event or multiple injury events or both.**

Injury by mechanism, type, severity and body parts affected.

The mechanism of injury included slips/trips (18.5%), use of tools/equipment (13.8%), overexertion during lifting (10.2%) and hit object on road (8.9%). The "other" category included stress, sitting for long hours, too much work load, standing for long hours, dust inhalation, vibrations from roller, hit by a car door on site, carrying bags of cement, cutting of iron rods, repetitive lifting of materials, stepped on nails, driving for long hours, vibrations from grader, use of grader, hit by hammer, physical abuse, steel bending, concrete mixer prick, hurt by spanner, faulty headpan and poor posture (Table 4).

Lower/upper back musculoskeletal strain constituted the predominant type of injury (41%) followed by repetitive strain injury (21.1%), lacerations/cuts (17%), superficial injury (6%), fracture (3%), among others. The category, "other", included twisted wrist, hit by object, injury from physical abuse by expatriate superiors, injury from iron rods and binding wires, among others. The body parts affected by the injuries included waist/lower back (29.9%), forearm/palm (18.9%), leg/foot (17.5%), chest (8.9%), generalised pain in multiple joints (7.1%), forehead (4.1%), ribs (3.8%), head (1.8), nose (1.8%) and knee (4.7%). The wrist, lips, ear, eye and back constitute the "other" category. The number of working days lost was used as a measure of the injury severity.[15] Out of the 308 injured workers, 88.0% were considered to have had minor injuries (i.e. "no day lost" up to six days of absence from work), 8.8% were moderate (7–29 days of absence from work) and 3.2% were severe (absence from work for more than 30 days) (Table 4).

Table 4: Injury by mechanism, type, severity and body parts affected

Variable*	Frequency	Percentage (%)**
Mechanism of Injury (mentioned 384 times)		
Slips/trips	71	18.5
Use of tools/equipment	53	13.8
Overexertion during lifting	39	10.2
Hit object on road	34	8.9
Road traffic incidents	12	3.1
Fall from ground level	9	2.3
Fall from height	4	1
Others	162	42.2
Type of Injury Sustained (mentioned 596 times)	**Frequency**	**Percentage (%)**
Lower/upper back musculoskeletal strains	242	40.6
Repetitive Strain Injury	126	21.1
Cuts/Laceration	103	17.3
Superficial Injury	34	5.7
Fracture	16	2.7
Open Wound	9	1.5
Hammer Injury	9	1.5
Nail Injury	6	1.0
Other	51	8.6
Body Parts Affected (mentioned 338 times)	**Frequency**	**Percentage (%)**
Waist/lower back	101	29.9
Forearm/Palm/Finger	64	18.9
Leg	59	17.5
Chest	30	8.9
Generalised pain in multiple joints	24	7.1
Forehead	14	4.1
Ribs	13	3.8
Head	6	1.8
Nose	6	1.8
Knee	5	1.5
Other	16	4.7
Severity of Injury***	**Frequency**	**Percentage (%)**
Minor	271	88.0
Moderate	27	8.8
Severe	10	3.2

*** As workers could report multiple injuries arising from multiple injury events, the variables mechanism of injury, type of injury and body parts affected have different numbers of entries.**

****Percentages based on denominator of total number of responses in a given category.**

***** Severity based on outcome of most severe single injury, if more than one injury.**

Discussion

This study sought to determine the proportion of road construction workers who were injured at work in Ghana and the details of those injuries, including mechanism, type and severity. We found that most (88%) of the workers had been injured during the prior year. The leading mechanisms of injury were slips/trips, use of tools/equipment and overexertion during lifting. The main types of injuries sustained were back strains, repetitive strain injury and lacerations. Although most (88%) injuries were minor, a significant number of

  doi: 10.60014/pmjg.v12i2.338

workers (12%) had injuries from which they lost more than a week of work.

A high rate of injuries to road construction workers has been found in other countries. For example, roughly 20,000 construction workers are injured each year in highway and road construction accidents in the United States. Transportation incidents accounted for over 65% roadway worksite fatalities. The US's Census of Fatal Occupational Injuries (CFOI) data indicated that 55% of fatalities occurred within the work zone itself.[18] The scientific literature on road construction worker injuries is fairly limited, but there is more information about injuries among general construction workers, especially injuries during building construction. Wong found that in Hong Kong, 63.1% of construction workers had been involved in one or more injuries at work.[19] Amissah and others found that more than half (57.9%) of Ghanaian housing construction workers had experienced occupational injuries.[13] In Gondar City, Ethiopia, Adane and colleagues found the prevalence of construction injuries to be 38.7%.[20] Even though, these are injuries suffered during housing construction, the proportion of workers sustaining injuries, are smaller than those of road construction workers, pointing to the hazardous nature of the construction industry and the need for pragmatic interventions to reduce the numbers. In the current study, most workers (67.5%) had multiple injuries. In contrast, Wong found in Hong Kong that 80.3% sustained single injuries, while 19.7% had multiple injuries.[19]

The contrast, in terms of higher multiple injuries could be attributed to the poor safety regulation and enforcement in Ghana, a developing country. The leading types of injury in the current study were back strains and repetitive strain injuries, with lacerations being third. In their study in Ghana, Amissah *et al.* found that the type of injuries sustained by building construction workers were open wounds and superficial contusions.[13] The difference in the injury types in Ghana could be due to the dissimilar activities performed by the two construction worker groups, even though, some of them are similar. The leading mechanisms of injury were slips/trips, use of tools/equipment and overexertion during lifting. Yilmaz studied occupational accidents in the general construction sector in Turkey and found that the main causes of accidents were being hit by objects and 'being stung by something'. The most important reason of occupational accidents was 'unsafe behaviours' with a rate of 67%, which was defined as not obeying the rules, although the necessary occupational safety measures were provided.[9] According to Choi *et al.*, the leading causes of fatal occupational injuries in the United States from 2011 to 2015 were falls/slips/trips (36.2%), transportation incidents (28.6%) and contact with objects and equipment (16.0%). Similarly, in other countries, falls were often the leading cause of fatal accidents in construction. For example, falls from heights accounted for 50.4% of construction deaths in South Korea and 53.5% in China.[21]

In the case of the other research, road, housing and other types of construction were involved whereas this current study only involved road construction, which may have accounted for the differences in the mechanisms of injury. Information specific to road construction is more limited. In the United States, between 1995 and 2002, 844 workers were killed while at work at road construction sites. Approximately 93% of the total were male. More than four-fifths (693) of occupational fatalities that occurred were caused by transportation incidents. Most prevalent were workers who were struck by a vehicle or mobile equipment, accounting for approximately 60% (509). Other fatal events of note included highway collisions between vehicles or mobile equipment (10%), being struck by an object (5%) and falls (3%) (US Bureau of Labour Statistics, 2004).[6]

More recently, from the perspective of the US Federal Highway Administration (2010), each year, over 20,000 workers are injured in road construction work zones. Between 2003 and 2008, these injuries were caused by contact with objects or equipment (35%), slips/trips/falls (20%), overexertion (15%), and transportation incidents (12%).[22] The proportion of injured road construction workers in the US is smaller than what was found in this study. This may be as a result of the enforcement of safety regulations such as the use of personal protective equipment, proper housekeeping, safety training for workers and strict sanctions regimes on construction sites, among others, in developed than in developing countries like Ghana.[15,24]

In the current study, the body parts most affected by injury were the waist/lower back, forearm/palm, and leg/foot. In Turkey, Yilmaz found that in the construction sector, eye, finger, foot and hand were the most common body parts affected. The eyes were affected most (14%) by the metal burrs produced as a result of exposure to heat, such as metal cutting and welding processes. The fingers (11%), hands (8%) and face (5%) were mostly effected by frequent use of drilling and cutting tools as against the feet which were mostly affected by falling objects.[9] The differences in activities, environment and worker attitudes may be responsible for the different body parts affected by injuries.

The number of days lost from work was used as a measure of the severity of injury sustained.[17] In the current study, most (88.0%) injuries were minor ("no day lost" up to six days of absence from work), but a significant number (12.0%) resulted in a week or more of lost work time. The UK Labour Force Survey estimated that in construction, there were 61,000 cases of non-fatal work-related injury with 27% resulting in an over seven days absence from work.[23] This high percentage of severe injuries in the UK study may be

  doi: 10.60014/pmjg.v12i2.338

because it was in respect of both building and road construction activities.

The current study is one of the first studies to report injuries for construction workers specific to road construction in sub-Saharan Africa. In one of the few other studies on this topic, Nyende-Byakika reported on road construction injuries in Uganda, showing that 56%-85% of workers (depending on the specific site) had sustained injuries at the current work sites, although a time frame was not given. The leading injuries were lacerations and bruises. The injuries mainly arose during the activities of clearing, grading and drainage.[24] The current study focused on injuries sustained by workers involved in road construction-related activities, which include but not limited to excavation, grading, compaction, steel cutting and bending, carpentry, masonry, civil works, concrete mixing and bituminous surfacing, among others. These numerous activities involved in road construction are hazardous and increase the workers' exposure to injuries, accounting in part for the high injury prevalence, type, mechanism and severity in this current study. The other studies in sub-Saharan Africa either involved only housing construction or both housing and road construction.

For the types of injuries found in the current study, several countermeasures can be considered. First is increased use of personal protective equipment. The effectiveness of personal protective equipment in occupational safety is well documented.[25] It is also notable that one study from Ethiopia reported a high annual prevalence of injury of 32.6% in construction. This was cut in half by both personal protective equipment use and safety training.[10] Second, the second leading mechanism of injury was due to use of tools and equipment. Such injuries could be decreased by proficiency training in the use of these tools and equipment. Third, the leading types of injuries were back strains and repetitive strain injury. Ensuring that worker postures are varied can lower the risk of such injuries, such as ensuring that manual handling activities are interlaced with other activities.

Limitations

This study has some limitations. First, the recall period was one year, and there could be some memory decay or forgetting of injuries that occurred earlier during that period. This memory decay would bias the study to under-estimate the actual burden of injury. Second, construction sites were selected purposively in three middle-belt regions of Ghana. The findings may not be generalisable to other areas of Ghana. Third, drivers were over-represented among workers, in part because on-site supervisors were more likely to release drivers to be interviewed (while waiting to drive or while driving) than other workers.

Conclusion

Most road construction workers in this study had been injured during the prior year. Leading mechanisms were slips/trips, use of tools/equipment and overexertion during lifting. The main types of injuries sustained were back strains, repetitive strain injury and lacerations. A significant number of workers had injuries from which they lost more than a week of work. Possible areas for safety improvement include enforcement of the use personal protective equipment over the body parts most affected, proficiency training in the use of tools/equipment and ensuring that manual handling-related activities are inter-laced with other activities that vary worker postures.

Funding

This study was funded in part, by a grant D43-TW007267 from the Fogarty International Center, US National Institutes of Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the funders.

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  doi: 10.60014/pmjg.v12i2.338

EPIDEMIOLOGY OF MOTORCYCLE-RELATED MAXILLOFACIAL INJURIES PRESENTING TO THE 37 MILITARY HOSPITAL, GHANA

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Abstract

Objective: The study examined the epidemiology of motorcycle-related maxillofacial injuries to provide data to guide the prevention and management of maxillofacial trauma.

Methodology: The research was a one-year prospective cross-sectional study of patients presenting with motorcycle crash-related maxillofacial injuries. The variables recorded include the demographic data, type of motorcycle collision, day and time of motorcycle crash, location of the crash, role of injured patient, maxillofacial and concomitant injuries sustained. Descriptive statistics were used to ascertain the epidemiology of maxillofacial injuries sustained.

Results: A total of 148 patients aged between 15 and 65 years were involved in the study. There was a high male dominance (96%) among patients who sustained maxillofacial injuries secondary to motorcycle-related road traffic crashes (RTC). The median age of the participants was 30.9 +/- 9.1 years. Most (55.6%) of the motorcycle crashes resulted from collisions with cars. Maxillofacial injuries were mostly soft tissue injuries with the midface sustaining the most. Skeletal injuries often occurred in the mandible with parasymphyseal fractures constituting the majority of the mandibular fractures.

Conclusion: There is a male predominance in patients with motorcycle-related maxillofacial injuries with a peak age of 21-30 years. Victims of motorcycles crashes often sustain soft tissue injuries with aesthetic and functional implications. Motorcycle crashes contribute significantly to the public health burden of RTC, especially in developing countries like Ghana. Healthcare professionals ought to be conversant with the epidemiology of maxillofacial injuries in motorcycle crash victims to ensure prompt and comprehensive management.

Key words: *Epidemiology, Maxillofacial, Motorcycle, Injury*

Introduction

The economic burden of Road Traffic Crashes (RTC) on developing countries is enormous as the estimated costs as a percentage of Gross Domestic Product (GDP) ranges from about 1-5% in most African countries.[1] According to the WHO 93% of the world's fatalities on the roads occur in low and middle-income countries, even though these countries have approximately 60% of the world's vehicles. The number of injuries and deaths from RTC are expected to increase with further motorization.[2] There have been disproportionately high and rising numbers of motorcycle deaths globally, especially in developing countries.[1] Additionally, motorcycle users stand the greatest risk of death in traffic among vehicle occupants. Contrary to a car crash, victims of motorcycle accidents absorb all the kinetic and compressive energy resulting from the crash.[3] Also, motorcyclists are less visible and they share the traffic space with occupants of fast-moving vehicles.

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Conflict of Interest: None Declared

Maxillofacial injuries are associated with various degrees of morbidity requiring extensive treatment at a huge cost to patients. In a study on maxillofacial and concomitant injuries in multiply injured patients, Parkins et al., reported that RTC was the commonest cause of injury accounting for 55% of injuries.[4] In recent times, there has been the increasing use of motorcycles and tricycles as a means of public transportation in Ghana although this is illegal according to the road traffic regulations.

Motorcycle transportation has been identified as the cause of most oral and maxillofacial injuries with the majority of the victims suffering multiple facial bone fractures.[5] Motorcycle taxis, also known as "Okada" or "boda boda" in parts of Africa, have become an integral part of the transport sector in several cities in Sub-Saharan Africa. Reasons cited for their continued use include economic gains, fast means of transport, the ability to travel on poor roads, and fun to ride, among others.[6]

Regulations guiding motorcycle transportation in Sub-saharan Africa vary considerably. While Nigeria has banned the use of motorcycle in the capital city, Lagos, Ghana has been debating the legalization of motorcycles for commercial transportation.[7] The policies on motorcycle usage needs to consider the public health burden as well as the socioeconomic

doi: 10.60014/pmjg.v12i2.298

implications. This would be possible if local data is available to inform such policies. Thus, this study sought to describe the epidemiological profile of motorcycle crash victims and the pattern of maxillofacial injuries sustained to inform policy and guide the management of maxillofacial trauma.

Materials and Methods

The study prospectively analysed data from patients presenting to the 37 Military Hospital with maxillofacial injuries resulting from motorcycle crashes from 1st October 2020 to 30th September 2021. The 37 Military Hospital is the National Emergency Response Center of Ghana and attends to both military and civilian patients. Maxillofacial trauma patients either report directly or are referred to the Maxillofacial Unit of the Dental Division for management. Motorcycle riders and pillion passengers who presented to the Hospital within the study period were included in the study. Patients who were referred to other health facilities by the Trauma and Surgical Emergency Unit or died before being referred to the Maxillofacial Unit were excluded from the study. A standard maxillofacial trauma form was used for data collection. The data was entered in Microsoft Excel 2010 and analysed using Stata 14 software (StataCorp. College Station, TX). The variables recorded were the demographic data, type of motorcycle collision, day and time of motorcycle crash, location of the crash, role of injured patient, maxillofacial and concomitant injuries sustained, as well as clinical signs elicited. The age category was classified as minor (less than 18 years), young adult (18 to 35 years), middle-aged adult (36-55 years), and older adults (above 55 years).[8] The determination of the pattern of maxillofacial injuries sustained by victims of motorcycle accidents was done by dividing the face into three broad regions as the upper, middle, and lower third. This was done using two imaginary horizontal lines through the pupillary plane and the commissures of the mouth.

Descriptive statistics were done for the background variables and categories, with report of proportions. The central tendency for age was reported with its corresponding standard deviation. The pattern of motorcycle-related injuries was also ascertained by the use of descriptive statistics. The prevalence of motorcycle-related maxillofacial injuries was determined as a fraction of the number of motorcycle-related cases over the total number of RTC and trauma cases presenting to the OMFS department of the hospital within the study period. Informed consent was obtained from all patients. Ethical approval was sought from the Institutional Review Board of the 37 Military Hospital.

Results

The study participants comprised of 142 males and 6 females between the ages of 15 and 65 years. The proportion of various age groups as well as the education and employment status of the participants are as shown in Table 1.

Table 1 Background Characteristics of Participants

Variable	Number (N)	Percent (%)
Sex		
Male	142	95.9
Female	6	4.1
Age category		
Minor (<18yrs)	5	3.4
Young adults (18-35yrs)	114	77.0
Middle-aged adults (35-55yrs)	26	17.6
Older adults (>55yrs)	3	2.0
Occupation		
Formally employed	39	26.4
Informal employment	89	60.1
Unemployed	20	13.5
Education		
No education	5	3.4
Primary	9	6.1
Junior High School	38	25.7
Senior High School	67	45.3
Tertiary	29	19.6
Post-graduate	0	0.0

The majority of the participants were within the 21-40 years age bracket (Figure 1).

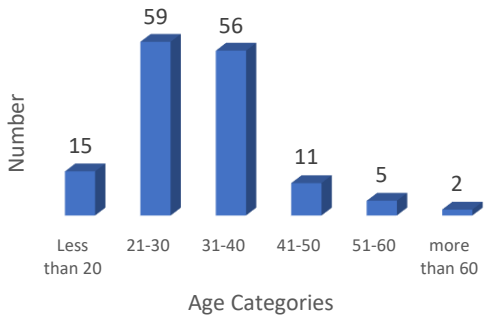

Figure 1 Age Distribution Of Participants

The prevalence of motorcycle-related cases among all trauma cases at the Oral and Maxillofacial Unit of the 37 Military Hospital was determined to be 31% while accounting for 46% of RTC. Most of the motorcycle crashes occurred on Saturdays (18.8%) with the afternoons recording the highest incidence (32%) followed by morning (24%). In terms of motorcycle usage, 23% of the riders used the motorcycles for commercial purposes, mostly as motorcycle taxis and for delivery services. Many motorcycle-related injuries occurred in urban areas (85%), with rural areas accounting for the remaining 15%. Regarding the role of the injured patients, 86% of the participants were riders while 14% were pillion passengers. Most (55.6%) of the motorcycle crashes resulted from collision with cars (Figure 2).

doi: 10.60014/pmjg.v12i2.298

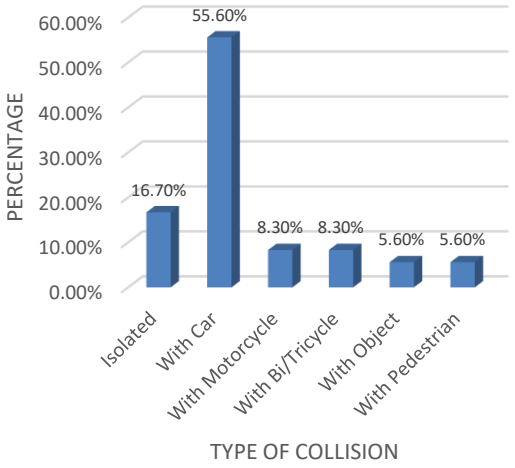

Table 2: Pattern of Maxillofacial Injuries

Injury description	Number	Proportion %
Tissue type		
Soft tissue	125	84.5
Hard tissue	50	33.8
Region		
Upper face	80	54.1
Mid-face	94	63.5
Lower face	86	58.1
Symmetry		
Unilateral	52	35.1
Bilateral	96	64.9
Unilateral injuries (N=52)		
Right	24	46.0
Left	28	54.0

Table 3: Distribution of Maxillofacial Clinical Signs

Clinical Signs	Number (N)	Proportion (%)
Eye Signs		
Edema	12	10.0
Ecchymosis	5	4.2
Subconjunctival haemorrhage	13	10.8
Malocclusion	10	8.3
Dentoalveolar involvement	39	32.5
Others		
Epistaxis	16	13.3
Bloody otorrhea	1	0.8
CSF Otorrhea	1	0.8
Trismus	19	15.8
Paraesthesia	1	0.8
Telecanthus	3	2.5

Most (84.5%) patients sustained soft tissue injuries with injuries to the middle third of the face dominating. The injuries sustained were bilateral in most instances (64.9%). The left side of the face was often injured in patients who sustained unilateral facial injuries (Table 2).

Although the middle third of the face was mostly injured, skeletal injuries mostly occurred in the mandible with parasymphyseal fractures constituting the majority of mandibular fractures. Besides dentoalveolar manifestations, trismus, epistaxis and ocular anomalies were the predominantly elicited clinical signs (Table 3). Concomitant injuries were mostly observed in the limbs.

Discussion

The study participants were made up of 96% (142) males and 4% (6) females. The finding agrees with most studies among victims of motorcycle-related road traffic injuries.[9,10] Reasons cited for the sex differences in RTC, and motorcycle accidents, in particular, include the involvement of men in risky driving practices, driving under the influence of alcohol, and speeding.[11] The participants in this study were mostly young adults (77%) with an average age of 30.9 +/- 9.1years and the peak age group being 21-30 years. This finding agrees with global and local figures.[5,12,13] The presence of a lot of young male riders should be of concern since they are reportedly more likely to engage in risky behaviours like not wearing a helmet while riding a motorcycle.[14] Over half (60%) of the victims of motorcycle crashes reported being employed in the informal sector with 45% having secondary school education while 3% had no formal education. This is expected as 80% of Ghana's workforce is employed in the informal sector.[15]

Motorcycle collisions accounted for 31% of all maxillofacial trauma cases and 46% of road traffic-related injuries reporting to the Maxillofacial unit of the 37 Military Hospital within the study period. This emphasizes the significant contribution of motorcycle crashes to the increasing burden of RTC. The percentage of RTC involving motorcycles was however lower than a study in Nigeria where motorcycle-related crashes constituted 69.4% of RTC.[16] In Pakistan, the proportion of RTC contributed by motorcyclists is much higher at 84.2%.[17] The highest number (28) of motorcycle crashes occurred on Saturdays. This may be because most social activities in Ghana are scheduled on Saturdays and there is a high likelihood of riders riding under the influence of alcohol. Concerning the time of day, the majority (32%) of the motorcycle crashes happened in the afternoon, with an additional 24% happening in the morning. This reinforces the fact that motorcycles are increasingly being employed as a means to circumvent the traffic congestion in urban centres, especially during peak periods.

Collision with another vehicle, mostly cars, was the predominant mechanism (55.6%) of the motorcycle crashes. In the commercial towns, this is often due to the parking of vehicles on the shoulders of roads without the requisite warning signs.[18] It can also be attributed to the small size of the motorcycle relative to other vehicles and the tendency for motorcyclists to share a lane space

doi: 10.60014/pmjg.v12i2.298

with a car. In terms of motorcycle usage, 23% of participants used motorcycles for commercial purposes, including courier services and public transportation. A study in South China reported that motorcycle taxi riders were more likely to indulge in risky behaviours such as speeding late at night or early morning, not insisting on helmet wearing by pillion passengers, and running a red light.[19] Future studies could examine the differences between the road safety habits of the private and commercial motorcyclists to help with the debate on the legalisation of motorcycle use for commercial transport in Ghana.

Most (85%) of the victims of motorcycle crashes sustained soft tissue injuries, predominantly facial abrasions, and lacerations. Similar findings were reported by Oginni et al., among intracity road users involved in motorcycle-related maxillofacial injuries where the injuries sustained were mostly soft tissue or in combination with a bone injury.[20] The middle third of the face was commonly involved with 64% of injuries occurring in that region. This could be due to the fact that motorcyclists often prefer to have the midface exposed for better vision and hearing. The finding agrees with previously published data [20,21] but differs from other studies in which the lower third of the face was observed to be commonly involved.[12,22,23] Although most injuries occurred in the middle third of the face, the mandible was the most frequently (55.4%) fractured bone with the parasymphyseal region dominating (30.4%). Several studies have also reported the mandible as the most frequently involved facial bone in RTC and motorcycle crashes in particular.[13,20,24,25] Lee et al., observed that fractures to the posterior mandible (body, angle) were more common with interpersonal violence while mandibular fractures resulting from RTC commonly occur in the anterior mandible.[21] A higher frequency of anterior mandibular fractures occur in the absence of a shock-absorbing system like airbags and helmets.[21] The low use of helmet by motorcyclists in Ghana(5) could be a contributory factor to the high incidence of parasymphyseal fractures observed in this study.

The most common clinical sign was a limitation in mouth opening (15.8%). This can be attributed to the high number of mandibular fractures observed in the study. Mandibular fractures can lead to spasm of the muscles of mastication. The trismus could also result from impingement on the coronoid process by an inferiorly displaced zygomatic arch, trauma to the masticatory muscles resulting in spasm, and inferior displacement of the maxilla in Le Fort fractures. Other common signs were epistaxis (13.3%), subconjunctival haemorrhage (10.8%), and periorbital oedema (10%). This is commensurate with the finding of predominant midface injuries. Fractures of the bones of the middle third of the face are often accompanied by orbital signs such as was observed in this study. This highlights the need for a comprehensive head and neck examination in motorcycle crash victims and prompt ophthalmology consult when necessary.

Conclusion

There is a male predominance in patients with motorcycle-related maxillofacial injuries with a peak age of 21-30 years. Most motorcycle-related maxillofacial injuries occur in the middle third of the face while skeletal fractures often involve the mandible. Majority of the participants sustained soft tissue injuries with aesthetic and functional implications. Motorcycle crashes contribute significantly to the public health burden of RTC, especially in developing countries like Ghana. Healthcare professionals ought to be conversant with the epidemiology of maxillofacial injuries in motorcycle crash victims to ensure prompt and comprehensive management.

Declaration

Conflict Of Interest

The authors declare no conflict of interest.

Acknowledgement

We would like to acknowledge Dr Paa Kwesi Blankson for assisting with the analysis of the data. All interns who helped with the data collection are also appreciated.

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  doi: 10.60014/pmjg.v12i2.298

CASE REPORT

MASSIVE CYSTIC DEGENERATION OF NEGLECTED LEIOMYOMA MIMICKING AN OVARIAN TUMOUR IN A 48 YEAR OLD WOMAN

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Abstract

Introduction: Leiomyomas are common benign tumours of the female pelvis with growth and extension not limited to pelvis. The occurrence of solitary or multiple nodules are initially asymptomatic except when it is occurring within the cavity of the uterus. Symptoms would however develop with time if not properly treated or ignored, which could lead to live-threatening complications.

Case Presentation: This is a report of a 48-year-old woman with neglected leiomyoma who presented with an enormous abdominal distension due to massive cystic degeneration of the leiomyoma mimicking an ovarian tumor. An abdominal ultrasound scan performed revealed a large solid-cystic abdominal mass on which account an exploratory laparotomy where total abdominal hysterectomy left salpingectomy and bilateral oophorectomy was performed. The histopathology report of the tumour revealed it was a benign fibromyoma (leiomyoma) with degenerative changes. The ovaries and left tube were all normal.

Conclusion: Leiomyoma though a benign tumour, can grow disproportionately and undergo degenerative changes if neglected. This can result in life-threatening sequelae, mimicking a malignant tumour.

Key words: *Leiomyomas, Uterine fibroids, Degenerating myoma, Cystic degeneration, Abdominal distension*

Introduction

Leiomyomas are benign pelvic tumours in women with some studies reporting cumulative incidence of 70-80% independent of symptoms[1]. In a retrospective, study leiomyomas were found to be more common in premenopausal women; but incidence decreased in postmenopausal women to 0.25%[2]. Leiomyomas are hormone-dependent and typically grow during reproductive years. Their growth usually slows down and they may even regress after menopause due to decreased estrogen production[3,4]. However, there have been reported cases of leiomyomas growing aggressively in postmenopausal women[4,5]. Leiomyomas typically present with symptoms of menorrhagia, dysmenorrhea, and bulk-related symptoms, such as abdominal distension and pain[6]. Some cases of rapidly growing leiomyomas have been reported, with growth rates of up to 5 cm per year[7]. The growth rate of leiomyomas is influenced by several factors, including age, hormonal status, and genetic factors[8].Rapid growth of leiomyoma in the later part of reproductive years or in a postmenopausal woman is an unusual finding which could be attributed to several years of neglect resulting in degeneration mimicking a malignant tumour. When the leiomyoma nodule is sub-seroral or parasitic, it is not confined to the uterus and pelvis but can grows into the upper abdominal cavity especially if there are adequate extra-uterine sources of blood supply which could be favorable for unrestricted growth.

The differential diagnosis of a rapidly growing abdominal mass includes ovarian tumors, leiomyomas, and other rare tumors such as sarcomas[9,10]. Imaging studies, such as ultrasound and computed tomography (CT) scans, are essential in the evaluation of these patients. Biopsy or surgical excision may be necessary to establish a definitive diagnosis[11].

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Conflict of Interest: None Declared

Case Report

This case initially presented to the Amasaman District Hospital in September 2020 complaining of an abdominal distension and a productive cough of one mouth duration which was not responding to over-the-counter medications and herbal treatments. She tested positive for pulmonary tuberculosis when some laboratory investigations were conducted. She was started on tuberculosis treatment for six mouths and referred to the Greater Accra Regional Hospital on account of ovarian tumor in December 2020. An ultrasound scan done in September 2020 reported, the uterus was heterogeneous in echotexture and bulky in size measuring 8.9cm x 5.3cm x 8.1cm. The endometrial stripe thickness was normal. There was a large complex cystic mass arising from the pelvis into the abdomen with multiple septations measuring 8.8cm x 13.9cm on the left and 3.9cm x 7.5cm on the right suspected to be of ovarian origin. The liver, spleen, pancreas,

doi: 10.60014/pmjg.v12i2.317

gallbladder and both kidneys were all normal. The serum CA 125 was 29.9U/ml.

At presentation at the Greater Accra Regional Hospital, she complained of worsening abdominal distention, abdominal pain, early satiety, cough, easy fatigability, orthopnea and palpitations. She was diagnosed of a uterine mass for the first time 16 years ago at different hospital during pregnancy and delivery of her second child but she did not seek any treatment. She had her last pregnancy and delivery 9 years ago with the existing uterine mass/tumour and failed to make the needed follow-up appointments for the surgical treatment. She continued the use of herbal medications as treatment. The uterine mass became obvious with marked abdomen distension in the last 4 years due to gradual increase in size with recurrent episodes of abdominal pains. It started growing rapidly with worsening abdominal pain from august 2020. She consented and had laparotomy performed in May 2021 at a time her abdominal distension became very rapid and colossal severely restricting her daily activities after a series of defaults in follow-up while being prepared for surgery.

Her menarche was at 16 years and last menstrual period was in April 2021. The cycle length is usually 30 days, the menses were regular and usually last 2-3days. She had no history of sexually transmitted diseases, contraceptive use, cervical cancer screening or breast cancer screening. Her coitarche was at 20yrs and the first pregnancy was an ectopic for which she had a surgery performed 25 years ago. She had three other pregnancies subsequently all of which were normal during the antenatal period, labour and puerperium. All were delivered vaginally now aged 22, 16 and 9 years alive and doing well. She had no positive personal or family history of diabetes, hypertension, asthma, sickle cell disease. She had tested positive for pulmonary tuberculosis and was on treatment for six months which was duely completed. she had positive history of recurrent use of a local alcohol called akpeteshie, herbal and over the counter medications.

She looked chronically ill and was mildly pale but not jaundiced or febrile with temperature of 36.2C, hydration state was fair with bilateral pitting pedal oedema up to knee level. Her height was 166cm and her weight was 65kg when she presented in September 2020 but had increased to 75kg in May 2021. The abdomen was grossly distended and tense compatible with term size higher order multiple gestation with measurement of 100cm from symphysis pubis to xiphisternum. Size of abdomen both anterior and lateral views are shown in figure 1 below. A vague mass filling the entire abdomen was palpable. The bowel sounds were reduced. The pulse rate was 92 beats per minute, blood pressure was 109/92 mmHg and SPO2 was 97%. Both heart sounds were normal. The respiratory rate was 22 cycles per minute with broncho vesicular breath sounds with reduced air entry bilaterally at lower lung zones.

Pre-surgical investigations performed in May 2021 showed her Hb was 8.4g/dl, Wbc 4.5 x 10^9/L, neutrophils 45%, lymphocytes 49.6%, platelets 352 x 10^9/L. Renal function, liver function, fasting blood sugar and routine urine examination tests were all normal. Covid-19 screening, Hepatitis B and HIV tests were all negative. She was transfused a total of four units of whole blood and four units of fresh frozen plasma intraoperatively and post operatively. Entry of the abdomen was through a midline incision extending above the umbilicus, initially the cystic content of the tumour was drained before the tumour was separated from the anterior abdominal wall completely and exteriorized. The posterior part was separated from the bowels and omentum which was providing extra-uterine sources of blood to the tumour. This was followed by excision of the pedicle of the tumour as shown in figures 2-4 below. Total abdominal hysterectomy left salpingectomy with bilateral ophorectomy was performed subsequently. The post-operative period on admission during for five days in hospital was uneventful on analgesics, antibiotics and anticoagulation. She was discharged home on the fifth day after operation on haematinics. Her Hb was 10.5g/dL and wound healing was satisfactory at the outpatient follow-up visits to the clinic. There has not been any signs of recurrence of the disease or malignancy.

Figure 1*: Anterior and lateral views of colossal abdominal distention due to massive cystic degeneration of neglected leiomyoma in a 48-year-old woman.*

doi: 10.60014/pmjg.v12i2.317

The findings at laparotomy were (figure 2 below): A colossal solitary tumour arising from the pelvis and occupying the grossly distended abdominal cavity and compressing on the bowels, gastrum, omentum, the liver, the gall bladder and the rest of intra-abdominal organs against lateral parietal peritoneal surfaces and diaphragm. The retroperitoneal organs such the pancreas, both kidneys and ureters were all normal. The undersurface of the diaphragm, the liver and its ligaments and gallbladder were all normal. The tumour consisted of solid area from the point of its attachment by a broad pedicle about 6cm to the posterior fundal part of the uterus. The portion of the tumour mostly in the upper abdomen was an enormous cystic area firmly attached to the anterior abdominal wall containing a slightly haemorrhagic fluid which measured about 16 litres which had to be drained before full surgical access into the abdominal cavity was possible as in figure 2. The posterior part of the tumour had adhesions to the omentum and its blood vessels. There were no macroscopic tumour deposits or enlarged lymph nodes of the omentum. The uterus was slightly enlarged but normal. Both ovaries appeared normal, the ampullar and fimbrial portions of the right tube were absent, the left tube was grossly normal. The bladder and pelvic peritoneum were all normal. There was no enlarged pelvic or para-aortic lymph nodes. There was no free fluid in the abdomen. The estimated blood loss was about 1L.

Figure 2*: showing the tumour with normal uterus, ovaries and left tube. The solid part of the tumour is at posterior fundal part of the uterus. The upper cystic part of the tumour is shown as collapsed sac after draining the 16 litres of hemorrhagic fluid content.*

Summary of histopathology report returned as: partially open uterus with cervix and adnexae weighed 269g. The cervix measured 5.5 cm x 4.0 cm x 2.0 cm; the uterus measured 9.0 cm x 10 cm x 3.0 cm. The left tube and ovary measured 7.0 cm x 4.0 cm x 2.0 cm. Partially cystic and solid tumour weighing 4563g and measuring 27 cm x 25 cm x 9 cm with cut sections showing a variegated white light grey dark brown haemorrhagic cystic tissue. The findings of the cervix, uterus, tubes and ovaries were unremarkable with no evidence of malignancy. The huge mass was composed of interlaced fascicles of smooth muscles and collagen, moderately vascular with multiple dilated vascular channels lined by flattened endothelial cells. The cystic areas of the mass contained amorphous material. There were areas with hyaline degeneration. Myxoid change was also present within the stroma. Only mild cellular atypia with no evidence of any mitotic activity or histologic features of malignancy. The conclusion of histology was a huge abdominal mass, showing histologic characteristics of a benign fibroyoma with degenerative changes. There are no overt features of malignancy.

Discussion

Solitary leiomyomas are rare, accounting for a fraction of all uterine leiomyomas[12]. These tumours can grow to a large size and present with symptoms that can mimic malignant ovarian tumours as seen in this case reported. The reason for the rapid or aggressive growth of these tumors when they are neglected for a long time without treatment vary. The rapid growth of the leiomyoma in this report was possibly due an initial massive cyst degeneration as inner part of large leiomyoma deficient in blood supply but with subsequent periodic hemorrhage into the cyst by enlarged peripheral and sub-serosal vessels. This is evident by the hemorrhagic nature of the cystic fluid and histology showing moderately vascular and multiple dilated vascular channels of the tumour. The patient had chronic cough due to pulmonary tuberculosis which could have mechanically resulted in the rupture of some of the blood vessels into a preexisting cystic degeneration of the solitary leiomyoma giving rise to the massive cystic component of the leiomyoma.

The abdominal symptoms progressively worsened and severely restricted her daily activities. She gained 10kg in weight between her presentation in September 2020 and just before the laparotomy in May 2021 mainly from the accumulation of cystic fluid distending the abdomen. The combined weight of the solid tumour 4563g with 16 litres of cystic fluid estimated weight of weight of 16kg gives a total weight estimate of 20.5kg tumour. This weight is more than the weight of cases reported in India and Nigerian[13,14]. The weight of 20.5kg is however, compares favorably with the combined weight of higher order multiple pregnancy fetuses such as septuplets-7 or octuplets-8 at delivery. Large subseroral or parasitic leiomyomas have been reported

  doi: 10.60014/pmjg.v12i2.317

with acute life-threatening complications even during pregnancy due to unrestricted growth in the abdominal cavity and degeneration especially if there is adequate extra-uterine sources of blood supply[15].

Unlike malignant tumours which spread via lymphatic, direct invasion of surrounding structures and hematogenous routes, the growth and extension of leiomyomas into the abdomen is related to development of new nodules, increasing size of existing nodules and degenerative changes that occur within the existing nodules. Rapid growth of the leiomyoma has been reported to be due to sarcomatous degeneration[9] which is associated with poor prognosis due the malignant change that has occurred in the tumour. Fortunately, the case reported here did not have sacomatous degeneration. The post-operative follow-up and prognosis in this case has been good after surgical removal of the benign tumour and histology did not confirm a malignancy that was suspected before the lapoarotomy was performed.

Conclusion

Leiomyoma though a benign tumour, can grow disproportionately and undergo degenerative changes if neglected. This could result life threatening sequelae characteristics of malignant tumours.

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  doi: 10.60014/pmjg.v12i2.317

REFEEDING SYNDROME IN SCHIZOPHRENIA CASE REPORT

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Abstract

Introduction: Recent studies have shown growing concern for refeeding syndrome (RFS) among patients suffering from other medical conditions, although the exact incidence in this population is unknown. The phenomenon is also present among patients with mental health conditions characterised by poor feeding, poor appetite, catatonic features, and poor cognitive functioning. Generally, RFS occurs with the reintroduction of calories to severely malnourished patients. It becomes critical for clinicians to have a high incidence of suspicion for prompt diagnosis and appropriate management to keep them alive if the malnutrition does not take their lives.

Case Presentation: We report a case of a 53-year-old man with an 8-year history of schizophrenia and a 3-month history of poor feeding. We admitted him because he refused to feed or drink for two weeks. As a result, he was severely malnourished, and we started refeeding while dealing with his psychotic symptoms. He gained about 2kg within a week of admission, but that was fraught with metabolic derangements, which included hypophosphatemia, hypomagnesaemia, and hypocalcaemia. We revised his diagnosis to RFS in schizophrenia and managed it as such.

Conclusion: There are no agreed biomarkers for the diagnosis of Refeeding Syndrome, and the diagnosis is mainly clinical, supported by electrolyte deficiencies. Unfortunately, hypophosphatemia does not have readily available formulations for its correction, which can lead to neurological, cardiovascular, and other complications, including sudden death. Delay in diagnosis worsens the prognosis, and the intuitive desire to feed a starved patient zealously leads them to death.

Key words: *Case report, hypophosphatemia, malnutrition, refeeding syndrome, schizophrenia*

Introduction

Metabolic processes resulting in death after the introduction of feed to severely malnourished people has been known for over 70 years and was first documented in the late 40s when studies were conducted among Japanese prisoners of war.[1] It was not until 1981 that the name "*Refeeding Syndrome*" was coined by Weinsier and Krumdieck who observed the sudden death of two severely malnourished individuals who were fed over-zealously.[2] Despite the relatively long history, there is still no consensus on the definition and its management because of the lack of high quality scientific evidence.[3,4] It is potentially fatal when missed, yet there are no agreed biomarkers for diagnosis. When diagnosed, treatment can be tasking, as formulations for treatment are not readily available, especially in low- and middle-income countries. Refeeding syndrome is described as "a range of metabolic and electrolyte alterations occurring as a result of the reintroduction and/or increased provision of calories after a period of decreased or absent caloric intake".[4] The syndrome can happen regardless of the route (oral, enteral or parenteral) of calorie intake.

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Conflict of Interest: None Declared

Case

A 53-year-old head pastor of a church in the capital city of the country, who is living with his wife and three children in Accra presented with a 3-month history of poor feeding, two weeks of refusing to eat anything at all, and 3 days of no water intake. He was diagnosed and managed as schizophrenia 8 years prior. He initially improved on medication but discontinued treatment after 4 years when his symptoms resolved. He was symptom-free for another 3 years and was apparently well until a year before presentation when he begun to experience symptoms that included poor personal hygiene, self-neglect and social withdrawal. It was difficult to get him help as he was a highly opinionated person. During this period, only two of his assisting pastors were permitted to visit. Two weeks prior to presentation he forbade one of the pastors from visiting. On examination, he was severely malnourished and cachectic. He weighed 35kg with an estimated BMI of 12.5 kg/m^2. An offensive body odour was noted as a

doi: 10.60014/pmjg.v12i2.302

result of poor oral and personal hygiene. He had overgrown nails (about 6cm each) and could not sit up in a wheelchair unsupported. He was negativistic, had persecutory delusions and resisted treatment. He was admitted to the psychiatry department of a teaching hospital and managed by a multidisciplinary team consisting of internists, dieticians, cardiologist and a neuropsychiatrist. His laboratory findings and weights during admission is as in **Table 1**.

Table 1

Admission DAY	**1**	**8**	**15**	**22**	**30**
Hb (g/dL)	8.2	4.2			
Na (mmol/l)	145	164	140	136	130
K (mmol/l)	4.5	3.1	2.4	4.6	4.0
Cl (mmol/l)	109	140	112	103	98
Urea (mmol/l)	42.8	15	9	3.2	4.1
Creat (µmol /l)	263	87	105	57	47
eGFR (mls/min/1.73m$^{2)}$	27	87	70	89	>89
Calcium (2.15-2.50)		1.88	1.58	1.78	1.77
Adjusted Calcium (2.15-2.65)		2.28	2.08	2.26	2.25
Phosphate (0.81-1.45)		0.36	0.30	0.84	1.17
Magnesium (0.66-1.07)		0.78	0.56	0.84	0.64
Albumin (35-50) g/L		20	15	16	16
Weight (kg)	35	46	42	41	

He was started parenteral feeding for the first 48 hours with thiamine supplementation. Four Sub-convulsive Electrical Brain Stimulation sessions on alternate days were initiated on day 2 of admission as patient was uncooperative with nasogastric (N/G) tube. After a week he became somehow cooperative and the N/G tube was passed to deliver a high protein (1.2 g/kg) and a total of 1800 cal/day and medication via the N/G tube. Elastic stockings and subcutaneous enoxaparin prophylaxis were also added to his treatment against hyper-coagulable states. RFS was diagnosed on day 8 of admission following the gross deficits in electrolytes as indicated in the table 1. Parenteral potassium, magnesium and calcium were initiated. Phosphate was to be replaced from his diet as there were no specific formulations available. Calorie intake was then restricted to 1000 cal/day and increased gradually to 1600 cal/day over two weeks. We observed worsening of symptoms on days that followed the days he was described as *"fed well"*.

Patient developed a bilateral pneumonia on day 10 (diagnosed by x-ray) and this could be due to a nosocomial infection coupled with his expected low immunity from the severe malnutrition. He was managed on parenteral ceftriaxone and co-amoxiclav with oral azithromycin. He improved as he was able to maintain good oxygen saturation ($SpO_{2)}$. He however, developed right pleural effusion which yielded serous fluid on tapping on day 15. Nasopharygeal swap was taken to rule out Covid-19; concurrently oral doxycycline, vitamin C and zinc were added to the treatment. On Day 34 when he developed a high-grade fever and atelectasis with bronchopulmonary fistula. He was managed with chest tube under water seal and intranasal oxygen. He died suddenly 2 days later.

Discussion

Britain's National Institute for Health and Care Excellence (NICE) has developed a screening, assessment and management guidelines to prevent RFS or mortality if it occurs.[5] Short Nutritional Assessment Questionnaire (SNAQ) has also been validated for screening and diagnosing malnutrition.[6] However, both NICE and SNAQ have low sensitivity and specificity scores on retrospective validation analyses.[4] The important thing is for clinicians to have a high index of suspicion, especially for persons who may be at risk of developing RFS such as persons with poorly managed mental health disorders, substance use disorders, malabsorption, malignancies, starvation in protests, military recruits, athletes, child abuse and critically ill patients.[7]

Despite the recognition of starvation and RFS for many years, the metabolism of starvation and the changes that occur during refeeding is not completely understood.[8] Glucose is the main source of energy production and the excess is stored as glycogen in the liver or muscles. When glycogen store capacity is exceeded, glucose is converted to fat and stored as fatty acids in adipose tissue. This results in reduction of blood glucose levels and a consequent reduction in insulin production from the pancreatic islet cells.[9]

With starvation, the body begins to break down stored glycogen and it is depleted in about 72 hours without food. Gluconeogenesis begins from non-carbohydrate sources for obligate glucose users like

  doi: 10.60014/pmjg.v12i2.302

brain and erythrocytes. This is accompanied by fatty acids metabolism to form ketone bodies for production of energy. The net result of starvation is the depletion of fats, proteins, potassium, phosphate and magnesium.[8,10] This depletion affects major organs like lung, heart, liver, intestines and kidneys with complications such as hypotension, bradycardia and hypothermia.[11,12]

The primary goal in caring for nutritionally depleted patients is the preservation of functional protein.[8] With the resumption of feeding, particularly glucose, there is an increased production of insulin. Insulin intrinsically enhances protein formation and prevents degradation of protein.[13] It pushes potassium and phosphate intracellularly for phosphorylation during the breakdown of glucose in glycolysis, Krebs cycle and the electron transfer system. Hypophosphatemia is generally accepted as the hallmark of RFS even though it is not the only cause of hypophosphatemia. Other causes of hypophosphatemia include chronic alcoholism, insulin administration, vitamin D deficiency, hyperparathyroidism and Fanconi syndrome.[14]

Hypophosphatemia decreases Adenosine triphosphate (ATP, the *energy currency*), cyclic adenosine monophosphate (cAMP, 2nd messenger for many biological processes) and 2,3-Diphosphoglycerate (2,3-DPG, in the erythrocyte), due to decreased glycolysis.[15] The 2,3-DPG fall increases haemoglobin oxygen affinity, so low phosphorus level induces tissue hypoxia. ATP levels may also decrease in myocardial and skeletal muscles and can result in dysfunction and death of various cell types and therefore the appearance of cardiovascular and neuromuscular symptoms.[16]

In addition to hypophosphataemia, RFS is characterised by hypomagnesaemia, hypokalaemia, thiamine and other vitamins (B_6 and B_{12}) deficiencies, trace metal deficiencies (e.g., selenium and zinc), glucose and lipid imbalance, and a spurious hyponatremia with fluid balance abnormalities. Hypomagnesaemia is associated with refractory hypokalaemia and hypocalcaemia which can lead to clinical signs and symptoms and could mask RFS symptoms.[17] Thiamine is required for metabolism of pyruvic and lactic acids, and links glycolysis to the Kreb's cycle. Deficiency of thiamine causes fatal acidosis.[4,11,17] Insulin is antinatriuretic and fluid retention occurs as a sequela causing death by pulmonary oedema.[19] These abnormalities to a greater extent explains the clinical features of RFS manifested by our patient. Table 2 depicts general clinical presentation.[3]

Table 2

	Neurological	Cardiovascular	Others
Hypophosphatemia	Weakness, paraesthesias, lethargy, confusion, coma, sudden death	arrhythmias, cardiac failure, left ventricular dysfunction,	Dyspnoea, haemolysis, increased susceptibility to infection, tissue hypoxia, rhabdomyolysis
Hypomagnesaemia	Hyporeflexia, fasciculations, psychosis, delirium, vertigo, apathy, depression, irritability	arrhythmias, ECG changes	Hypocalcaemia (tetany, ataxia, muscle weakness, tremor)
Hypokalaemia		Arrhythmias, ECG changes	Constipation, fatigue, paralytic ileus, rhabdomyolysis
Sodium retention		Fluid overload, congestive heart failure, tachycardia, peripheral oedema	Acute lung oedema, decreased haematocrit, decreased serum albumin levels
Thiamine deficiency	Dry beriberi, Wernicke's encephalopathy (nystagmus, ataxia, ophthalmoplegia, confusion), Korsakoff syndrome (anterograde and retrograde amnesia, confabulations)	Wet beriberi	

The incidence of RFS is not exactly known due to the lack of consensus of its definition and decreased awareness so being under-diagnosed. A study of inpatients of an internal medicine department revealed an incidence of 8% in the study population.[20] Screening patients who may be at risk of RFS and adopting the management guidelines can prevent the condition. Early diagnosis of the syndrome when it occurs with timely correction of the deficient ions and vitamins can reduce the risk of mortality.

The principle for managing RFS as agreed by the ASPEN consensus in 2019 is to "start low and go slow".[4] The complex metabolic changes occur largely due to the fast re-introduction of calories. One can begin with 25% of the required calorie per day and graduated over the subsequent 3 - 5 days.[4] The ions implicated

doi: 10.60014/pmjg.v12i2.302

need to be monitored daily and replaced when low except for hyponatremia whose correction can cause pontine myelinosis.[21,22] With the poor integrity of the GI tract, parenteral replacement of the ions and the vitamins may be ideal while correcting the energy deficiency.[11]

Conclusion

The nature of many mental illnesses and other wasting chronic diseases lend itself to poor self-care and a resultant malnutrition. A high index of suspicion and screening for RFS is important for the holistic care of patients who present with chronic conditions. Reintroducing calories after starvation with zeal may be intuitive but potentially fatal. Caution is necessary to keep them alive if the starvation did not kill them. It may be necessary that such patients are managed in intensive care units judging from the many electrolyte imbalances that are not routinely checked for yet can be fatal. A high index of suspicion in adults presenting with cachexia is crucial for early identification and intervention of the appropriate care. Parenteral phosphate may be lifesaving in RFS and need to be made readily available especially in developing countries where starvation is relatively more common.

Declarations

Ethical approval and consent to participate.

Not applicable

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Availability of supporting data

The medical records and laboratory results are available with Korle-Bu Teaching Hospital (KBTH) where he was treated.

Competing interests

We declare no conflicts of interests.

Funding

There was no funding for this study.

Authors' contributions

Dr. Eugene K Dordoye contributed to the conceptualization, writing of the methods, supervision of data and reviewing of the work. Drs. Dela Fiagbe and Josephine Stiles-Darko contributed to the management of the patient, data analysis and review of the manuscript, Dr. Emmanuel Dziwornu and Dr Thelma M Alalbila Aku contributed to the conceptualization, writing out and reviewing of the manuscript.

Acknowledgements

We wish to acknowledge the contribution of the surviving wife and children, nurses and all other health professionals in the teaching hospital who were called in to help.

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  doi: 10.60014/pmjg.v12i2.302

ABDOMINAL ECTOPIC GESTATION IN THE SECOND TRIMESTER AT A DISTRICT HOSPITAL: A RARE CASE

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Abstract

Introduction: Abdominal ectopic pregnancies are uncommon forms of ectopic pregnancies. They might be unnoticed until late in pregnancy and are associated with an increased risk of maternal complications and mortality. This is a case report of an abdominal ectopic gestation diagnosed at the first visit to a district hospital in Ghana and how it was managed in a low-resource setting.

Case Presentation: A 28-year-old gravida 4 parity 3, presented with 4 months history of amenorrhoea associated with recurrent bleeding per vaginum. Ultrasound showed a slightly bulky uterus with very scanty echogenic material within the endometrial cavity. There was however a right adnexal gestational sac with a live foetus at 19 weeks + 4 days and no free fluid was seen in the pouch of Douglas. The patient was counselled and prepared for an emergency exploratory laparotomy and intraoperative findings showed normal size uterus of about 8 weeks in size with an unruptured right adnexae gestation. The gestational sac was in the region of the right ovary which could not be visualised and attached to the uterus via the ovarian ligament with a normal-looking right tube. Post-operative recovery was uneventful and she was discharged three days later.

Conclusion: Abdominal ectopic gestation can pose a diagnostic challenge, particularly in low-resource settings. There is a need for clinicians to have a high index of suspicion and provide timely surgical intervention necessary to reduce complications and mortality associated with the condition.

Key words: *Abdominal ectopic gestation, Laparotomy, District Hospital, Ghana.*

Introduction

Abdominal ectopic pregnancy is a rare disorder caused by the embryo being implanted in the peritoneal cavity outside of the uterine cavity, as well as the fallopian tubes and broad ligament.[1] It has been reported to account for 1% of all ectopic pregnancies.[2] According to the literature, the incidence of abdominal pregnancy varies between 1 in 10,000 and 1 in 30,000 pregnancies.[3] In Ghana, a retrospective review of cases in Kumasi showed that abdominal ectopic pregnancy accounted for 0.46% of all ectopic pregnancies.[4] In Nigeria, an incidence of 0.34 per 1,000 deliveries has been reported in a retrospective study.[5]

Abdominal pregnancies might be unnoticed until late in the pregnancy and it is linked to an increased risk of maternal complications and mortality.[6] One factor contributing to the high maternal mortality rate could be the prevalent misdiagnosis of abdominal ectopic pregnancies.[7] Diagnosis and management can be challenging, particularly in low-resource settings.[3] This case report highlights the subtle presentation of a case of abdominal ectopic gestation in the second trimester and its management in a District health facility in Ghana.

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Conflict of Interest: None Declared

Case Report

On the 15th of February, 2021 at 11:20 am a 28year old Gravida 4 Para 3, presented to a district hospital in Ghana with 4 months history of amenorrhoea associated with recurrent scanty bleeding per vaginum. She was asymptotic of anaemia and could not tell her last menstrual period. There was no current obstetrics history since she had not presented to any facility for antenatal care. From her past obstetrics history, all 3 pregnancies were normal and delivered vaginally at term. There were no known Chronic medical conditions and no previous surgeries.

On Examination she was moderately pale, afebrile, anicteric and hydration was satisfactory. Her cardiorespiratory system was stable with a blood pressure of 100/60mmHg. Her abdomen moved with respiration, it was soft with tenderness in the lower region and had a pelvic mass of 20 weeks in size. There was no hepatosplenomegaly. She was conscious and alert.

A urine pregnancy test done was positive and a full blood count showed a haemoglobin of 10.6g/dl. Abdominopelvic ultrasonography showed a slightly bulky uterus with very scanty echogenic material within the endometrial cavity. There was a right adnexal

doi: 10.60014/pmjg.v12i2.333

gestational sac with a live foetus at 19weeks + 4days. The left adnexa was unremarkable. There was no free fluid seen in the pouch of Douglas. There was also no free fluid seen in the hepatorenal space. Figure 1 shows an image from the ultrasound scan.

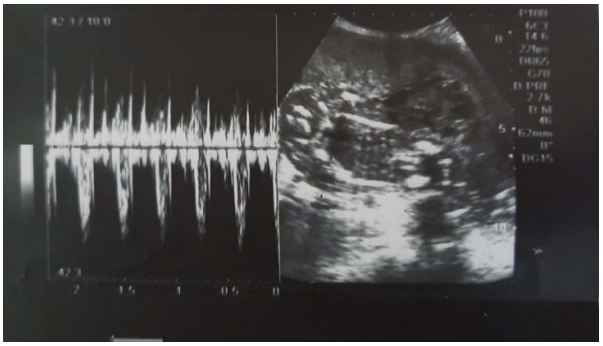

Figure 1 *- Right adnexal gestational sac with a live foetus*

An impression of an unruptured extrauterine ectopic pregnancy was made with a differential diagnosis of 1) Abdominal Ectopic pregnancy 2) Right ovarian Ectopic pregnancy. The patient was counselled and prepared for an emergency Exploratory Laparotomy.

Intra-operative findings in the theatre were: Normal size uterus of about 8 weeks size with an unruptured right adnexae gestation (a well-formed fetus at about 20 weeks, weight of 250g, attached to ovary and omentum). The gestational sac was in the region of the right ovary which couldn't be visualized, with a normal-looking right tube. There were few adhesions of the omentum and small bowel on the surface of the gestational sac. There were normal-looking left ovary and fallopian tube. There was no haemoperitoneum and the estimated blood loss was about 300 millilitres.

Figures 2 and 3 are images from intraoperative findings.

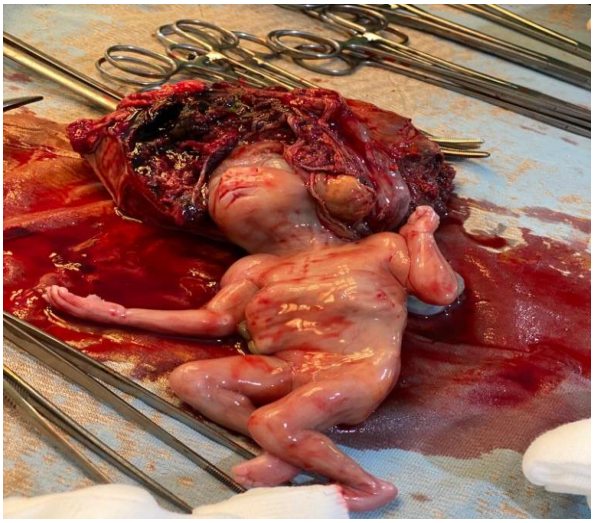

Figure 2 *– Fetus*

Figure 3 *– Gestational sac and Uterus*

The surgical procedure that was carried out was a Laparotomy with right Oophorectomy and adhesiolysis. Her post-operative condition was satisfactory and her recovery was uneventful. The extrauterine gestation was taken for histopathological studies which showed a right ovary and attached to it was a gestational sac and umbilical cord. Omentum was inflamed. Features were of an ectopic gestation attached to but not within the right ovary. The patient was discharged on the third postoperative day and has since been well.

Discussion

Abdominal ectopic pregnancy remains a rare type of ectopic pregnancy that has significant morbidity and mortality for both the mother and the fetus.[3] The implantation of the embryo in abdominal ectopic pregnancy is either primary or secondary to an intraperitoneal abortion of tubal pregnancy.[2] The omentum, pelvic sidewall, the Douglas pouch, spleen, colon, liver, big pelvic arteries, diaphragm, and uterine serosa are among the implantation sites.[8]

The main risk factors that have been identified to be associated with abdominal ectopic pregnancy include tubal damage or history of tubal pregnancy, pelvic inflammatory disease, endometriosis, assisted reproduction techniques, uterine or tubal surgeries, dilatation and curettage, genital malformations, and multiparity.[2,9,10] The patient in this case report from her past medical history had none of these risk factors identified in the literature except for being a multiparous woman.

The presentation of abdominal ectopic gestation is usually non-specific. Clinical presentation can range from abdominal pain with intestinal transit disorder to abdominal pain during active movements of the fetus.[11]

doi: 10.60014/pmjg.v12i2.333

Other signs that can be observed at presentation are spreading of the abdomen due to an irregular presentation and the palpation of the fetal parts under the maternal abdominal wall, especially in advanced abdominal pregnancy.[11] Our patient in this case report presented with recurrent scanty bleeding per vaginum with tenderness in the lower region.

Sonography remains an important diagnostic tool for the evaluation of ectopic pregnancy. An early obstetric ultrasound is frequently used to make the diagnosis of abdominal ectopic pregnancy. Diagnostic criteria by ultrasound may include: the demonstration of a fetus outside the uterus in a gestational sac, or the depiction of an abdominal or pelvic mass identifiable as the uterus distinct from the fetus; failure to detect a uterine wall between the fetus and the bladder; the fetus's proximity to the maternal abdominal wall; the placenta's location outside the uterine cavity and an empty uterine cavity.[9] The management of abdominal ectopic pregnancy is determined by the stage at which it is discovered. Sapuri et al proposed the following criteria under which conservative management is feasible if the diagnosis is made before 28 weeks gestation:[12]

1. Absence of a major congenital malformation.
2. A live fetus.
3. Continuous hospitalization in a well-equipped and well-staffed maternity unit with immediate blood transfusion facilities available.
4. Careful monitoring of maternal and fetal wellbeing.
5. Placental implantation in the lower abdomen away from the liver and spleen.

In a low-resource setting of a district Hospital, all these criteria cannot be met and therefore conservative management will be a challenge. Generally, while some authors believe that expectant management and waiting until fetal lung maturity is a viable option, others believe that there is a substantial danger of a life-threatening haemorrhage.[13,14] Hence the optimal treatment of abdominal ectopic pregnancy is unknown and there is no standard treatment algorithm.[9,10], In this case, immediate laparotomy was offered to the patient because she was exhibiting maternal complications of pregnancy which manifested as recurrent vaginal bleeding and tenderness of the lower abdomen.

Conclusion

Abdominal ectopic gestation is an uncommon condition that can pose a diagnostic challenge, particularly in low-resource settings. There is the need to have a high index of suspicion even in patients who have no known risk factors. Its presentation can delay compared to tubal ectopic pregnancies. Timely surgical intervention is imperative to reduce complications and mortality associated with the condition.

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ACKNOWLEGEMENT OF REVIEWERS

The Editorial Office of the Ghana College of Physicians and Surgeons would like to acknowledge with reverence and deep gratitude, all reviewers whose effort have been valuable to the preservation of the high quality of articles published in the Postgraduate Medical Journal of Ghana. For this edition we extend special thanks to the reviewers hereby listed.

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FROM THE PAST

LEPROSY

Leprosy is a nonfatal, chronic infectious disease caused by Mycobacterium leprae, whose clinical manifestations are largely confined to the skin, peripheral nervous system, upper respiratory tract, eyes, and testes.

The propensity of the disease, when untreated, result in certain characteristic deformities and the recognition in most cultures that the disease is communicable from person to person have resulted historically in a profound social stigma.

The first leprosarium in Ghana was established at Dome, Ho by Dr Cook in 1925.Thereafter,the British Empire Leprosy Relief Association (BELRA) made a considerable contribution in the establishment of leprosy services in the country.

Also, the first modern leprosarium was opened at Ankaful in 1949 by Dr McKilvie. The Medical Field Units took leprosy services to rural areas in Ghana in the 1940s, 1950s and 1960s.

There are two extreme types of leprosy. They are Lepromatous leprosy, which is associated with free multiplication of the causative organism, and tuberculoid (or neural) leprosy in which the multiplication of the organism is restricted by an active defensive tissue.

Treatment:Crude oils and ethylesters which contain fatty acids are being given orally, by intravenous.It is also infilterated into lepromatous area of skin. The residue of the dose is then injected.

PMJG Editorial Policy

About

The Postgraduate Medical Journal of Ghana (PMJG) is a medical science journal published, twice a year by the Ghana College of Physicians and Surgeons (GCPS). The first issue is released in March and the second in September. The scope of the journal is centred on the specialities of the faculties of the GCPS. Broadly captured under the divisions of Physicians and Surgeons, these faculties include but are not limited to Laboratory Medicine, Paediatrics and Child Health, Psychiatry, Anaesthesia, Otorhinolaryngology, Orthopaedics and Trauma etc (visit ***www.gcps.edu.gh*** for the full list of specialties). Original research articles, case studies and special articles on any of the specialties of the GCPS are welcome for submission.

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Manuscripts written in English and typed double-spaced in single column format, preferably in font size no. 12 should be sent together with a cover letter.

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All submissions should be accompanied by a cover letter which must include statements on the following points:

1. All authors have made significant contributions to the methods and findings in the paper.
2. All authors have read and approved the final draft.
3. Financial or commercial interests must be acknowledged.
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Arrangement

The order of the text should be as follows: **title page**, **abstract** (structured) of no more than 250 words with 2-8 key words (MeSH terms) at the bottom. The main text must be divided into the following sections: **introduction**, **subjects (or materials) and methods**, **results**, **discussion**, **conclusion**, **acknowledgements**, **references**, **tables**, **legends to figures** and **figures**. Each section should begin on a new page and all pages must be numbered consecutively, beginning with the title page.

Title Page: The first page should include the title, names of authors, centre where the work was carried out and a short running title. The full postal address of the corresponding author, with postal code, phone numbers, fax numbers and e-mail address must also be provided on the title page.

Abstract: A structured abstract (no more than 250 words) is required for original articles and must provide an overview of the entire paper, with succinct statements on **objectives, design, subjects, interventions, outcome measures, results and conclusions.** For other types of manuscript, a short summary may be adequate.

Tables: Tables must be typed on separate pages in **word format** and numbered consecutively. Each must have a brief heading describing the contents. Tables must be referred to in the text and information in them not duplicated in the text. The maximum number of tables allowed for each article is **four (4)**. Additional tables will have to be converted to text. In some cases, certain reasons will prove sufficient to allow for more than the aforementioned number, however, this will be decided by the Chief Editor after authors have stated said reasons in the cover letter.

Illustrations: Photographs, photomicrographs, electron micrographs and imaging figures must be of

high quality and submitted in three original copies. A size of 235 x 264 mm is advised and the figure number should appear on the back of each, together with an arrow indicating the top edge. For photomicrographs, details of stains and a scale bar should be provided. Where patient's identity is not concealed in a photograph, a written consent from the patient must be submitted.

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Abbreviations: Abbreviations should be defined on first use and then applied consistently subsequently. Non-standard abbreviations or those used less than three times in the text are not permitted.

Numbers and Units: Measurements must be reported in metric units only. Temperatures should be given in degrees Celsius. Blood pressure should be expressed in mm Hg. and haematological and biochemical measurements in SI (Systeme Internationale) units. Decimal points must be used appropriately and not commas.

Trade Names: Non-proprietary (generic) names of products should be used. If a brand name for a drug is used, the British or International nonproprietary (approved) name should be given. The source of any new or experimental preparation should also be given.

References: References should be limited to those relating directly to contents of the paper. References should be cited in sequence and numbered by Arabic numerals in superscript. The list of references at the end of the article should be numbered in the order in which they appear in the text. They should give the names and initials of **all** authors; in cases where the number of authors exceed **5**, the abbreviation "*et al"* should be used to represent remaining authors after the fifth is cited. The authors' names must be followed by the title of the article, the title of the journal, abbreviated in the style of the Index Medicus, the year of publication, the volume number and the first and last page numbers. References of books should give the title of the book, followed by the place of publication, the year and the relevant pages. References for websites should state the name of author(s), title of article, website publisher, date of publication and the URL to the article.

EXAMPLES

Article

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

Book

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

Book Chapter

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

Website references

Doe J, Phils MR. A client's guide to rational emotive behaviour therapy. Conseil. 2017: https://www.conseil.com/

Special identification items like digital object identifiers (DOI) will be allowed inclusion to end text references, aside this, all references should be arranged as stated in the instructions.

Review Process

The PMJG will peer review all the material it receives. Manuscripts will be reviewed by external referees when it is deemed necessary. In studies that contain quantitative data and statistical inferences, the Editor may request that a statistician reviews them. For studies based on questionnaires, authors are required to attach the questionnaire to the manuscript, in order to facilitate the review process.

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Proofs will be sent to the corresponding author, preferably as an attachment to an e-mail. Corrected proofs should be returned with the least possible delay. Alterations made to the proofs other than the correction of printer's errors are charged to the author.

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Where human investigations or animal experiments are part of the study, the journal assumes that the study design has been approved by an appropriate ethical committee. Where an appropriate ethical committee is not readily available, the principles of the Helsinki Declaration as amended should be followed strictly.

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Ghana College of Physicians and Surgeons

20TH ANNIVERSARY Annual General & Scientific Meeting

THEME Two Decades of Postgraduate Medical Training In Ghana

4th - 8th December 2023 | Ghana College of Physicians & Surgeons, Accra / Virtual

MONDAY 4TH

PRE-CONFERENCE ACTIVITIES (VIRTUAL)

3:00pm - Orientation for Graduating Fellows and Members

Faculty Board Meetings

Pre-Conference Fees Only GHS 115.00 per day.
Payment mode: GCPS MTN momo number 055 985 6745
Reference: participant's name and course

TUESDAY 5TH

9:00am - Faculty Meetings / Faculty Elections

1:00 pm - Membership Induction Ceremony

REGISTRATION FEES FOR AGSM ONLY:

Fellows: GHS 700.00

Members: GHS 700.00

Residents: GHS 300.00

WEDNESDAY 6TH

8:30am - Fellowship Induction Ceremony

6:30pm - Annual Dinner at the Marriott Hotel, Accra.

2:00pm - Residents' Meeting with The Rector (Virtual)

Dinner Fee :
Fellows & Members - GHS 1,000
Guest of Fellow / Member - GHS 1,400

THURSDAY 7TH

8:30am - 1st Scientific Session

11:00am - 2nd Scientific Session

2:30pm - 3rd Scientific Session

4:00pm - Ethics Seminar

5:00pm - Divisional Board Meetings

(All Sessions and the Meeting will be held VIRTUALLY)

FRIDAY 8TH

8:30 AM - Thanksgiving Service

11:30AM - Business Meeting

Both events will be held IN-PERSON at the College

Registration fees can be paid to: Ghana College of Physicians and Surgeons, **Account Number 1181 0101 2726 1101, ADB GHANA LTD., SPINTEX BRANCH.** Payment can be done electronically using VISA or Mastercard on the College website by clicking on GCPS PAY. Registration fees cover Certificate of Attendance and MDC Credit Points. For more information contact the Secretariat on **024 369 0073.**

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