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EDITORIAL

MEDICAL TOURISM IN GHANA: THE ROLE OF THE GCPS

Medical tourism involves a patient travelling from his or her country to another one for medical care. In most instances Ghanaians travel to countries such as the USA, UK, South Africa and India for some medical care. It should be possible to reduce or reverse the unilateral flow of patients from Ghana. With the establishment of the GCPS, Ghana has seen a rapid increase in the number of doctors who are specializing or subspecializing in some unique areas in medicine and very soon, with the necessary tools and exposure, these doctors will acquire enough expertise to handle all cases. Also, apart from the teaching hospitals that have centres of excellence, we have in the country a few other public, private and quasi-state hospitals that also have these centres of excellence. When we pool our resources together we should be able to attract the foreign patients to the country. The nation stands a lot to gain economically and the medical and ancillary professions will develop remarkably.

The reasons for patients travelling to other countries include the lack of facilities and expertise in one's own country for the management of particular cases. A patient requiring a kidney or liver transplant in Ghana has to travel out. Other indications are dental care, cosmetic surgery, fertility treatment, organ and tissue transplant and cancer care. Travelling to another country involves a huge financial cost. There is always the risk of getting an infection in transit or as a hospital acquired one. Antibiotic resistance, poor quality of care, communication challenges and development of deep vein thrombosis/pulmonary embolism and lack of continuity of care are also common challenges. The patient has to take steps to minimize some of the risks. Pre-travel consultation has to be thorough. Health travel insurance has to be arranged. The patient should always be accompanied by copies of the medical records. He/She should research into the health care provider and facility and also arrange for the follow up care. It is possible for the GCPS to set up a unit for the advocacy or coordination of medical tourism in Ghana since there is no central organization that has taken up the challenge in Ghana. Initially this can be done as a collaborative effort with the Ghana Health Service and the Ghana Medical Association. Such an effort will ensure orderliness in the venture and profitability in medical tourism.

The global medical tourism is estimated to yield billions of dollars. Countries such as the UAE and Qatar are getting a lot of money from the well -organized medical tourism. Ghana can chalk a similar feat and improve the economy of the country as a whole. Ghana can adopt and employ telemedicine to enhance medical tourism. We will use technology to deliver clinical care at remote and distant locations. It can be as simple as text messaging or as complex as a remotely controlled surgery. Real time video communication, remote monitoring, store- and-forward, storing and sharing medical information can all be developed. We will be careful with internet glitches, medicolegal issue and cost and maintenance of equipment.

JD Seffah
Editor-in- Chief

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ORIGINAL ARTICLES

DYSMENORRHEA AMONG UNIVERSITY OF GHANA MEDICAL AND DENTAL STUDENTS: PREVALENCE AND MANAGEMENT OPTIONS

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Abstract

Objective: Dysmenorrhea or menstrual pain is a common gynaecological disorder that affects the quality of life of most women in their reproductive years. Many women resort to the use of drugs and other remedies in an attempt to relieve this menstrual pain. The aims of the current study were to determine the prevalence of dysmenorrhea among female students of the University of Ghana Medical and Dental School, and also to identify common management strategies among these students.

Methodology: This was a cross-sectional study conducted in 2020, using an online questionnaire among 170 female students in the University of Ghana Medical and Dental School. Data was coded, stored and analyzed using SPSS version 23.

Results: Prevalence of dysmenorrhea among respondents was 91%; with significant correlation between dysmenorrhea and family history, duration of bleed, onset of pain and duration of pain. Data showed that 89% of students with dysmenorrhea engaged in self-medication. The commonest drug used by respondents with dysmenorrhea was paracetamol. A large number of the respondents who had dysmenorrhea had mood disturbances and majority also reported that dysmenorrhea affected their day-to-day (academic) activities.

Conclusion: Dysmenorrhea was found to be highly prevalent among female medical and dental students, with self-medication being the most common management strategy. Among the various drugs used in management, paracetamol was found to be commonest.

Key words: *Dysmenorrhea, Prevalence, Management, Self-medication*

Introduction

Dysmenorrhea, simply referred to as menstrual pain, is a common gynaecological disorder that affects the quality of life of most women in their reproductive years[1]. Dysmenorrhea affects about 40-80% of women,[2] and is known to have social and economic impact in most countries.[3] There are two types of dysmenorrhea: primary and secondary dysmenorrhea. Primary dysmenorrhea refers to normal physiological pain that occurs during the first few days of menstruation. Secondary dysmenorrhea is pathological, occurs weeks before or after menstruation, and is associated with some pelvic pathology such as the presence of uterine fibroids, endometriosis, or adenomyosis.[4,5]

Dysmenorrhea, according to many studies including one by Fatima *et al.*,[6] is due to the release of prostaglandins (especially prostaglandin E_2 and $F_{2\alpha}$) from the cyclooxygenase (COX) pathway which leads to contractions of the uterine wall.[7] Additionally, the aforementioned contractions reduce blood flow to the uterus. The combination of prostaglandin-induced uterine contractions, ischemia from decreased blood flow to the uterus and hypersensitivity of peripheral nerves leads to dysmenorrhea: which manifests as lower abdominal cramps.

World prevalence of dysmenorrhea, in studies conducted by the World Health Organization (WHO), ranged from 8.8% to 94%[8]. Studies done among Hispanic adolescents in the United States of America and Ghanaian adolescents showed prevalence of 85%[9], and 74.4%,[10] respectively. Dysmenorrhea among University students in Ghana, Ethiopia and a medical college in India recorded prevalence of 83.6%, 71.8% and 67.5%, respectively.[11,12,13] Some risk factors associated with dysmenorrhea include early menarche, positive family history, age less than 20 years, nulliparity, higher socioeconomic status, heavy menses, depression, smoking, anxiety, and lack of physical activity.[12,13,14,15,16] Common associated symptoms of dysmenorrhea include headache, diarrhoea or change in bowel movements, nausea, vomiting, bloating, and backache.[3, 18]

Reports suggest that a lot of women resort to self-medication during episodes of dysmenorrhea. Osonuga *et al.*,[18] found that only 8.9% of women with dysmenorrhea sought medical advice, while 88.7% either practiced self-medication or did nothing. Common drugs known to be administered by women who experience dysmenorrhea include paracetamol, aspirin, ibuprofen, oral contraceptive pills and herbal

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medications.[1,19,20] Non-steroidal anti-inflammatory drugs (NSAIDs) are usually first line in the management of dysmenorrhea in many countries.[20] This is due to the fact that these NSAIDs reduce prostaglandin production by inhibition of COX. Examples of common NSAIDs used in the management of dysmenorrhea include ibuprofen, diclofenac, mefenamic acid and naproxen.[20] Furthermore, oral contraceptive pills are known to be effective in the management of dysmenorrhea and work by reducing prostaglandin levels in the lining of the uterus.[1] However, data suggest oral contraceptive pills are not commonly used in Ghana, as most people resort to painkillers and bed rest.[11] Other management modalities include exercise, use of heating pads, and taking of tea or herbs. Certain diets such as high consumption of fish, fruits and fibre are also known to help in the management of dysmenorrhea.[21]

Dysmenorrhea affects the well-being and productivity of most women. Dysmenorrhea is known to cause mood disturbances (depression), disruption in social interaction, limitation in sleep, hospital admissions, lack of concentration, inability to study, absenteeism from school and bad grades.[9,11,12,22,23] There is paucity of data on prevalence of dysmenorrhea among female students in medical schools in Ghana, and self-medication practices among these students who have knowledge about drugs. This study determined the prevalence of dysmenorrhea, self-management practices and effects of dysmenorrhea on productivity among medical and dental students of University of Ghana.

Materials and Methods

A cross-sectional study conducted in 2020, was used to assess the prevalence and management strategies of dysmenorrhea in female students of the University of Ghana Medical School (UGMS) and University of Ghana Dental School (UGDS), College of Health Sciences, Accra, Ghana. These 2 schools of the College of Health Sciences (University of Ghana), train medical and dental students. Together, they train over 200 health personnel every academic year with an average student population of 1400 (about 59% females and 41% males); as at the 2020 academic year. Students spend 6 and half years in school to complete their education.
Respondents were female students of the UGMS and UGDS. All female students from levels 100 to 600 in the chosen schools were eligible to partake in the study.

A total of 170 female students were selected for the study based on sample size determination using Cochran's formula,[24] with an estimated prevalence of 0.8 (80%) [2, 9], a margin of error (e) of 0.05 (± 5%), and z value of 1.96 for a 95% confidence interval. A total of 170 female students were selected using convenience sampling technique. This was done by use of an online questionnaire link which was shared with members of each year group. A structured online questionnaire with both close-ended and open-ended questions was used for data collection. The questionnaire consisted of a demographic section, a section to ascertain prevalence of dysmenorrhea, sections for symptoms associated with dysmenorrhea, impact of dysmenorrhea on academic activities and drugs/management strategies employed by these students. The online questionnaire was pre-tested among 10 students in the School of Biomedical and Allied Health Sciences (SBAHS), University of Ghana. Data collected was entered, cleaned and analysed using the Statistical Package for the Social Sciences (SPSS) version 23 and Microsoft Excel 2013. Data was analysed with simple descriptive statistics and presented using tables and graphs to depict frequencies and percentages. Chi-square test was used to assess associations between the study outcome variables and independent categorical variables with 95% confidence intervals.

Approval for the conduct of this study was by the Proposal Review Committee of the Department of Community Health, UGMS **(ID: UGMS-CHDRC/103/2020).** All participants provided informed consent (a column was added to the online questionnaire for participants to indicate whether they consented to the study or not). Confidentiality and anonymity of participating students were ensured throughout the course of the study by use of initials at the name section of the questionnaire.

Results

Out of 170.0 female respondents from the University of Ghana Medical and Dental Schools, 92.0 (54.1%) fell between ages 21-24 years. A majority of the respondents were from the Level 300 class (**Table 1**).

Table 1: Age and Level of Study of Respondents (N=170)

Age	Frequency	Percent (%)
18-20	32.0	18.8
21-24	92.0	54.1
25 - 29	37.0	21.8
30-34	9.0	5.3
Level		
Level 100	9.0	5.3
Level 200	9.0	5.3
Level 300	48.0	28.2
Level 400	39.0	22.9
Level 500	31.0	18.2
Level 600	34.0	20.0

Majority (89.4%) of the respondents had menarche between the ages of 10-14 years. Also, 90.6% of the respondents had their menstrual cycle length ranging

between 21-35 days. The duration of bleeding for most participants was 4-5 days (65.9%) (**Table 2**).

Table 2: Gynaecological History of Student Participants (N=170)

No. of days / years	Frequency	Percentage (%)
Age at Menarche (Years)		
<10 years	9.0	5.3
10-14 years	152.0	89.4
15-19 years	9.0	5.3
Length of Menstrual Cycle		
<21 days	3.0	1.8
21-24 days	24.0	14.1
25-29 days	87.0	51.2
30-35 days	43.0	25.3
>35 days	13.0	7.6
Duration of Bleeding		
2-3 days	18.0	10.6
4-5 days	112.0	65.9
6-7 days	40.0	23.5
Family History of Dysmenorrhea		
Yes	107.0 (62.9%)	62.9
No	63.0 (37.1%)	37.1

A majority (91.0%; n = 155) of the respondents had dysmenorrhea. Among those with dysmenorrhea, 59.3% had menstrual pain beginning on the first day of menstruation, 31.0% of these students had pain prior to menstruation and 5.2% had pain starting on the second day of menstruation. Associated symptoms of dysmenorrhea reported by respondents included: headache, diarrhoea, tiredness, tender breasts, insomnia, perineal pain, fever, body pains, acne, hot flashes, sore throat, blister in mouth, among others. Family history of dysmenorrhea, Duration of bleed/menses, Time of onset of pain and Duration of pain were found to be significantly associated with dysmenorrhea (**Table 3**).

Table 3: Factors Associated with Dysmenorrhea Among Respondents

Variable	Chi Square	P-Value
Age of respondents	1.899	0.594
Age at menarche	2.070	0.355
Cycle length	3.609	0.461
Duration of bleed	9.158	0.010
Family history	3.712	< 0.05
Onset of pain	170.000	< 0.001
Duration of pain	170.000	< 0.001

Of the 155 students who experienced dysmenorrhea, a majority (81.9%) reported decreased activity during episodes of dysmenorrhea. However, most (60.6%) of them did not miss lectures during these periods. Of the 61 respondents who missed school during times of dysmenorrhea, 45 of them (73.8%) often missed school for 1 day, while none of the students missed school for more than 3 days. Out of the respondents who did not miss lectures (n = 94) during episodes of dysmenorrhea, 49 (52.1%) of them went to class without taking medication, while 43 (45.7%) of them used pain reducing remedies. Also, 85.2% (n=52.0) of respondents who missed lectures used analgesics while the remaining 14.8% (n=9) did not. Majority (78.7%; n = 122) of the 155 students who experienced dysmenorrhea said they could not focus in class.

Furthermore, a majority (91.0%) reported that dysmenorrhea did not have any effect on their academic performance. Respondents whose academic performances were affected by dysmenorrhea (9.0%) were asked to cite examples of how dysmenorrhea affected them. Some of the respondents (n = 7) reported that they were unable to study or adequately prepare or revise for examinations because of the pain associated with dysmenorrhea. Others (n = 3) said their inability to focus during examinations due to dysmenorrhea affected their performances. The data also showed that most respondents (122 out of 155), representing 78.7%, experienced mood disturbances during dysmenorrhea. A summary of the effect of dysmenorrhea on academic performance and quality of life of respondents is presented in **Table 4**.

Table 4: Effect of dysmenorrhea on academic performance and quality of life

Variable	Number of respondents	Percentage out of 155 Respondents (%)
Mood disturbances/Depression	122	78.7
Reduced Socialization	106	68.4
Sleep Disturbances	65	41.9
Lack of concentration	97	62.6
Inability to study	83	53.5
Absenteeism from class	54	34.8
Hospital Admission	5	3.2

Of the 155 students who experienced dysmenorrhea, 112 (72.0%) used both pharmacological (**Table 5**) and non-pharmacological (**Figure 1**) methods to manage dysmenorrhea, while 31 (20.0%) used only non-pharmacological methods. Additionally, a majority of the respondents (n = 130) relied on bed rest during

episodes of dysmenorrhea. Common drugs taken by the students included paracetamol (66.1%), ibuprofen (12.7%) and diclofenac (11.9%). None of the students used oral contraceptive pills, aspirin or herbal preparations for dysmenorrhea. A number of the respondents, 105 (89.0%), practiced self-medication.

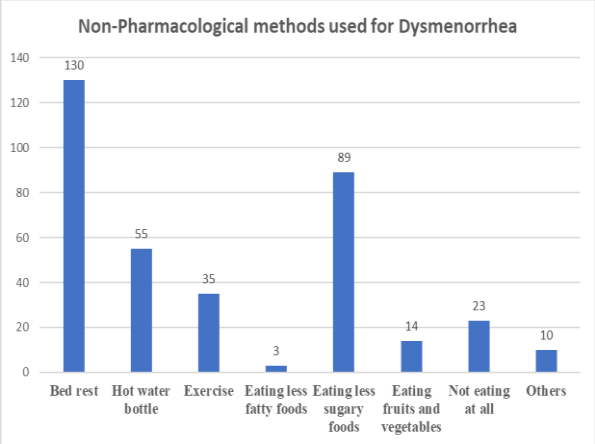

Figure 1: *Non-pharmacological methods used by respondents who experienced dysmenorrhea.*

Table 5: Drugs taken by students to reduce dysmenorrhea.

Drugs Used for Dysmenorrhea	Frequency	Percent (%)
Paracetamol	78	66.1
Ibuprofen	15	12.7
Diclofenac	14	11.9
Others		
Piroxicam	4	3.4
Naproxen	2	1.7
Ponstan (Mefenamic acid)	3	2.5
Folic Acid	1	0.85
Buscopan	1	0.85
Total	**118**	**100**

Discussion

From the current study, prevalence of dysmenorrhea among University of Ghana Medical and Dental students was 91.0%. This is high but consistent with global prevalence rates which range from 16.0% to 91.0%.[8,11,25,26] The prevalence of dysmenorrhea in this study was relatively high as compared to 60.9% and 50.9% in other studies done in various medical and dental schools across the globe.[27,28] Differences in prevalence may be due to sample size variations among the various studies. Prevalence of dysmenorrhea has been found to have some association with factors such as age, family history, early or late menarche, smoking, etc.[29] In this study, however, duration of bleeding ($p=0.010$), onset of pain ($p<0.001$) and duration of pain ($p<0.001$) were found to be significantly associated with dysmenorrhea prevalence. These factors have also been reported in studies done by Kural *et al.*[30] In the current study, a majority of students had dysmenorrhea on the first day of menstruation. This was consistent with literature which suggests that pain is normally in the first 2 days, and this pain is as a result of increased release of prostaglandins leading to intense uterine contractions.[9, 32, 33]

The commonest symptoms associated with dysmenorrhea in this study were diarrhoea, tiredness, nausea, bloating, loss of appetite and headache. These symptoms are consistent with findings in other studies conducted in Saudi Arabia and India[4, 34]. Respondents in the current study did not report breast changes as symptoms associated with dysmenorrhea, as has been reported elsewhere.[11] In this study, 81.9% of students were less active during dysmenorrhea. This did not prevent them from attending lectures, as only 39.3 % of them missed lectures.

It is noteworthy, however, that those (72.2%) who attended lectures could not focus in class during episodes of dysmenorrhea because of the pain, discomfort and the symptoms associated with condition. It can be speculated that lecture attendance may have been as a result of attendance sheets that had to be signed during each lecture. The effect of dysmenorrhea on school attendance in this study was consistent with some other studies conducted in schools in Italy and one Indian district where absenteeism was 37.9% and 47.9% respectively.[15, 35]

In relation to effect of dysmenorrhea on academic performance, majority (91.0%) of the respondents reported that dysmenorrhea did not affect their academic performance, even though a number of them had to miss lectures. On the contrary, studies done by Fatima *et al* and Acheampong *et al.*[6, 23] have reported poor academic performance among students as a result of episodes of dysmenorrhea.

Furthermore, 78.7% of the respondents had mood disturbances/depression during dysmenorrhea. Reports suggest that university students may often be under stress which is likely to trigger depressive moods, or even suicide ideation.[36, 37] Dysmenorrhea is also known to aggravate depression, anxiety disorders and other psychological disorders.[8, 38] There is therefore a need for increased psychosocial support for females in schools. Hospital admissions among respondents in this study was not common as was the case in the study done at the University of Cape Coast, Ghana.[22]

Paracetamol was the most common drug (66.1%) used by students for dysmenorrhea. Other studies have reported NSAIDs as the most effective drugs for dysmenorrhea.[13, 39] The use of paracetamol as first-line

treatment for dysmenorrhea has been reported by another study which was conducted in Ghana.[11] Paracetamol being common among medical and dental students in the current study could be as a result of knowledge these students have of possible adverse effects (peptic ulcer and nephrotoxicity) associated with continuous use of NSAIDs. Although aspirin, herbal medication and oral contraceptive pills are used in other parts of the world to manage dysmenorrhea, none of the students reported using these agents in this study.

For non-pharmacological methods, bed rest was the most common method used and corroborated a study done in the northern part of Ghana.[11] Reports suggest some association between high sugar intake and dysmenorrhea.[29, 40] In the current study, some of the students took in less sugary foods during dysmenorrhea.

Self-medication was highly prevalent (89.0%) among respondents in this study. This could be as a result of possible long hours spent at health facilities, a challenge in many resource-poor countries.[41]

In a study conducted among medical and paramedical students, self-medication was found to be more prevalent among medical students.[6] Additionally, most of the analgesics used by respondents in the current study are over-the-counter medicines, as such, medical students with knowledge of drugs can easily get these drugs. In this study, 74.5% of the students reported using multiple remedies. Some used only pharmacological, while others used a combination of pharmacological and non-pharmacological. A study conducted in Canada, after assessing effectiveness of a number of management strategies for dysmenorrhea, concluded that a combination of pharmacological and non-pharmacological methods (including surgery if necessary) should be used to effectively manage dysmenorrhea.[42]

Conclusion

There was a high prevalence of dysmenorrhea among University of Ghana Medical and Dental students. During episodes of dysmenorrhea, a combination of pharmacological and non-pharmacological methods was used by respondents in this study. Overall, dysmenorrhea caused morbidity and affected the day-to-day activities of female students.

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A FORMULA FOR THE DETERMINATION OF APPROPRIATE CHEST TUBE SIZE AND LENGTH OF INSERTION IN CHILDREN

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Abstract

Objective: The study was carried out to develop a formula that uses the child's age or body surface area (BSA) to determine the appropriate size and length of the chest tube to be inserted.

Methodology: Children aged 12 years and below who had chest tube insertion at the National Cardiothoracic Centre from July 2015 to August 2016 were retrospectively enrolled into the study. The inclusion criterion was those who had the chest tube data recorded in their notes. This was the derivative cohort. The chest tube type used was SURUCATH ULTRA®. The BSA was calculated using the Mosteller formula. The statistical analysis was performed using Microsoft excel 2013. The data of the derivative cohort was plotted on a graph, and an equation was deduced from the graph, representing the data. This equation is the formula. The formula was then used to determine the appropriate chest tube size and length of insertion on a validation cohort from January 2021 to April 2022.

Results: In the derivative cohort, there were 50 children, 34.0% being males. The mean age was 4.2 ± 2.9 years. The weight ranged from 3.5 – 50 kg, the height ranged from 50 – 159 cm and the body surface area ranged from 0.2 – 1.5 m^2. In the validation cohort, there were 56 children, 48.0% being males. The mean age was 4.4 ± 2.8. The weight ranged from 5 – 40 kg, the height ranged from 54 – 152 cm and the body surface area ranged from 0.3 – 1.3 m^2. The outcome of the validation was good. The chest tubes functioned well and there were no chest tube-associated complications. The formulae obtained were S (FG) = A + 16, L (cm) = 0.3A + 3.5, S (FG) = 6B + 16, L (cm) = 3.5B + 3, where S is the size of the chest tube, A is the age in years, L is the length of insertion and B is the body surface area. The L is the length of the tube that has gone into the chest.

Conclusion: A formula has been developed to guide in determining the most appropriate chest tube size and length of insertion in children, using the age and body surface area.

Key words: *Formula, chest tube, size, length, children*

Introduction

The insertion of chest tubes is a very important procedure in clinical practice. It is a life-saving procedure, often inserted for therapeutic purposes. Even though it is a life-saving procedure, it is fraught with many complications, some of which become life-threatening if the necessary precautions are not taken. If the tube is too big there can be injury to the intercostal neurovascular bundle, and if it is too small also, it will not drain well. If the length of insertion is too short, it will not drain well. It may even cause a pneumothorax, with its attendant morbidity and mortality. If it is too long also, it can damage the lung and any structure in the mediastinum. Indeed, we have encountered several situations where chest tubes were inserted elsewhere, without much awareness of the appropriate size and length, leading to some complications. It is therefore very important to have an idea of the most appropriate size and length of the chest tube to be inserted, especially in children. Some formulae have being developed in medical practice to guide the correct positioning of endotracheal tubes and double-J stents in children using the age.[1, 2] Kopac also developed a formula for the estimation of the appropriate size of urinary catheter in children.[3] With chest tube insertion in children, however, there is no clear formula (a mathematical relationship) that uses the age or the body surface area (BSA) of the child to determine the appropriate size and length of the chest tube to be inserted. It is in this regard, we carried out this study to help develop a simple formula that provides a more

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precise guide to the clinician using the child's age or BSA.

Materials and Methods

The study had both a retrospective part and a prospective part. They were both carried out in the National Cardiothoracic Centre, Korle-Bu Teaching hospital. The retrospective part involved children aged 12 years and below, who had chest tube insertion for various procedures between July 2015 and August 2016, and the chest tube size and length were recorded in their notes. The selection of the size of the chest tube and length was based on the clinician's experience, since there was no guiding formula. And since this is a cardiothoracic centre where chest tubes are passed very frequently, and with good outcomes, the clinicians' choices provided reliable data.

The maximum age of 12 years was used because the Department of Child Health admits children up to the age of 12 years. The chest tube type used during the study period was SURUCATH ULTRA®, from Suru International PVT. LTD, Dahanu, India. The BSA was calculated using the Mosteller formula: BSA (m^2) = $\sqrt{(W \times H)/3600}$, where W is weight in kg and "H" is height in cm.[4] The statistical analysis was performed using Microsoft excel 2013. This included the means, standard deviations and the plotting of the graphs from the data obtained. The equations derived from the graphs became the formulae. The formulae were then used to guide in chest tube insertions in the validation cohort.

The validation cohort involved 56 children, also aged 12 years and below, who had various procedures between January 2021 and April 2022, and the chest tube parameters were recorded in their notes. Using the formula, the age was used to predict the appropriate chest tube size to be used (Table 2). The BSA was also used to predict the appropriate chest tube size to be used. The values were the same in most instances. Where there was a slight difference, the clinician had the option of using the Age-predicted value or the BSA-predicted value. The age and the BSA were again used to predict the appropriate lengths of insertion.

Results

There were 50 children in the derivative cohort, 17 (34.0%) males and 33 (66.0%) females. The mean age was 4.2 ± 2.9 years (0.4 – 11 years). The weight (W) ranged from 3.5 – 50 Kg, the height (H) ranged from 50 – 159 cm and the body surface area (BSA) ranged from 0.2 – 1.5 m^2.

Table 1: The derivative cohort

No	Age/ years	Sex	Wt/ kg	Ht /cm	BSA /m^2	Diagnosis	Size /FG	Length /cm
1	0.4	M	3.5	50	0.2	PDA	18	4
2	0.4	F	5.0	66	0.3	PDA	18	4
3	0.5	M	5.5	59	0.3	VSD	16	3
4	0.6	F	5.0	66	0.3	PDA	16	4
5	0.7	F	5.0	63	0.3	PDA	16	3
6	0.8	M	6.2	65	0.3	PDA	18	3
7	0.9	F	5.0	70	0.3	PDA	16	3
8	1.0	F	9.0	80	0.4	PDA	18	3
9	1.2	F	7.0	72	0.4	PDA	18	4
10	1.3	F	8.5	79	0.4	TOF	20	3
11	1.3	F	8.0	62	0.4	PDA	16	4
12	1.3	M	11.0	85	0.5	PDA	20	4
13	1.7	F	10.0	55	0.4	AVSD	20	4
14	1.8	F	5.0	77	0.3	PDA	20	5
15	2.0	F	9.0	88	0.5	PDA	20	4
16	2.6	M	12.0	94	0.6	VSD	20	5
17	2.7	F	10.2	92	0.5	PDA	16	4
18	2.8	M	13.0	97	0.6	VSD	18	4
19	2.8	F	17.0	106	0.7	PDA	20	6
20	2.8	M	12.0	94	0.6	PDA	18	3
21	3.0	F	12.0	97	0.6	VSD	18	5
22	3.0	M	10.5	96	0.5	TOF	18	3
23	3.0	F	12.0	97	0.6	PDA	20	4
24	3.0	F	8.0	92	0.5	PDA	18	4
25	3.2	F	11.0	95	0.5	VSD	20	4
26	3.2	F	10.5	94	0.5	PDA	20	4
27	3.5	F	12.0	78	0.5	PDA	20	4
28	4.0	M	17.5	108	0.7	VSD	18	5
29	4.0	F	11.0	111	0.6	PEF	24	6
30	4.6	M	14.0	108	0.6	TOF	20	4
31	5.0	F	19.5	112	0.8	PEF	24	6
32	5.0	F	20.0	112	0.8	PEF	24	6
33	5.0	M	14.0	109	0.7	TOF	18	4
34	5.0	M	11.0	98	0.5	CS	24	4
35	5.0	M	14.0	101	0.6	TOF	20	5
36	5.8	F	13.0	88	0.6	CS	20	4
37	6.0	F	20.0	97	0.7	TOF	20	4
38	7.0	M	18.0	117	0.8	MR	20	4
39	7.0	F	25.0	134	1.0	PT	20	5
40	7.0	M	23.0	126	0.9	TOF	20	6
41	7.0	F	25.0	132	1.0	BT	24	6
42	7.0	F	26.0	122	0.9	PDA	20	6
43	8.0	F	20.0	104	0.8	PDA	24	6
44	8.0	F	21.0	120	0.8	TOF	20	6
45	8.0	F	23.0	130	0.9	TOF	24	6
46	8.0	M	19.0	124	0.8	PDA	20	5
47	8.8	F	25.5	134	1.0	PDA	24	6
48	9.5	M	25.0	135	1.0	TOF	24	5
49	10.8	F	26.0	132	1.0	VSD	20	6
50	11.0	F	50.0	159	1.5	EPT	28	8

PDA-patent ductus arteriosus, **VSD**-ventricular septal defect, **TOF**-tetralogy of Fallot, **AVSD**-atrioventricular septal defect, **CS**-corrosive stricture, **BT**-bronchial transection, **PEF**-pleural effusion, **EPT**-empyema thoracis, **PT**-pneumothorax

The correlations between the age and chest tube size, age and chest tube length, BSA and chest tube size, BSA and tube length are shown from Fig. 1 to Fig. 4 respectively.

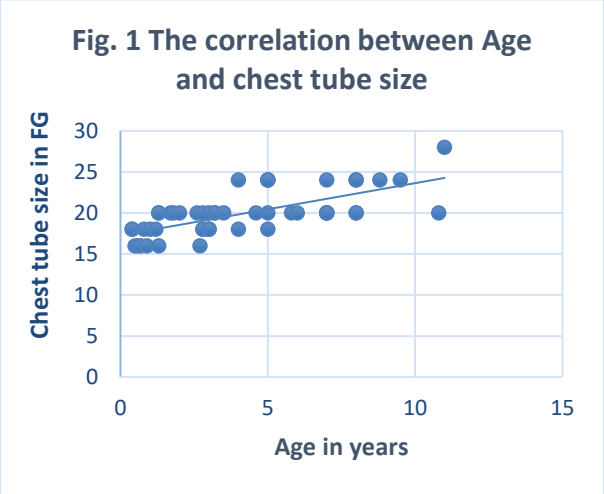

Fig. 1 *The correlation between Age and chest tube size. This is a plot of the size of chest tube and the age of the child that it was used for.*

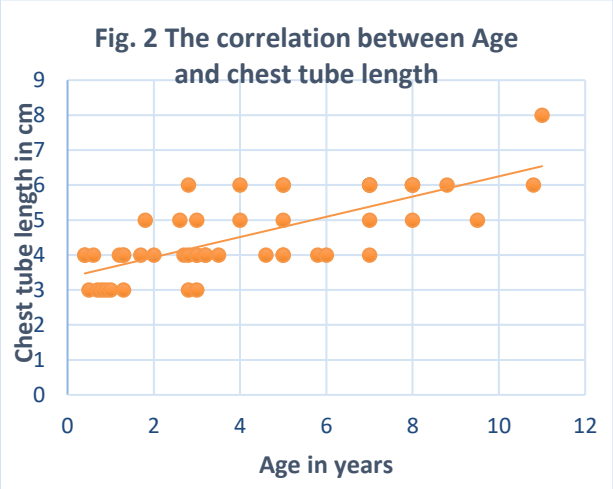

Fig. 2 The correlation between Age and chest tube length. This is a plot of the length of the chest tube inserted versus the age of the child.

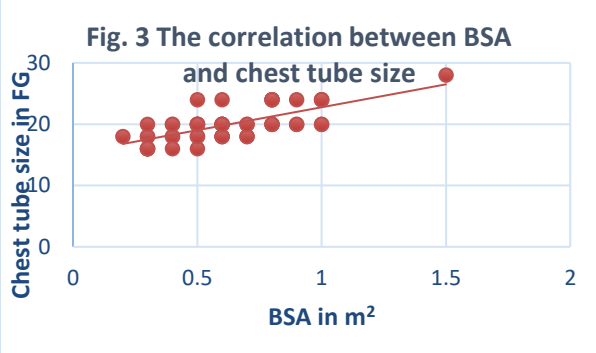

Fig. 3 *The correlation between BSA and chest tube size. This is a plot of the size of chest tube used against the BSA of the child.*

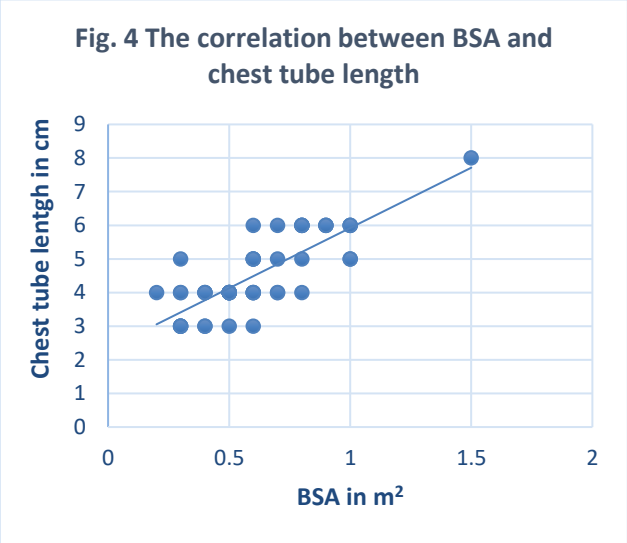

Fig. 4 *The correlation between BSA and chest tube length. This is a plot of the chest tube length inserted versus the BSA of the child.*

All the graphs were scatter diagrams, implying that the clinicians' choices were varied. But there were no chest tube-associated complications.

The formulae

1. The formula for determining the appropriate chest tube size using the age is **S (FG) = A + 16**, where S is the size and A is the age in years.

2. The formula for determining the appropriate chest tube length using the age is **L (cm) = 0.3A + 3.5**, where L is the securing length and A is the age in years.

3. The formula for determining the appropriate chest tube size using the BSA is **S (FG) = 6B + 16**, where S is the size and B is the BSA.

4. The formula for determining the appropriate chest tube length using the BSA is **L (cm) = 3.5B + 3**, where L is the securing length and B is the BSA.

The size obtained is approximated to the nearest even number, and the length obtained is also approximated to the nearest whole number. In the validation cohort there were 56 children, with 27 (48.0%) being males. The age range was 0.5 – 11 years, with a mean of 4.4 ± 2.8. The weight ranged from 5 – 40 kg, the height ranged from 54 – 152 cm and the body surface area ranged from 0.3 – 1.3 m^2.

Table 2: The validation cohort

No	AGE /Years	SEX	WT /Kg	HT /Cm	BSA /m^2	DIAGNOSIS	Tube Size Predicted By AGE	Tube Size Predicted By BSA	Actual tube Size used/FG	Tube Length Predicted By AGE	Tube Length Predicted By BSA	Actual tube Length used/cm
1	1.3	F	7	70	0.4	PDA	18	18	18	4	4	4
2	8.0	F	23	134	0.9	TOF	24	22	24	6	6	6
3	1.0	F	5.5	54	0.3	PDA	18	18	18	4	4	4
4	6.0	F	16	110	0.7	TOF	22	20	20	6	5	6
5	2.5	M	10	90	0.5	VSD	20	20	18	5	5	5
6	11.0	M	39	152	1.3	PEF	28	24	24	7	8	7
7	7.0	F	18	110	0.8	TOF	24	22	24	6	6	6
8	3.0	F	12	95	0.5	TOF	20	20	20	5	5	5
9	4.0	M	14	98	0.6	TOF	20	20	20	5	5	5
10	6.0	F	16	112	0.7	CS	22	20	20	6	5	5
11	6.7	F	20	110	0.8	TOF	24	22	24	6	6	6
12	1.6	M	15	82	0.5	PDA	18	20	18	4	5	5
13	9.0	M	29	130	1	VSD	26	22	24	6	6	6
14	7.0	M	18	116	0.8	TOF	24	22	24	6	6	6
15	3.0	M	10	97	0.5	TOF	20	20	20	5	5	5
16	3.0	F	9	90	0.4	TOF	20	18	20	5	4	4
17	6.0	M	18	110	0.8	TOF	22	22	24	6	6	6
18	1.4	F	9	70	0.4	PDA	18	18	18	4	4	4
19	6.0	M	18	110	0.8	TOF	22	22	24	6	6	6
20	5.0	M	14	110	0.6	TOF	22	20	20	5	5	5
21	5.0	F	15	105	0.6	AVSD	22	20	20	5	5	5
22	2.0	M	8	88	0.4	TOF	18	18	18	4	4	4
23	4.0	M	12	100	0.5	TOF	20	20	20	5	5	5
24	2.0	F	12	90	0.5	TOF	18	20	20	4	5	4
25	8.0	M	25	122	0.9	TOF	24	22	24	6	6	6
26	1.2	F	7	71	0.4	PDA	18	18	18	4	4	4
27	1.5	M	7	73	0.4	PDA	18	18	18	4	4	4
28	1.3	F	7	70	0.4	PDA	18	18	18	4	4	4
29	3.0	F	13	92	0.6	VSD	20	20	20	5	5	5
30	4.0	M	13	102	0.6	TOF	20	20	20	5	5	5
31	6.0	M	15	141	0.8	TOF	22	22	20	6	6	6
32	1.0	M	5	70	0.3	PDA	18	18	18	4	4	4
33	11.0	F	40	150	1.3	TOF	28	24	24	7	8	8
34	4.5	F	20	124	0.8	AVSD	22	22	20	5	6	6
35	3.0	F	11	90	0.5	VSD	20	20	20	5	5	5
36	10.0	M	22	143	0.9	TOF	26	22	24	7	6	7
37	3.0	F	12	80	0.5	TOF	20	20	20	5	5	5
38	6.0	F	15	100	0.6	TOF	22	20	20	6	5	6
39	0.8	M	7.5	65	0.4	PDA	18	18	18	4	4	4
40	5.0	F	16	110	0.7	TOF	22	20	20	5	5	5
41	6.0	M	20	127	0.8	TOF	22	22	20	6	6	6
42	6.0	F	16	110	0.7	TOF	22	20	20	6	5	6
43	2.0	F	9	82	0.5	PDA	18	20	20	4	5	4
44	0.9	M	9	75	0.4	PDA	18	18	18	4	4	4
45	5.0	M	21	110	0.8	TOF	22	22	24	5	6	5
46	7.7	M	24	123	0.9	FBI	24	22	24	6	6	6
47	3.0	F	9	98	0.5	PDA	20	20	20	5	5	5
48	7.0	M	24	124	0.9	TOF	24	22	20	6	6	6
49	3.0	F	13	88	0.5	TOF	20	20	20	5	5	5
50	0.5	F	5	78	0.3	PDA	16	18	16	4	4	4
51	1.0	M	7	79	0.4	PDA	18	18	18	4	4	4
52	9.8	F	20	115	0.8	PDA	26	22	24	7	6	7
53	5.0	M	15	104	0.7	TOF	22	20	20	5	5	5
54	2.5	M	8	70	0.4	PDA	20	18	20	5	4	5
55	3.0	F	13	83	0.5	TOF	20	20	20	5	5	5
56	2.0	F	10	75	0.4	PDA	18	18	18	4	4	4

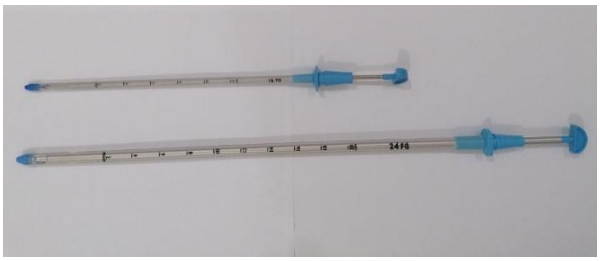

Fig. 5 *Sample of type of chest tubes used in the study.*

All the graphs were scatter diagrams, implying that the clinicians' choices were varied. But there were no chest tube-associated complications.

Discussion

Chest tube sizes are measured using French gauge (FG) in even numbers; 16, 18, 20, 22, 24, 26, 28, etc. This size refers to the external diameter of the tube. The numerical size, when divided by 3 gives the diameter in millimetres (mm). The thickness of the tube is 1.0 – 1.5mm. What determined the size of chest tube and length in the first place, was the experience of the clinician. The scatter diagram nature of the graphs was therefore not surprising. It implies that the clinicians' choices for the chest tube sizes and lengths were very varied. And yet they all obtained good results. A particular chest tube size was chosen for a number of ages. And a particular age can also take a number of sizes. The correlation developed from the graph represented a 'mean' of the choices. The formula was developed from the equation of the graph. It then serves as an appropriate guide. It is therefore not a rigid rule. It is easier to use the age than the BSA because using the age does not involve tedious calculations. But the BSA is more appropriate because it considers the size of the child by using the weight and the height. The size of the child correlates with the size of the intercostal space, which in turn has a bearing on the size of the tube that must be chosen and how far it must be pushed in.

Variations in the formula

Since the formulae have been developed from scatter diagrams, it means that slight variations in the equations will still work.

Intraoperative data

Most of the chest tubes were inserted in the theatre (intra-operatively). But this does not mean that the formulae are limited to only intra-operative situations. They can be applied in any clinical situation. The formulae are also not limited to only the diagnoses in the tables. They are applicable to any diagnosis in a child. All that is needed to apply the formula is the age or the weight and height of the child.

Conclusion

A formula has been developed to guide in the determination of the most appropriate chest tube size and length of insertion in children, using the age and body surface area. S (FG) = A + 16, L (cm) = 0.3A + 3.5, S (FG) = 6B + 16 and L (cm) = 3.5B + 3, where S is the size of the chest tube, A is the age in years, L is the length of insertion and B is the body surface area.

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A COMPARISON OF TWO DOSING REGIMENS OF MISOPROSTOL IN LABOUR INDUCTION: A RANDOMISED CONTROLLED TRIAL

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Abstract

Objective: To compare the effectiveness and safety of 50µg of sublingual misoprostol administered six (6) hourly to that of 50µg of vaginal misoprostol administered four (4) hourly.

Methodology: A non-blinded, randomized controlled trial conducted from Sept 1, 2014, to Nov 31, 2014, at a tertiary hospital in Ghana. Hundred and sixty women with medical or obstetric indications for labour induction were randomized into two groups.

Results: The rate of vaginal delivery, caesarean section, uterine tachysystole and uterine hyperstimulation were similar in both groups. Sixty-three (78.8%) and 66 (82.5%) mothers in the vaginal and sublingual groups delivered vaginally. More (10.0%) mothers in the vagina group required emergency caesarean for foetal distress. Six (vaginal group) and 8 (sublingual group) of the mothers required emergency caesarean for cephalopelvic disproportion. Three mothers from each group had an emergency caesarean section due to failed labour induction. Almost the same number of mothers had uterine tachysystole in both groups. More (3.8%) mothers in the vaginal group had uterine hyperstimulation. Differences in the mean induction delivery interval and the need for oxytocin augmentation were not significant. No differences were found in the intrapartum passage of meconium, blood loss in the third stage of labour, 5-minute Apgar score <7, and neonatal intensive care unit admissions.

Conclusion: The sublingual regimen was as effective and safe as the vaginal regimen in achieving vaginal delivery.

Key words: *Ghana, Labour Induction, Sublingual misoprostol, Premature rupture of membranes*

Introduction

Induction of labour (IOL) is a frequently performed obstetric procedure, utilized in 9.5 – 33.7% of all pregnancies.[1,2] IOL is defined as the initiation of uterine contractions at or after 28 weeks of gestation, and before the onset of spontaneous labour, by medical or surgical means for the purpose of vaginal delivery.[3] IOL is indicated for a wide range of maternal and foetal conditions, including postdates, premature rupture of membranes (PROM), and hypertensive disorders of pregnancy, when the anticipated outcomes for the foetus, the mother or both, are better than waiting for spontaneous onset of labour.[4,5] Despite its widespread practice, there is a lack of agreement in the literature on medication type, dosing, route, and dosing interval. Misoprostol, a prostaglandin E1 analogue, is a commonly used medication for IOL.[6] Misoprostol is typically available as a 200µg scored tablet, which often is broken into pieces to approximate 25, 50 and 100µg doses.[7–9] Misoprostol is inexpensive and widely available, and thus is frequently used in Sub-Saharan Africa and other low-resource settings. The most common protocol in Sub-Saharan Africa is 50µg of misoprostol administered vaginally every four hours.[9,10]

As an alternate route of administration, sublingual misoprostol is easy to administer, more acceptable to women[7] and may reduce ascending infection risk associated with vaginal exams in certain clinical contexts such as PROM. Despite these advantages of sublingual administration, there is concern about potential associations with foetal distress, meconium-stained amniotic fluid, low Apgar scores, and NICU admission.[11] Poor neonatal outcomes associated with induction agents like misoprostol may be secondary to uterine tachysystole.[12] Since the rate of uterine tachysystole appears to decrease with increasing dosing interval,[13] increasing the dosing interval of sublingual misoprostol may increase its safety profile while maintaining the other advantages of a sublingual route.

It is unknown how an extended-interval dose of sublingual misoprostol compares to the commonly used vaginal misoprostol regimen regarding efficacy and safety. This study fills this gap by comparing the effectiveness and safety of the standard 50µg of vaginal

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misoprostol administered every four hours to 50µg of sublingual misoprostol administered every six hours.

Materials and Methods

Study design and participants

This was a non-blinded, randomized controlled trial conducted from Sept 1 to Nov 30, 2014, at the Komfo Anokye Teaching Hospital (KATH), located in Kumasi, Ghana. KATH is a tertiary hospital for the northern half of Ghana. Participants were adult pregnant women presenting for planned IOL at KATH. Inclusion criteria included age greater than or equal to 18 years, gestational age of 28 weeks or greater, single live foetus in cephalic presentation, and amniotic fluid index of more than 5. Exclusion criteria were abnormal cardiotocograph (CTG) on admission, known hypersensitivity to prostaglandins, previous caesarean delivery or myomectomy, and any other contraindications to vaginal delivery. Eligible women were enrolled in the study after obtaining written informed consent. The study was approved by the Committee on Human Research, Publication and Ethics (CHRPE) of the School of Medical Sciences, Kwame Nkrumah University of Science and Technology, and KATH, Kumasi **(CHRPE/AP334/14**). This clinical trial was registered with the Pan African Clinical Trial Registry (**PACTR202101825071744).**

Randomization

Participants were randomly allocated, in a 1:1 ratio, to receive misoprostol either sublingually or vaginally. The randomization sequence was computer-generated, using block sizes of 8, with each containing twenty random numbers. The allocation sequence was given to an independent pharmacist who prepared 160 consecutively numbered, opaque, sealed envelopes, each containing four 200-µg tablets of misoprostol and a regimen assignment. The treatment allocation was broken to the research assistant and the participant at the time of treatment application.

Procedures

Decisions regarding indication and timing of IOL were determined by KATH's obstetricians according to standard practice. On admission, routine clinical assessment included a history and physical exam, assessment of foetal presentation, sterile cervical exam, placement of intravenous access, obstetric ultrasound, and biophysical profile. A cardiotocograph (CTG) was performed prior to starting the IOL to rule out frequent uterine contractions or abnormal foetal heart tracing. 200µg tablets of Misoprostol (Cytotec®, Piramal Healthcare UK Limited, Northumberland, United Kingdom) were used in both study arms. Each tablet was split into approximate 50 µg portions using a pill cutter, a 50 µg portion was administered, and the other portions were discarded. In the vaginal route arm, 50µg of misoprostol was administered vaginally every 4 hours for a maximum of 4 doses.

In the sublingual arm, 50µg of misoprostol was administered sublingually every 6 hours for a maximum of 4 doses. Intravenous normal saline was started at a maintenance rate after the onset of contractions. The administration of misoprostol was stopped after the maximum of 4 doses was reached or if active labour was achieved. Active labour was defined as at least three regular painful contractions in a 10-minute period, each lasting 40 to 60 seconds. After active labour was achieved, artificial rupture of membranes or augmentation with oxytocin infusion was carried out as clinically indicated, according to department protocol. Augmentation was not started earlier than 4 hours after the last dose of misoprostol. If labour did not start within 4 hours of giving the fourth dose of misoprostol, the induction was considered to have failed, and the attending obstetricians determined subsequent management. Per routine clinical practice, uterine contractions were monitored every 30 minutes using palpation, and foetal heart rate was auscultated every 30 minutes after the start of the induction and every 15 minutes during the second stage of labour using a hand-held Doppler. Vaginal examinations were performed every 4 hours to assess cervical dilation and Bishop score. In addition, CTG was performed every 4 hours to evaluate uterine activity and foetal heart rate patterns. Relevant clinical data were extracted from participants' paper charts, including demographics, medical history, and obstetric history. Data on misoprostol given, IOL course, mode of delivery, and maternal and perinatal outcomes were prospectively collected.

Outcomes

The primary outcomes were 1) the rate of vaginal delivery and 2) the presence of uterine tachysystole/hyperstimulation. Secondary outcomes were induction-delivery interval (IDI), need for oxytocin augmentation, meconium-stained amniotic fluid, blood loss at vaginal delivery, 5-minute Apgar score less than 7, and neonatal intensive care unit (NICU) admission. Uterine tachysystole was defined as more than 5 contractions in 10 minutes, averaged over a 30-minute window.[14] Uterine hyperstimulation was defined as uterine tachysystole together with foetal tachycardia, late decelerations or absence of beat-to-beat variability on CTG.[15] Failed IOL was defined as the inability to achieve active labour at least four hours after the fourth dose of Misoprostol.[16]

Sample size and power

We assumed that the proportion of women achieving vaginal delivery and rate of uterine tachysystole were similar to those observed by Caliskan et al. [11] and Zahran et al[13]. for 50µg misoprostol administered 4-hourly vaginally and 6-hourly sublingually respectively. A total sample size of 160 participants (80 per group) has 80% power to detect a difference in the vaginal delivery rate of 22% and tachysystole rate of 13% between the two groups.[17]

Table 1: Sociodemographic and reproductive characteristics of the patients

Variable	Number	Percentage
Age	28.2(5.5)	
<25	43	26.9
26 to 30	65	40.6
31 to 35	36	22.5
> 35	16	10.0
BMI	26.5(4.6)	
Underweight	3	1.9
Normal	57	35.6
Overweight	67	41.9
Obese	33	20.6
Educational Level		
No formal education	23	14.4
Primary education	75	46.8
Secondary education and higher	62	38.8
Occupation		
Unemployed	35	21.9
Self-employed	84	52.5
Civil servants	41	25.6
Marital status		
Never married/separated	19	11.9
Married/cohabiting	141	88.2
Parity		
Nulliparous	62	38.7
Primiparous	39	24.4
Multip-of- 2-4	55	34.4
Grandmultip	4	2.5
EGA, completed weeks	40.6 (2.3)	
31-36	12	7.5
37-41	88	55.0
42+	60	37.5
Initial Bishop's score	8.2 (1.6)	
<6	14	8.7
6-8	63	39.4
>8	83	51.9
Indication for induction of labour		
Postdate pregnancy	121	75.6
Premature rupture of membranes	19	11.9
Medical condition in pregnancy/IUGR	20	12.5

Statistical analysis

Stata 13.0 (Stata Corporation, Texas USA) was used for analysis. The sociodemographic and obstetric characteristics, maternal and foetal outcomes were compared using Pearson's Chi-square (χ^2) or Fisher's exact tests (as appropriate) for categorical variables, while continuous variables were compared using student t-tests for mean differences, and Mann-Whitney U tests for median differences. All tests were two-tailed, and a p-value ≤ 0.05 was considered statistically significant.

Results

A total of 160 participants were included in the study, with 80 participants randomly assigned to the vaginal group and 80 to the sublingual group. Of all participants, the mean age was 28.2 (5.5) years, and the mean body mass index (BMI) was 26.5 (4.6). (**Table 1**). Most women had completed at least primary education (46.8 %), were employed (78.1%), and were married or cohabitating (88.2%). Most women (61.3%) were multiparous, and 92.5% were at least 37 weeks gestation or later. Prolonged pregnancies (≥ 42 weeks gestation) were common at 75.0% of the vaginal group and 76.3% in the sublingual group. (Table 2). The sociodemographic and reproductive characteristics were similar between the groups, with no significant difference in demographic variables, reproductive history, initial Bishop score, or indication for IOL. (**Table 2**).

Most participants (80.6%) delivered vaginally (**Table 3**). Of the 129 participants with vaginal delivery, oxytocin augmentation was needed by 19.4%, and 48.1% had an induction to vaginal delivery interval of less than 24 hours. Close to half of the participants delivered with a single dose of misoprostol. Of the 31 participants with a caesarean section, cephalopelvic disproportion was the most common indication (45.2%). The rates of vaginal delivery (78.8% vs. 82.5%) and caesarean section (21.2% vs. 17.5%) were similar in the two groups (**Table 4**). The groups did not differ significantly with regards to the proportion of women who delivered vaginally after a single dose of misoprostol, the mean total dose of misoprostol required to achieve delivery or the need for oxytocin augmentation.

The mean induction-to-vaginal delivery interval was similar, at 10.5 hours in the vaginal group compared to 11.9 hours in the sublingual group (p=0.10). The groups did not differ in the proportion of caesarean section for failed IOL, at 17.6% (n=3) in the vaginal group and 21.4% (n=3) in the sublingual group. Rates of uterine tachysystole (6.3% vs. 5.0%; p=0.73) and hyperstimulation (3.8% vs 1.3%; p= 0.64) were low and comparable in the two groups, (Table 5). Two (2.5%) women in the vaginal group compared to 1 (1.3%) in the sublingual group had uterine tachysystole accompanied by late FHR decelerations. One (1.3%) woman in the vaginal group had uterine tachysystole accompanied by foetal tachycardia, compared to 0 (0%) in the sublingual group. The incidence of meconium-stained amniotic fluid, mean blood loss at vaginal delivery, and rate of postpartum haemorrhage (defined as blood loss >500cc) after vaginal delivery did not differ significantly between groups. Regarding neonatal outcomes, the mean birth weight was 3.2 (0.6) kg, 14.4 % has an APGAR score less than 7 at 5 minutes of life, and

20 % were admitted to the NICU. Although mean birth weight did not differ between groups, there was a significant difference in birth weight ≥4.0kg, with 6.2% (n=5) in the vaginal group compared with 15.0% (n=12) in the sublingual group. The proportion of low Apgar scores at 1 and 5 minutes and NICU admission were similar between groups.

Table 2: Sociodemographic and reproductive characteristics of the patients

Misoprostol administration route			
Variable	**Vaginal (n=80)**	**Sublingual (n=80)**	**P-value**
	n (%)[a]	**n (%)[a]**	
Mean age (SD), years	28.6(5.8)	27.8(5.2)	0.37
Mean BMI (SD), kg/m^2	26.6(4.8)	26.4(4.4)	0.83
Educational Level			0.42
No formal education	11(13.8)	12(15.0)	
Primary education	34(42.5)	41(51.3)	
Secondary education and higher	35(43.7)	27(33.7)	
Occupation			0.37
Unemployed	18 (22.5)	17 (21.3)	
Self-employed	38 (47.5)	46 (57.5)	
Civil servants	24 (30.0)	17 (21.2)	
Marital status			0.46
Never married/separated	8 (10.0)	11 (13.8)	
Married/cohabiting	72 (90.0)	69 (86.2)	
Parity			0.33
0	28(35.0)	34(42.5)	
1+	52(65.0)	46(57.5)	
EGA, completed weeks			0.95
31-36	6 (7.5)	6 (7.5)	
37-41	43 (53.8)	45 (56.3)	
42+	31 (38.7)	29 (36.2)	
Initial Bishop's score			0.20
<6	4 (5.0)	10 (12.5)	
6-8	31 (38.8)	32 (40.0)	
>8	45 (56.2)	38 (47.5)	
Median (IQR)	9 (8-10)	8 (7-9)	0.08
Indication for induction of labour			
Postdate pregnancy	60 (75.0)	61 (76.3)	
Premature rupture of membranes	10 (12.5)	9 (11.3)	
Medical condition in pregnancy/IUGR	10 (12.5)	10 (12.5)	0.97

[a]Values are given as number (percentage) unless otherwise indicated. SD, standard deviation; BMI, body mass index; EGA, estimated gestational age; IQR, interquartile range; IUGR, intrauterine growth restriction.

Table 3: Maternal Outcomes

Variable	**N=160**	**N (%)**
Mode of delivery		
Caesarean section	31	19.38
Vaginal delivery	129	80.63
Vaginal delivery , N=129		
Vaginal delivery with 50	61	47.3
Vaginal delivery with 100	48	37.2
Vaginal delivery with 150	20	15.5
Need for oxytocin augmentation		
Yes	31	19.4
No	129	80.6
IDI, N=129		
less 12	15	11.6
12 to 24	64	49.6
more 24 hours	37	28.7
Indication for CS, N=31		
foetal distress	10	19.4
Failed IOL	6	32.3
CPD	14	45.2
Cord prolapse	1	3.23

[a]N=160 unless otherwise specified; bValues are given as number (percentage) unless otherwise indicated; SD, standard deviation; NICU, neonatal intensive care unit.

Tables 4: Clinical outcomes of induction in both groups

Variable	**Vaginal group n (%)[a]**	**Sublingual group n (%)[a]**	**P-value**
Mode of delivery, n=160			0.55
Vaginal	63 (78.8)	66 (82.5)	
Caesarean section	17 (21.2)	14 (17.5)	
NMD[b], vaginal delivery, n=129			0.40
1	31 (49.2)	30 (45.5)	
2	25 (39.7)	23 (34.9)	
3 or 4	7 (11.1)	13 (19.7)	
Mean total misoprostol dose (SD), mcg	86.3 (41.3)	93.1 (43.4)	0.31
Need for oxytocin use	15 (18.8)	15 (18.8)	1.00
Induction-vaginal delivery interval, n=129			0.11
<12 hours	42 (66.7)	35 (53.0)	
12-24 hours	21 (33.3)	31 (47.0)	
Mean (SD)	10.5 (4.6)	11.9 (5.1)	0.10
Indication for caesarean section, n=31			0.32
Failed IOL	3 (17.6)	3 (21.4)	
Foetal distress	8 (47.1)	3 (21.4)	
CPD	6 (35.3)	8 (57.2)	

[a]Values are given as number (percentage) unless otherwise indicated. [b]NMD number of misoprostol doses. SD, standard deviation; IOL, induction of labour; CPD, cephalopelvic disproportion.

Tables 5: Adverse Maternal and Foetal Outcomes

Variable	Vaginal group	Sublingual group	P-value
	n (%)[b]	n (%)[b]	
Uterine tachysystole	5 (6.3)	4 (5.0)	0.73
Uterine hyperstimulation	3 (3.8)	1 (1.3)	0.64
UT plus Late FHR deceleration	2 (2.5)	1 (1.3)	
UT plus foetal tachycardia	1 (1.3)	0 (0.0)	
Meconium-stained amniotic fluid	37 (46.3)	30 (37.5)	0.26
Blood loss at vaginal delivery, ml (n=129)			0.80
<200	18 (28.6)	22 (33.3)	
200-499	40 (63.5)	40 (60.6)	
≥500	5 (7.9)	4 (6.1)	
Mean (SD)	240.7 (127.8)	238.6 (106.6)	0.10
Birth weight, kg			0.05
<2.5	11 (13.8)	4 (5.0)	
2.5-3.9	64 (80.0)	64 (80.0)	
≥4.0	5 (6.2)	12 (15.0)	
Mean (SD)	3.1 (0.57)	3.3 (0.56)	0.06
Apgar score <7 at 1 min	30 (37.5)	22 (27.5)	0.18
Apgar score <7 at 5 min	15 (18.8)	8 (10.0)	0.11
NICU admission	18 (22.5)	14 (17.5)	0.63
Reason for NICU admission (n=32)			0.10
Apgar score <7 at 5 min	15 (83.3)	8 (57.1)	
Other reasons	3 (16.7)	6 (42.9)	

[a]N=160 unless otherwise specified; [b]Values are given as number (percentage) unless otherwise indicated; SD, standard deviation; NICU, neonatal intensive care unit

Discussion

We set out to compare the effectiveness and safety of sublingual misoprostol at 6-hourly intervals with the same dose of vaginal misoprostol at 4-hourly intervals for IOL. Except for significantly higher mean birth weights in the sublingual group, the sociodemographic characteristics, general and adverse maternal and perinatal outcomes were comparable between the two groups.

Previous studies comparing sublingual and vaginal misoprostol have reported the effectiveness of the sublingual route.[11,13] The 82.5% vaginal delivery rate in the sublingual arm of our study was higher than the rate of 70.6%, observed in the sublingual arm of a similar study, possibly due to a lower average pre-induction score of 2 in that study.[13] Bishop score correlates closely with the likelihood of successful outcome (i.e., vaginal delivery) at IOL, and the higher the Bishop score, the more likely a vaginal delivery would occur.[18] A far higher vaginal delivery rate of 92.5% was observed in the sublingual arm of another study which used the same dose but a shorter dosing interval of four hours.[11] To the contrary, fewer deliveries (<70%) occurred in the sublingual arms of similar studies that used 25µg of misoprostol in a 6-hourly dosing interval.[19,20] There is some evidence of appreciable increase in effectiveness when the misoprostol dose was increased from 25 to 50 µg at the same dosing interval using the vaginal route.[21]

Based on the acceptability and ease of sublingual administration of misoprostol, it is rewarding to observe more vaginal deliveries within acceptable time limits of induction. Consistent with the results of previous studies,[11,13,16,19,22] more women delivered vaginally in the vaginal arm after a single dose of misoprostol. The patterns of more vaginal delivery after the first misoprostol dose may suggest the possibility of a greater degree of uterine contractility secondary to prolonged plasma misoprostol following vaginal administration.[23]

We also observed that more women in the vaginal group delivered vaginally in less than 12 hours of induction. Similar findings were reported by Caliskan *et al*.[11] This pattern of more vaginal delivery under 12 hours may suggest a greater degree of uterine contractility with the vaginal at a certain critical misoprostol dose, which is likely to be more than 25 µg. The IDI of 11.9 hours in the sublingual arm of this study is much shorter than the 17.2 hours of a similar study by Zahran et al. 2009, using the same dose and dosing interval, but compares favourably with IDIs of 11 hours in a study where 50 µg misoprostol dose was given at 4-hourly intervals.[11,13] These disparities may be attributed to differences in the obstetric characteristics of the mothers. One such difference may be the mean pre-induction Bishop scores reported in the sublingual arms. The mean total misoprostol dose required to achieve vaginal delivery was higher in the sublingual group. This is consistent with the results of other studies.[11,20]

Per the pharmacokinetics of sublingual misoprostol (rapid fall in plasma misoprostol following single sublingual administration), the frequency and amplitude of uterine contractions may fade away quickly after sublingual administration, thus probably necessitating higher misoprostol dose for the same clinical effect.[24] In agreement with the results of one systematic review comparing the effectiveness of sublingual and vaginal misoprostol, we did not find any significant differences in the need for oxytocin augmentation between the two groups.[7] It is worth noting that other studies have reported higher oxytocin augmentation rates of 36-81% following vaginal and sublingual administration of Misoprostol for IOL.[11,13,22] This is probably due to the lower mean dose of misoprostol used in those studies.

The caesarean section rates in this study are comparable to those of a similar study where 50µg of misoprostol was also given but at shorter dosing intervals of 4 hours in both arms.[11] However, it is

pertinent to note that while rates of foetal distress (ominous FHR alterations) were similar in the vaginal arms of both studies, the rate in their sublingual arm was four-fold higher than the rate in our sublingual arm. This difference may be attributable to the shorter doing interval in their study. Furthermore, the foetal distress rate in their sublingual arm is higher than that in the vaginal arm (15% vs. 8.8%), while the converse was the case in our study (3.8% in the sublingual arm vs. 10% in the vaginal arm). These findings suggest that the 50μg of misoprostol given at six hourly intervals has comparable delivery outcomes with the same dose given vaginally or sublingually at four hourly intervals but with fewer FHR abnormalities.

The incidence of meconium-stained liquor was over one-third in both arms of the study. This is a common finding in labours induced with misoprostol, and it is a direct effect of misoprostol on foetal intestinal smooth muscle.[25] This is of significance in most low-resource settings where electronic foetal monitoring is not readily available and when intermittent foetal heart auscultation with the Pinard stethoscope or foetal doppler is not done meticulously. Meconium-stained liquor becomes an important clinical sign of foetal compromise and consequently an indication for caesarean section during inductions in such settings. In low-risk pregnancies, electronic foetal monitoring tends to be associated with increased operative delivery, while in high-risk pregnancies (such as HDOPs), it could reassure clinicians of foetal condition and avoid unnecessary intervention. Although not a direct cause of foetal hypoxia per se, meconium-stained liquor is associated with increased risks of meconium aspiration and subsequent neonatal morbidity.[25] Despite the high rate of meconium-stained liquor in our study, it is gratifying to note that our caesarean section rate was relatively lower due to meticulous intermittent foetal heart auscultation or use of the CTG.

More babies in the vaginal group had low birth weight, which may have accounted for the relatively higher low Apgar scores at 5 minutes and NICU admission rates in that arm. Despite some inaccurate foetal weight estimations leading to the inclusion of macrosomic babies in the study, our initial clinical assessment suggested that these women could deliver vaginally, and most did. Therefore, the higher rate of foetal macrosomia in the sublingual group was not a major contributor to the CPD rate in that group, which did not differ significantly from the rate in the vaginal group. The study had a couple of limitations. First, breaking off 50 μg from the 200 μg misoprostol tablet may not have been very accurate due to the shattering and crumbling of the tablet. However, trained research assistants, pile cutter, and alignment of the two 50 μg parts from the same 100 μg portion minimised such inaccuracies. Second, the use of intermittent CTG monitoring for a selected group of patients instead of continuous CTG monitoring for every case of induction may have introduced some bias. However, since the department did not have enough CTGs for multiple concurrent inductions and other labour cases, this remained the most practical option. Furthermore, the use of one-on-one care (due to relatively few cases of induction), as well as regular and diligent monitoring of the FHR, contractions, and passage of meconium, ensured that to a large extent, induction of labour-related abnormalities were not missed thus limiting the bias.

Conclusion

Fifty micrograms sublingual misoprostol administered 6-hourly was as effective as the 50 μg vaginal misoprostol administered 4-hourly in achieving vaginal delivery, and the incidence of uterine tachysystole and uterine hyperstimulation were not significantly different. The sublingual regimen had persuasive benefits of less adverse perinatal outcomes. Although the induction-to-vaginal delivery interval was longer, and there was an increased need for oxytocin augmentation in the sublingual arm of the study, the difference was not statistically significant. Therefore, 50 μg sublingual misoprostol given at 6-hourly intervals appears to be a convenient regimen for IOL. Risks of PPH and satisfaction associated with the various routes and dosing regimens of Misoprostol for IOL need to be investigated.

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THE MYTHS OF ALCOHOL USE IN GHANA

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Abstract

Objective: Alcohol has become a regular part of social functions in many cultures. Before the advent of alcohol use disorder becoming a nosological entity, many cultures noted the detrimental association with alcohol use, particularly in its excess use. With such observation, many cultures and even medical research, have tried in many ways to either justify or explain away the harmful effects of alcohol use and gone ahead to promote the use for the most mundane effects. Such explanations for alcohol use over time become acceptable in many cultures and can be viewed as myths. Four of such myths associated with alcohol use in Ghana, are presented here.

Methodology: These myths were drawn from a bigger study that looked at the prevalence of alcohol use disorder in an engineering company with mixed methods. A thematic analysis of their responses was used to arrive at these myths.

Results: Participants believed that alcohol is sexually potentiating, improves appetite and quality of sleep, and has medicinal qualities like "curing" chicken pox and necessary for successful surgery. Apart from the inconclusive evidence of alcohol, particularly red wine, protecting against cardiovascular death, we could not substantiate any of these claims from medicine.

Conclusion: Myths of alcohol use in different cultures need to be incorporated in preventive strategies adopted for alcohol use disorder for a comprehensive public health approach to curb the menace. Such myths should be integrated in the training of health workers to help them understand the addictive behaviour of alcohol users and the anthropological underpinnings to alcohol use.

Key words: *alcohol use, alcohol use disorder, anthropology, effects of alcohol and myths*

Introduction

Alcohol, an oxygenated hydrocarbon (ethanol: C_2H_5-OH), is considered a food and a drug. As food, consumption of 30g or 3 units of alcohol can produce up to 10% of daily energy requirement.[1] As a drug, alcohol is psychoactive and can change how we feel, think or behave when consumed. Thus, it may be anxiolytic, mood enhancing, sedating, produce motor incoordination or impair judgement.[2] Even though no biochemical reaction in the body requires exogenous alcohol, it is commonly consumed particularly at social functions in many cultures.[3]

Refined alcohol was introduced to Ghana by the trans-Atlantic trade.[4] Alcohol has however been part of diet in some parts of Ghana, for instance, Upper West Region where the beverage is brewed from millet.[5] With the introduction of refined alcohol, Ghanaians also began refining alcohol and the most popular is a gin known as *Akpeteshie*.[6] This local gin was even banned by the British colonial masters and only legalized 5 years after Ghana's 1957 political independence.[5] More illicit alcohol is abused in Ghana than licit refined alcoholic beverages according to World Health Organization.[7,8] Since most of the illicit alcohol are from spirits, *Akpeteshie* makes up the bulk of that. Studies in Portugal among high school students revealed many myths were associated with alcohol consumption.[9]

Similar myths have been documented in Nigeria where alcohol is believed to be medicinal.[10] The medicinal properties of alcohol myth is also in Ghana, except that it is alcoholic beverage and/or disease specific. In this study we put together the various myths that participants shared as the beneficial effects of alcohol.

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Method

This was part of a cross-sectional study done to assess the medical disease burden of alcohol use disorder among employees of a public engineering organization in Ghana[11]. Every 4th person on their nominal roll was pre-selected to be in the study (450 in all). All those who were preselected and were on leave or out of the office that day were excluded. In all, 373 employees returned the questionnaire and were included in the study. A mixed method was adopted, and the quantitative part has been published. The responses to the beneficial effects of alcohol were thematically analyzed and the responses that were shared by at least 10 participants were noted as a myth of alcohol use.

Results

Myth 1

Alcohol is sexually potentiating.

This was the most common perception of alcohol shared by the majority of participants, mainly men. This may be fueled by the many advertisements by alcohol producing companies in Ghana who use euphemism to propagate this view. For instance, an advert of a popular alcoholic beverage, *Adonko*, has many women swinging one man on a seesaw. A seesaw is referred to as *Adonko* in *Akan*, the most popular Ghanaian language, and it is also euphemism for sex (from "swinging waist").[12] Indirect language forms are common among Akan speakers.[13] By using indirect language too, the alcohol producing companies avoid sanctioning by the Food and Drug Authority (FDA) for making false claims.

"Drinking alcohol evokes two conceptually separable components: a psychologically driven expectancy component and a pharmacologically driven bioactive component".[14] The pharmacological component is largely as a central nervous system (CNS) depressant while the psychological component will include social disinhibition and increased libido. Perhaps, it is the increased libido in energetic young people who are physically strong anyway, that makes them believe the alcohol gave them "strength" for sex. In fact, alcohol use can cause impotence or erectile dysfunction, contrary to the myth that it makes one more sexually potent.[2,15]

Myth 2

Alcohol improves appetite.

Many participants perceived alcohol as an agent that enhances their appetite and hence, they drink it before a meal to get them to eat more. Even though moderate amounts of alcohol may boost appetite in some people, excess of it decreases appetite. The evidence for improved appetite with alcohol is not conclusive from literature and at best, only anecdotal according to Yeoman *et al.*[16] Caton *et al* posits that alcohol merely serves as cues to eat more and not a direct physiological response to the ethanol in the alcoholic beverage.[17]

Alcohol consumption has been shown to decrease ghrelin, a hormone produced by the enter-endocrine cells to regulate food intake and basically makes us feel hungry when high in the blood.[18] This means, alcohol which is addictive and can readily lead to binge drinking, will cause decreased blood levels of ghrelin and this will decrease our physiological need for food and cannot therefore be said to be appetite enhancing. Hence this perception can only be a myth.

Myth 3

Alcohol makes one sleep better.

Alcohol is believed to give good sleep when consumed as expressed by the participants. Alcohol is a potent inducer of sleep by reducing sleep latency but it unfortunately decreases the overall quality of sleep and this is even worse for persons who develop alcohol use disorder.[19,20] A study even observed a dose-response association between alcohol intake and poor quality of sleep in an epidemiological study.[21] In essence, alcohol being a potent somnogen, does not in any way compensate for the overall poor-quality sleep it gives and it will not be worth taking alcohol to sleep better. The belief therefore that alcohol gives good sleep we observed among the participants can only be a myth.

Myth 4

Alcohol has medicinal properties.

Many participants asserted that alcohol has some medicinal properties, so it was good to have a little alcohol in your body most of the time. They erroneously believed foods like bread, *kenkey* and *banku* (local food produced from corn) which made use of the process of fermentation contain alcohol at the time they are ready for consumption. All these foods are heated to temperatures above 100ºC for not less than 30 minutes, by which time the little amount of ethanol which boils at 70ºC would have evaporated. So, the perception that some of our staples contain alcohol already and that is what keeps us healthy cannot be right.[22]

The medicinal properties alcohol is believed to have include having a little amount of alcohol in one's blood to go through surgery successfully. Another is that it is good for the heart, and the last that featured often was using it to treat chicken pox. None of these claims can be substantiated except for the inconclusive evidence that red wine offers some protection against cardiac disease. This claim has received a lot of attention and research studies. Current evidence supports the fact that the polyphenols such as resveratrol in fruits which may end up in red wine are what provide the antioxidant properties that reduce the coronary risk and not the ethanol in alcoholic beverages.[23-25] The reduced cardiovascular risk observed in epidemiological studies among persons who consume a lot of red wine with their meals like the French, is because of the "red" in red wine and not the ethanol. This same effect will be observed if fruits replace the wine. The other medicinal properties cannot be substantiated at all and hence the belief that alcohol may have some beneficial properties can only be myth.

Conclusion

Alcohol consumption has been with Ghanaians since antiquity and its use has been associated with beliefs that encourage use of more of it and risking addiction. These misperceptions or myths will need to be addressed and debunked especially among the youth if we are to prevent alcohol use disorders. Alcohol use disorders are better prevented than treated and a concerted effort adopting a public health approach with anthropological underpinnings will achieve more.

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SPECIAL ARTICLES

HISTORY OF DIAGNOSTIC RADIOLOGY IN GHANA

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Summary

The history of Radiology in Ghana which began in 1951 has not been fully documented. The establishment of the Ghana College of Physicians and Surgeons, of which the Faculty of Radiology is a part, the West African College of Surgeons, as well as other institutions for radiography training, have played a major role in improving the Radiologist/Population-, Radiologist/Radiographer- and Radiographer/Population ratios in the country.

Credence has also been given to a number of aims and objectives of the Faculty of Radiology of the Ghana College of Physicians and Surgeons such as a) The turning out of Radiologists for 9 out of the 16 regions of the country. b) A vast improvement in the quality and quantity of radiological services to the citizenry by the provision of modern radiological equipment, as well as increased manpower for the various diagnostic procedures. c) The establishment of subspecialties such as Interventional radiology, Neuroradiology and Paediatric radiology.

The article seeks to highlight some of the major achievements and challenges in the delivery of radiological services to the citizenry of Ghana. Some of the challenges facing the specialty such as inadequate equipment in some public hospitals and the lack of maintenance of same are discussed. There is also inequitable distribution of radiologists across the country. Recommendations in the area of increased number of resident's slots for postgraduate training by the Ministry of Health, as well as the reestablishment of external exposure for trainers to deepen their knowledge for the training of residents have been mentioned.

Key words: *Ultrasonography, Computerized Tomography, Magnetic Resonance Imaging, Radio-isotope imaging, Mammography*

Introduction

X-rays were first discovered by a German professor of physics by name Wilhelm Conrad Roentgen on November 8th, 1895, in Wurzburg. He obtained a Nobel Prize in physics for his discovery in 1901. One of the earliest photographic plates from his experiments was a film of his wife's hand with a ring on it produced in 1896. His publication was entitled 'A new Kind of Rays' and this sparked an interest in X-rays throughout the scientific world. A year after his discovery, in Menlo Park, New Jersey, Thomas Alva Edison invented the fluoroscope in 1896. Following the discovery of X-rays, several applications of it and other forms of diagnostic methods have been developed to widen the scope and role of radiology in Medicine. Such applications and methods include the use of Ultrasonography (USG), Computerized Tomography (CT), Magnetic resonance imaging (MRI), Radio-isotope imaging, namely Single Photon Emission Computerized Tomography (SPECT) and Positron Emission Tomography (PET), digital radiography (DR) and mammography.[1,2] Ian Donald invented the foetal ultrasound in 1958 after the piezoelectric effect of a quartz crystal under mechanical vibration had been noted in 1880 by the brothers Jaques and Pierre Curie to produce electricity. Following that event several further developments in the commercial use of ultrasound have taken place dating back to 1963 and culminating in devices such as real time, colour Doppler and Spectral Doppler, 3D and 4D foetal ultrasound, the latter two in the 1980s and 1990s respectively as well as several other areas of utility. The first commercially available CT scanner was created by a British Engineer named Godfrey Hounsfield of EMI Laboratories in 1972. He co-invented the technology with physicist Dr. Allan Cormack and both researchers were later jointly awarded the 1979 Nobel Prize in Physiology and Medicine. MRI started in early 20th century. MRI was invented by Paul Christian Lauterbur, an American chemist who shared the 2003 Nobel prize in Physiology or Medicine with Peter Mansfield.

PET was discovered by Edward J. Hoffman, professor of nuclear medicine, together with Michael E. Phels in 1974 while the first whole body PET scanner appeared in 1977. The first completely dedicated mammography unit was developed by Gros in France in the middle 1960s. Digital radiography (DR) was introduced in the mid-1980s precisely in 1987 with Dr. Francis Mouyen launching the first digital radiography system[1,2]. Medical imaging has improved immensely since the discovery of the first X-rays over 120 years ago. There is much more accuracy in diagnosing a

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medical problem and because of these advances, there is also much less need to perform exploratory surgery.

Historical Background

It all started in 1951 when one expatriate radiologist by name Dr. Ali and four expatriate radiographers arrived in the country and were posted to the Korle-Bu Hospital with one of the latter four by name John Moss taking up the position of chief radiographer. The team had a supportive staff of eight x-ray operators who had undergone a 3-year training in radiography at the Ministry of Health X-ray Training School. The pioneer and first Ghanaian radiologist by name, Dr. Ferdinand Christian of blessed memory arrived in Ghana after the departure of the expatriate personnel and was posted to the Korle-Bu Hospital in 1964. He had a supportive staff of 12, out of which 4 had been trained as Radiographers in Great Britain. Other X-ray operators were posted to the 'G' Hospital in Kumasi now the Komfo Anokye Teaching Hospital in the Ashanti region, and other regional hospitals, namely Central, Western, Eastern, Volta and Northern, totalling in all 70. This gave a radiologist/radiographer ratio of 1/70 and a radiologist/population ratio of 1/7,739,473.

Dr. W. O. Brakohiapa, the principal author (present author) arrived in Ghana in February 1975 as a radiologist, after undergoing a four-year training in radiology at the Justus-Liebig University in Giessen, Western Germany. He was posted to the Korle-Bu Hospital X-ray department in February 1975, and thus became the second radiologist at that hospital. Later on, Dr. Mrs. Kuffuor, an expatriate radiologist, was posted to the Komfo-Anokye Teaching Hospital in the late 70's. The Radiologist/Population ratio increased to 3/ 10,395,452 i.e., 1/3,465,150 in 1977 from 1/7,739,473 in 1965. Special mention should be made of the role played by Mr. John Quaye of blessed memory, a principal radiographer, in assisting the present author in the performance of all the angiograms (renal, celiac and peripheral) between February 1975 and February 1981.These specialized examinations were later on carried out by Prof. Boateng-Jumah, Dr.Chris Kotei, both of blessed memory, (as well as the present author).

Prof. Boateng-Jumah and the present author taught residents in training under supervision, namely Drs. S. Asiamah, E. K. Brakohiapa, A. Kaminta and E. M. Ogoe and many others from 1999 to the mid-2000. Prof. Boateng-Jumah and Dr. Chris Kotei joined the Radiology department of the Korle-Bu Teaching hospital in the early 80's, further increasing the radiologist-radiographer ratio. By 1996 the number of radiologists in the country had increased to 7 made up of Prof. Boateng-Jumah, Dr. Chris Kotei and the present author of the Korle-Bu Teaching Hospital. Dr. Mrs. Kuffuor, a British born radiologist, Prof. Genny Scarisberg, at the Komfo Anokye Teaching Hospital (KATH), Dr. Kutin Nuamah at the 37 Military Hospital and Dr. Mrs. Ibukun Olubanke Ahove of the Social Security and National Insurance Trust Hospital (SSNIT), further increasing the Radiologist/Population ratio to 7/17,462,496, i.e.,1/2,494,642.[3] Mr. Smith Kumordjie Ocansey of blessed memory was the first Ghanaian chief radiographer at the Korle-Bu Teaching Hospital after the departure of the expatriate staff in the mid 60's till his retirement in the mid 80's. He was followed by Mrs. Dorothy Mills, from the mid 80's to the early 90's. Mrs. Agnes Odonkor of blessed memory succeeded as the head till the year 2000 and was followed by Miss Harriet Ankrah (later Mrs. Harriet Duah) in 2000 till 2005. Mr. Steven Boateng succeeded Mrs. Duah in 2005 and is the current Chief radiographer of the same institution.

Human Resource Development- (Teaching Programmes)

As with the training of anesthetists and nurse anesthesists in Ghana, the training of radiologists and radiographers began with The West African College of Surgeons and the Ghana College of Physicians and Surgeons for radiologists, and the Ministry of Health training school for X-ray operators.[4] Training for x-ray operators continued with an intake of 10 trainees every 2 years. Mr. Ephson of blessed memory, (who gave all the historical information about radiology in Ghana verbally) to the present author in the period preceding the arrival of the latter in Ghana in 1975, was the sole graduate tutor. He was joined by Messrs. John Quaye and Boadi of blessed memory, John Gagbetor, Mrs. Harriet Duah and Mr. K. Arthur as teaching staff. Mr. Ephson was the first principal of the Ministry of Health X-ray Training School for X-ray operators from 1964 to 1982, followed by Mrs Harriet Duah from 1982 to 1986. Mr. Boadi was the principal from 1986 to 1988 but was succeeded again by Mrs Duah from 1988 to 2004. Mr. K. Arthur succeeded Mrs. Duah from 2004 to 2006. The X-ray operators of The Ministry of Health X ray Training School were later designated as X-ray technicians. The school folded up in 2006 because the School of Biomedical and Allied Health Sciences (SBAHS) of the College of Health Sciences, University of Ghana had started it's radiography BSc degree training already in 2002-2003 academic year, and taken over the further training of radiographers in the country.

Undergraduate and Graduate Training of Radiographers

Masters, Bachelors and PhD Degrees: The School of Biomedical and Allied Health Sciences (SBAHS) of the College of Health Sciences, University of Ghana continued with the training of radiographers, offering a 4-year diagnostic and therapeutic radiography Bachelor of Science, BSc. degree and an MSc. degree in medical ultrasonography. Also under review in the same facility is the MSc in medical imaging and radiotherapy.

The School of Allied Health Sciences (SAHS) of the University of Cape Coast (UCC) offers a BSc. Degree course in Diagnostic Imaging Technology for Radiographers. The University of Health and Allied

Sciences (UHAS), Ho, also offers a Bachelor of Diagnostic Imaging (radiography), Master of Philosophy in Medical Imaging, and Doctor of Philosophy for radiographers, sonographers, radiotherapists, medical physicists and radiologists. The Kwame Nkrumah University of Science and Technology (KNUST) offers a four-year BSc degree course in ultrasonography for radiographers.[5]

Diploma certificate: There is a 3-year diploma training program for radiological technicians started 5 years ago at the College of Health and Well-being, in Kintampo, ran by the Ministry of Health.

Training of Radiologists: West African College of Surgeons (WACS)

The postgraduate training program of the West African College of Surgeons (WACS) was inaugurated in January 1975. Prof. Boateng-Jumah, Dr. Chris Kotei and the present author were external examiners as well as lecturers of the faculty of radiology of the college. Despite the early start of the postgraduate training program of the West African College of Surgeons in 1975, it was not until 1999 that the residency program of the Ghana College of Physicians and Surgeons started in Ghana. Drs. Samuel Asiamah, Edmund Brakohiapa and Edwin Ogoe of the Korle-Bu Teaching Hospital and Dr. Andrew Kaminta of the 37 Military Hospital enrolled as the first group of radiology residents.

These pioneer residents had to do a lot of travelling to Nigeria for multiple radiology update courses with the support of the Ministry of Health. Prof. Boateng-Jumah and the present author asked then Dr. Millicent Obajimi (now Prof. M. Obajimi) of Ibadan University College Nigeria to assist as a visiting lecturer in the training of the first group of residents in the year 2000 followed by Dr. Alex Akoto Yeboah to beef up the faculty. The first Ghanaian fellows of the West African College of Surgeons in radiology by examination were Drs. Samuel Asiamah, Edmund Brakohiapa and Edwin Ogoe (2003), followed a year later by Dr. Andrew Kaminta (2004). Thereafter Dr. Vincent Hewlett and Dr. Mrs. Klenam Dzefi-Tettey in 2005 with Dr. Mrs. Klenam Dzefi-Tettey becoming the first female Ghanaian radiologist to qualify from the WACS. Other fellows from the WACS were Drs. Eric Otu-Danquah, Mrs. Augustina Badu-Peprah, Adu Tutu Amankwah, Margaret Twum, Yaw Mensah-Boateng, Benjamin Dabo Sarkodie, Jared Oblitey, Hafisatu Gbadamosi, Rosemond Aboagye, Andrea Appau, Mary Oblitey and Yaa Achiaa Afreh, making a total of eighteen (18) Ghanaian Fellows to date. The current Ghanaian examiners of WACS are Drs. Samuel Asiamah, Edmund Brakohiapa, Vincent Hewlett, Klenam Dzefi-Tettey, Augustina Badu-Peprah,and Yaw Mensah-Boateng.

History of the Establishment of the Ghana College of Physicians and Surgeons (GCPS)

It all started in a small hotel in New Achimota in 2002 when the then Acting Rector of the College, Prof P. K. Nyame, called a meeting of heads of Faculties and their deputies to start drawing up their curricula for the establishment of the Ghana College of Physicians and Surgeons. Prof. Boateng-Jumah and the present author attended that meeting and started immediately thereafter to work on the curriculum for the Faculty of Radiology. Others who played a role were the British born Radiologist Dr. Genny **S**carisburg from the KATH and Dr. Alex Akoto Yeboah with the help of the newly qualified fellows of WACS. Eventually the GCPS was inaugurated in 2003 with Prof. P. K. Nyame as the first rector of the college, and Prof. Boateng-Jumah as the first chairman of the Faculty of Radiology, followed by Dr. Alex A. Yeboah and the present author; the latter in 2006.

Aims and Objectives

The aims and objectives of the faculty of Radiology in line with those of the Ghana College of Physicians and Surgeons are basically to increase the overall manpower in the delivery of radiological services to the citizenry of Ghana and beyond.[6]

Accreditation of Teaching Hospitals

The KBTH in Accra and later the KATH in Kumasi were giving full accreditation whereas the 37 Military Teaching Hospital in Accra was given partial accreditation according to specific criteria of the college. Upon the acquisition of an MRI machine, the 37 Military Teaching Hospital was also given full accreditation while the University of Cape Coast Teaching Hospital was given partial accreditation in 2018. A final curriculum was drawn up in 2007 by Dr. Samuel Asiamah and the present author both of the Korle-Bu Teaching Hospital as well as Dr. AduTutu Amankwah of the Komfo-Anokye Teaching Hospital based mainly on the Australian model, while the ultrasound portion of the curriculum was based on the model of the Jefferson Ultrasound Radiology Education Institute (JUREI) at the Thomas Jefferson University Hospital in Pennsylvania USA. A review of the curriculum including a new system of fellowship has been drawn up by Drs. S. Asiamah, Mrs. Ewurama A.Idun, Mrs. Klenam Dzefi-Tettey and Adu Tutu Amankwaa in November 2021.

Human Resource Development - (Training Programme)

The radiology postgraduate program of the GCPS started at the KBTH and Dr. C. Tasiame after passing a written and oral examination in March 2004 was admitted into the program in September of the same year. Later Drs. A. Ankrah, Ewurama A. Idun, Alhassan, E. M. K. Edzie, K. Amedi, H. Afachao and Adu-Gyimiri joined him for the membership program, with the residents of the 37 Military Hospital receiving part of their training at the KBTH. The faculty examiners comprised the present author as chief examiner and others namely Drs. Samuel Asiamah, Edmund

Brakohiapa, Mrs. Augustina Badu-Peprah, Andrew Kaminta, Mrs. Klenam Dzefi-Tettey and Vincent Hewlett with Dr. Yaw Mensah-Boateng as the invigilator, and Professor Donald Amasike Nzeh of Nigeria as the external examiner. The heads of Departments of Radiology in the teaching hospitals later became designated as examiners. The total number of residents in the Teaching Hospitals at the end of February 2022 is 68 comprising 30 at the Korle-Bu Teaching Hospital, 17 at the 37 Military Teaching Hospital and 21 at the Komfo Anokye Teaching Hospital and there are 6 fellows of GCPS by examination to date.

The Role of the Teaching Hospitals

The heads of the teaching hospitals and their supporting colleagues have played a vital role in the training of residents for the postgraduate program, namely Dr. A. Kaminta, who played a vital role in the training of his residents and was an examiner till his retirement with Drs. Alhassan, Mrs. E. A. Idun and currently Dr. K. Amedi as the next head of department supported by Dr. Janet Bamfo-Addo, Dr. Lulu (a visiting Cuban radiologist), and three other radiologists of the 37 Military Hospital; Prof.Boateng-Jumah, Drs. Alex Akoto Yeboah, Vincent Hewlett, Yaw Mensah-Boateng and Mrs. Klenam Dzefi-Tettey as successive heads of the department of radiology of the Korle-Bu Teaching Hospital, supported by Dr. Chris Kotei, the present author, Drs. Samuel Asiamah, Edmund Brakohiapa and Edwin Ogoe of the Korle-Bu Teaching Hospital; as well as Dr. Mrs. Augustina Badu-Peprah and Dr. Adu Tutu Amankwah, supported by Drs. Ato Quansah, George Asafu Adjayi Frimpong and a visiting Nigerian Radiologist, Dr. Adeyinka (now Prof.) of the KATH. The head of the Radiology Department of the School of Medical sciences of the University of Cape Coast, Dr. E. K. M. Edzie and Prof. P. N. Gorleku are yet to begin the training of residents.

Teaching

Teaching continues to be enhanced in the form of 1) didactic lectures on the 10 organ systems by lecturers of the college, supported by daily presentations by residents on selected topics. 2) Constant online lectures by external lecturers on various topics through zoom, facilitated by Drs. E. A. Idun, A. Badu Peprah and Klenam Dzefi-Tettey. 3) Practical teaching of residents on various forms of imaging including USG, CT and MRI of the whole body as well as angiography, Barium studies, interventional radiological procedures, film viewing and reporting. The faculty chooses various topics of interest for continuing professional development (CPD) yearly at the Annual General Meeting of the College. The present author assumed the positions of chairman and chief examiner of the faculty of radiology in 2006 and played a major role in directing the affairs of the faculty as well as participating fully in the teaching of residents until his retirement in 2012. Mention should be made of Dr. Samuel Asiamah for his role in human resource development of the faculty of radiology of the Ghana college of Physicians and Surgeons, firstly as the former secretary and secondly, now chief examiner of the faculty, as well as his role in the teaching of residents in the theory and practice of MRI, CT, Ultrasound, angiography and core biopsy. Through Dr. Asiamah's tutorship and further attachment in the USA as an observer, a fellow of the college, Dr. Yaw Mensah-Boateng has acquired the skills in biopsy and drainage and has also trained Drs. Simpson Mensah and Hafisatu Gbadamosi in CT and ultrasound-guided biopsy and drainage as well as Drs. Andrea Appau and Dorothea Akosuah Anim in ultrasound-guided procedures. Dr. Mrs. Klenam Dzefi-Tettey, the current faculty secretary of the GCPS and head of the department of radiology of the Korle-Bu Teaching Hospital together with other fellows, namely Drs. S. Asiamah, Yaw Mensah-Boateng, B. D. Sarkodie, A. Appau, E. Jackson and Hafisatu Gbadamosi have also played and continue to play an important role in the teaching and training of residents assisted by 6 members at the Korle-Bu Teaching Hospital. Similar mention is made of Drs. Augustina Badu-Peprah, Adu Tutu Amankwah, Ato Quansah and George Asafu Adjayi Frimpong of the Komfo Anokye Teaching Hospital for their roles in the teaching of residents and other colleagues.

Pre- and Post-Fellowship Exposure

Some of the first to the fifth groups of fellows from the West African College of Surgeons have had postgraduate exposure in Radiology outside Ghana. Drs. Edmund Brakohiapa, Edwin Ogoe, Samuel Asiamah, Vincent Hewlett, Klenam Dzefi-Tettey, Eric Otu-Danquah, Augustina Badu- Peprah, Adu Tutu Amankwah, Yaw Mensah Boateng and Benjamin Dabo Sarkodie had attachments of varying periods at the Hospital of the University of Pennsylvania (HUP), USA. While at HUP they attended short term ultrasound courses of various types and duration such as breast core biopsy, Doppler, musculoskeletal, transvaginal, 2D and 3D OBGY USG at JUREI of the Thomas Jefferson University Hospital in Philadelphia, Pennsylvania. Dr. S. Asiamah also attended a 3-month course in interventional radiology (Angiography and core-biopsies) in Hungary before attending another 3-month course in the University of Pennsylvania in MRI. Drs. Augustina Badu-Peprah and Ato Quansah had courses of 6 months and 3 months duration respectively at the Academic Medical Centre (AMC) in Amsterdam. Dr. Kaminta had a 1 year, pre-fellowship attachment in Australia. These exposures have positively enhanced their knowledge and teaching capabilities in radiology to the advantage of the faculty of radiology of the GCPS.

Interventional Radiology

Interventional radiological procedures actually started when Prof. Boateng Jumah assisted in an

ultrasound–guided drainage of a liver abscess by a surgical specialist in 2001 while Dr. E. K. Brakohiapa assisted in an ultrasound-guided Nephrostomy tube placement by the urologist, Dr. J.Mensah (now Prof.) and also performed breast core biopsies in 2004 at the Radiology Department of the Korle-Bu Teaching Hospital.

Subspecialty Training

Dr. Benjamin Dabo Sarkodie of the Korle-Bu Teaching Hospital is the first accredited interventional radiologist in Ghana. Other subspecialty radiologists are Dr. Emmanuel K. Y. Jackson of LEKMA Hospital but now at the KBTH as a neuroradiologist and Dr. Rosemond Aboagye of the Greater Accra Regional Hospital as a pediatric radiologist. Special mention is made of Dr. B. D. Sarkodie for his role in the first treatment of cerebral aneurysm by coiling/stenting, hitherto unavailable in Ghana. He has since then, on his own, performed several cases of that kind as well as other procedures some of which are, the non-vascular interventions such as biliary drainage/stenting; nephrostomy; radiofrequency and microwave ablation of tumours; endovascular interventions: angioplasty and stent insertion; transarterial chemoembolization (TACE); neurointerventions: intracerebral aneurysm coiling/stenting; intra-arterial chemotherapy for retinoblastoma. There are currently 3 radiologists, namely Drs. Edmund K. Brakohiapa of the University of Ghana Medical School, Babatunde B. Jimah of the School of Medical Sciences, UCC and Dorothea Akosua Anim of the Radiology department of the Korle-Bu Teaching hospital undergoing training in his outfit.

Dr. E. K. Y. Jackson (Neuroradiologist); some of the procedures being carried out by him are CT/Fluoroscopic- guided steroid injections, nerve root block, medial branch block and rhizotomy. Fluoroscopic guided ganglion impar block, vertebroplasty, intrathecal chemotherapy injection, CT guided synovial cyst rupture. Dr. Rosemond Aboagye (Pediatric Radiologist): apart from the routine procedures performed under fluoroscopy such as barium studies and others of the genitourinary tract, she performs specialized USG including Doppler studies, USG guided drainages and biopsies, as well as Specialized paediatric CT and MRI for all systems.

Ultrasound Training

The training for non-radiologist medical doctors in ultrasonography in Ghana earnestly began when Philips Engineering organized a 'Teaching the Teachers' program at their premises in 1997. The program was attended by 3 radiologists namely Prof. Boateng Jumah, Dr. Chris Kotei and the present author, as well as two gynaecologists, namely Dr. J. O. Armah of blessed memory and Prof Seffah of the University of Ghana Medical School. Following that event, the three radiologists participated in the training of more than 120 doctors in ultrasonography in Ghana[7]. This was followed by the Thomas Jefferson University Ultrasound Unit's 'Teaching the Teachers' program in which the present author was among eight African radiologists who underwent a 4 months' training program in ultrasound at the Ultrasound Unit of the Thomas Jefferson University in Philadelphia. Participants were given certificates of participation after the period apart from receiving 2 ultrasound machines each to use for teaching in 'Jefferson Ultrasound Affiliate Centres' in their various countries. He started the ultrasound training program successfully for radiologists and residents for some time at the Korle-Bu Teaching Hospital's Thomas Jefferson Ultrasound Affiliate Centre of which he was the director but had to curtail the program because of lack of cooperation.

Current Examinations in Teaching Hospitals

All the teaching hospitals carry out simple examinations of the chest, abdomen, skull, upper and lower extremities as well as the spine and mammography. **Special Examinations**: These include:

1) Fluoroscopy**:** Barium studies, namely barium meal, swallow and enema, distal loopogram, fistulogram, hysterosalpingography, urethrography, micturating cystourethrogram, sinography, retrograde cystourethrography.

2) USG: of the abdomen and pelvis, doppler and duplex ultrasound of the vessels, muskulo-skeletal USG and ultrasound of small parts such as breast, thyroid and scrotum.

3) CT scan of the brain, sinuses and orbits, chest abdomen and pelvis, spine, breast and prostate as well as CT urography, angiography and triple phase angiography of the liver.

4) MRI: Brain, sinuses, orbits, internal auditory meatus, abdomen, pelvis, spine, joints as well as Magnetic Resonance Cholangiopancreatography (MRCP) are performed at the Korle-Bu- and Komfo Anokye Teaching Hospitals, but not available at the 37 Military Hospital and the School of Medical Sciences of the University of Cape Coast.

5) Interventional radiological procedures are performed at the Korle-Bu Teaching Hospital, Komfo Anokye Teaching Hospital and the School of Medical Sciences, University of Cape Coast. In addition, the Korle-Bu Teaching Hospital offers dacrocysto/sialography, T-Tube intraoperative and postoperative cholangiography, Percutaneous Transhepatic Cholangiography (PTC) and Endoscopic Retrograde Cholecystopancreatography (ERCP).

Equipment-History

Initial Stage: The basic X-ray equipment at the Korle-Bu Teaching Hospital in the early to mid '70s were one MX-2, and one MX-4 machines, manufactured by Watson and Sons Ltd. for conventional radiography. There were also 2 General purpose machines from Philips and Siemens, one with linear tomographic attachment, and the other with attachment for

angiography. The fluoroscopic machine at that time was a fluorescent screen, for which the radiologist needed visual adaptation in the dark for 30 minutes before screening could begin. There was also a skull unit used by Dr. Mustapha, a renowned neurosurgeon of blessed memory, for performing ventriculography, pneumoencephalography and carotid angiography. Orthopantomography for dental radiography was also available at the X-ray department of the Korle-Bu Hospital.

Equipment for the middle stage, i.e. The mid-1970s to mid-1980s at the Korle-Bu Hospital continued as above until the late 1980s when a fluoroscopic machine with image intensifier and TV monitor was acquired. The first CT scanner was acquired in 1994 at the Korle-Bu Teaching Hospital. Following that event, radiography machines, CT scanners and ultrasound scanners have been acquired by other hospitals and private institutions in the country since the early 1990s. The climax of equipment acquisition however occurred when a new Spiral CT Scanner, an MRI machine, 4 ultrasound machines, 2 out of which had Doppler capability, a new mammography machine as well as a Siemens fluoroscopic machine with image intensifier and remote-control system were installed at the Korle-Bu Teaching Hospital in 2006. There is now an increasing number of 1.5 Tesla MRI machines in private and a few public facilities, and a 3 Tesla MRI machine at the International Maritime Hospital in Tema. The MRI machine at the 37, Military Hospital is however non-functional, and the School of Medical Sciences of the University of Cape Coast is yet to acquire an MRI machine. Coronary angiograms and virtual colonoscopy can be undertaken in private facilities at the Euracare Advanced Diagnostics and Heart Health Centre, and Akai House clinic in Accra, as well as the Spectra Health Centre in Kumasi.

Achievements/Observations

By the end of the year 2008, four (4) residents had qualified as members of the faculty of radiology (of the Ghana College of Physicians and Surgeons) by examination and 3 of them, namely Drs. K. Amedi, Mrs. E. A. Idun and E. K. M. Edzie, had embarked on a fellowship program which they successfully completed in 2009. By the year 2012 there were in total 30 radiologists in the country, about 56 in 2019 and 92 in 2021, to further improve the Radiologist/Population ratio from30/26,000,000, i.e., 1/866,666in 2012 and still further in 2019 to 56/30,417,856 i.e.,1/543,176 as well as in November 2021 to 92/30,800,000 i.e., 1/334,782. The Radiologist/Radiographer ratio also improved from the mid-70s from 2/70, i.e., 1/35 to 92/342, i.e., 1/3.713 in 2021. The Radiographer/Population ratio also improved in the middle seventies from 70/10,395,452, i.e., 1/148,506 to 342/30,800,000 i.e., 1/90,058 in 2021.[3,8,9] The recommended mean number of radiologists in Western Europe, for example, Germany is 12 per 100,000 people, and the USA 10-12 per 100,000. Ghana has 0.289 radiologists per 100,000 (2.89/1,000,000) people and Nigeria has 0.231 per 100,000 (2.31/1,000,000) in 2019. This means that the Ghanaian Radiologist-population ratio of 92/30,800,000 i.e., 1/ 334,782 is favourable compared to the Nigerian Radiologist-population ratio of 1/566000. Africa generally has very low numbers of radiologists for their population.[10]

However, the trend in Ghana shows improvement compared with the past period. By the effort of the training colleges and Ghana Association of Radiologists, the Eastern, Western, Volta, Bono, Bono East, Northern and Central regions which hitherto had no radiologists, obtained pioneer radiologists in the persons of Drs. C. Tasiame, Mrs. M. Twum, K. Kekesie, K. Adu Gyimiri, Isaac Quaye, A. Bawa and E. K. M. Edzie respectively.

Despite the low availability of, and familiarity with the use of teleradiology in Ghana, there is a significant reduction in radiological reporting times by radiologists since the introduction of the application. According to Edzie E. K. M *et al* only 13% of radiologists in Ghana had availability to teleradiology even though 32.6% were familiar with it. About 95.7%, 13% and 10.9% of radiologists used WhatsApp, Facebook and Twitter facilities respectively for the communication of radiological information. Other supporting ICT facilities such as Picture Archiving and Communication System (PACS), Electronic Patients Record (EPR), and Radiology Information Systems (RIS) have all contributed to the improvement created by teleradiology. Digital Imaging and Communications in Medicine (DICOM) software was used by 58.7% of radiologists in Ghana while MicroDicom and AMIDE (a Medical Image Data Examiner) were scarcely used[10].

Even though there are now well established facilities for the training of radiographers especially in ultrasonography, a number of recalcitrant institutions are still operating in the field with inadequate training, sometimes as short as 2 weeks, with certification of participants. This situation has led to a spurious act of the 'mushrooming' of untenable and fake ultrasound units all over the country to the detriment of the unsuspecting patient. Sixteen percent (16%) of ultrasonographers in Ghana are not licensed despite the existence of regulatory bodies for licensure. Despite the existence of ultrasound practice in eleven (11) out of sixteen (16) regions in the country, there is still an unfair distribution of sonographers because 70% of them are located in the Greater Accra- and Ashanti regions.[11]

There has been a marked improvement in the acquisition of CT facilities in Ghana currently compared with the early 90s, while MRI equipment acquisition has witnessed only a marginal increase of 1, i/e. (14) currently compared with the figures of 2016, i.e. (13), most probably because of the high cost of the MRI equipment. However, there is a progressive increase in MRI utilization in Ghana due to increased sensitivity (better contrast resolution capability than CT scan) and

the fact that it does not use ionizing radiation. The trend of inadequate availability of MRI equipment and application for the population goes for the West African subregion, even though there has been an increase in the number of equipment in the last decade. Ghana's 14 MRI units were fairly equally distributed between the private (57%) and the public sectors (43%). Ghana with 0.48 units/million population had the highest number of MRI units/million population followed by Nigeria with 0.30 units/million population.[12,13] There has been a steady increase in the types of specialized radiological examinations including new techniques of interventional radiology compared with the past period. This has been exemplified by Benjamin Sarkodie *et al* [14,15] and George Asafu Adjayi Frimpong *et al*.[16,17]

Mammography remains the mainstay examining tool in the diagnosis of breast diseases. Breast cancer is the commonest female cancer worldwide and also the commonest cause of cancer related deaths in Ghanaian women. Screening mammography is practiced worldwide and helps in early detection of breast cancer. Although a retrospective study on breast diseases in 2013 revealed that there was a larger number of screening mammography evaluations (115 out of 180) 63.8% than symptomatic diagnostic evaluations,[18] a more recent study on cervical and breast screening of Ghanaian women in 2020 shows a low mammogram screening practice of 3.4% among Ghanaian women.[19] Tomosynthesis (commonly known as three-dimensional mammography) has become more common although not available in all breast imaging centers. New modalities for breast screening such as MRI and USG, despite their specific advantages and drawbacks, are unlikely to overtake mammography screening for the general population in the near future.[20,21] To date there are 92 radiologists, 68 radiology residents and 342 certified radiographers in Ghana with the distribution of Radiologists as shown in **Table 1**.

Challenges

A few of the many challenges facing the delivery of radiological services in Ghana are as follows. 1)The need to establish more subspecialties in radiology to cater for all aspects of specialized diagnostic and therapeutic needs cannot be overemphasized and needs financial support from the ministry of health. 2)There is inadequate funding for the purchase and maintenance of equipment in public hospitals and health posts. 3)There is the need to address the existing unfair distribution of radiologists in the various regions.

Ghana Association of Radiologists (GAR)

The Ghana Association of radiologists was inaugurated in 2009 with the present author as the first president, followed by Dr. Mrs. A. Badu-Peprah, Dr. E. K. Brakohiapa, Dr. Mrs. Ewurama A. Idun and presently re-elected Dr. Mrs. Augustina Badu-Peprah. Since the formation of the association there has been a study progress in the collective services of radiologists in the country through annual conferences and meetings with multiple scientific sessions for continuing professional development (CPD). These have included both in person, and online teaching sessions, the first online lectures being held in 2016 using the teamviewer App. With the advent of the COVID-19 pandemic, Zoom meetings have however become the most predominant teaching modality. One such notable event was the first update course organized on a webinar by the West African College of Surgeons (Faculty of Radiology) during the COVID-19 pandemic and hosted by Ghana.[22]

Table 1. Regional distribution of Ghanaian radiologists

Region	
GREATER ACCRA REGION	54
CENTRAL REGION	5
WESTERN REGION	1
EASTERN REGION	5
ASHANTI REGION	18
VOLTA REGION	2
NORTHEN REGION	3
SAVANNAH REGION	0
NORTHEAST REGION	0
WESTERN NORTH REGION	0
BONO REGION	3
BONO EAST REGION	2
AHAFO REGION	0
UPPER EAST REGION	0
UPPER WEST REGION	0
OTI REGION	0

The annual conferences feature both internal and external presenters on various topics including interventional and paediatric radiology. The GAR is an Associate Institutional Member of the European Society of Radiologists (ESR). To date the GAR can boast of 140 members.[23] **Table2** lists the private diagnostic centers in Ghana, and the public and private diagnostic centers in Ghana that provide CT and MRI services.

Recommendations

Postgraduate radiology residency training in Ghana needs to be strengthened to deliver the core mandate of producing members and fellows of the college with requisite professional skills, who would deliver quality radiological services to the citizenry, engage in research as well as achieve the aim of producing 3 radiologists for the regions and 2 for the districts in the near future. This can be achieved by 1) Increasing the number of slots for resident trainees in the program by the Ministry of Health. 2)Re-establish post graduate external attachments for trainers to deepen their knowledge and skills for training residents. 3)Institute bidirectional performance appraisal to enable trainees to evaluate their trainers in order to counteract the 'little or no accountability concept' on the part of trainers. 4)In addition to professional qualification and competences there is the need to instruct trainers in modern medical

education and pedagogic techniques. 5)The concept of overemphasis on service provision of the resident to the detriment of educational enterprise needs to be changed.[24] Funding for the purchase and maintenance of modern diagnostic equipment in public hospitals and other public health facilities would be desirable for implementation by the Ministry of Health. To stem the unacceptable and unwarranted status quo and health menace posed by unlicensed sonographers, regulators and other stakeholders must cooperate by subjecting all practicing diagnostic medical sonographers to register with the professional body, the Ghana Society of Radiographers (GSR). The GSR umbrella association must also support the licensed sonography practitioners and the regulatory body.

Table 2. Regional distribution of imaging facilities in Ghana

PRIVATE DIAGNOSTIC CENTRES	
GREATER ACCRA REGION	**ASHANTI REGION**
International Maritime Hospital	Quitt Healthcare Ltd
C and J Hospital	Hopexchange Medical Center
Supreme Specialist Scan	Aninwah Medical Center
Best Scan	Gimc
Quest Medical Imaging	Spectra Health
Scanport Medical Diagnostics	**CENTRAL REGION**
Euracare	Raaj Specialist Scan
Sonotech Medical and Diag Center	Rand Medical and Health Systems
Plus Diagnostics	**BRONG AHAFO REGION**
Sunshine Health Care	Techiman Holy Family Hospital
Paradise	**EASTERN REGION**
Synlab	St Dominic Hospital
Bog Hospital	**WESTERN REGION**
Grace Diagnostic	Oasis Medical Consult
The Trust Hospital	Raaj Specialist Scan
Diagnostic Centre	Diascan
Akai House Clinic	
Genesis Diagnostics	
Precious Gem Diagnostics	
Medray Diagnostic	
Nyaho Medical Center	
Clinax Health Care	
Accra Medical Center	

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DIAGNOSTIC CENTRES WITH CT	
GREATER ACCRA REGION	**ASHANTI REGION**
International Maritime Hospital	Gimc
C And J Hospital	Spectra Health
Supreme Specialist Scan	Aninwah Medical Center
Quest Medical Imaging	Knust Hospital
Euracare	Hopexchange Medical Center
Sonotech	KATH
Pluslab Diagnostics	**WESTERN REGION**
Sunshine Health Care	Oasis Medical Consult
Paradise	Ghana Ports and Harbour Authority Hospital
Synlab	Diascan
Bog Hospital	Efia Nkwanta Reg Hospital
Grace Diagnostic	**EASTERN REGION**
The Trust Hospital	St Dominic Hospital
Diagnostic Centre	Koforidua Regional Hospital
Akai House Clinic	**BRONG AHAFO REGION**
KBTH	Techiman Holy Family Hospital
Medray Diagnostic	**CENTRAL REGION**
Plus Diagnostics	Cape Coast Teaching Hospital
Nyaho Medical Center	**NORTHERN REGION**
Clinax Health Care	Tamale Teaching Hospital
Accra Medical Center	**BONO REGION**
37 Mil Hospital	Sunyani Regional Hospital
Gt Accra Reg Hosp	**VOLTA REGION**
Univ Of Ghana Medical Center	Grace Diagnostic
DIAGNOSTIC CENTRES WITH MRI	
GREATER ACCRA REGION	**ASHANTI REGION**
International Maritime Hospital	KATH
C and J Hospital	Spectra Health
Quest Medical Imaging	
Euracare	
Paradise	
Sunshine Health Care	
Diagnostic Centre	
KBTH	
Focos Orthopedic Hospital	
Sinel Hospital	
Accra Medical Center Center	
Sonotech	

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THE VALUE OF FOOD: A NECESSARY RHETORIC

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Summary

Food is a basic necessity of life. It provides nutrients, which in turn provide energy, required not only for daily activity through various physiological functions, but for growth, repair and immunity. It follows logically that with optimal nutrition, health is granted and ill-health distanced. This, however, is not the premise from which the general populace, the medical and pharmaceutical establishments, and governments discuss health. The populace eats to taste and satisfaction; the healthcare apparatus exists to attend to the sick; and the health budget is on hospitals, equipment, drugs and emoluments of the health work force. The attention given to the content of food by the community, the space occupied by food and nutrition in medical school curricula, and policies on food and nutrition by governments are testaments to this. In this write-up, the value of food is illustrated with a clinical case, and recommendation to raise the attention paid to food and nutrition from the current level is made.

Literature

Malnutrition affects health in a totality that is generally oblivious[1] to both patient and caregiver. The extent of damage only becomes obvious after correction. Health is "a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity".[2] The wealth of a nation depends on the health of its people. In this piece, an allegation is made that disease is first and foremost caused by malnutrition in either content and/or quantity. The causes of ill-health as narrated in average medical literature are inherited and acquired, with the latter predominating (i.e., microbial, degenerative, and malignant). Good nutrition will forestall all these by a healthy immune system, optimal growth and repair, and a well-developed cognitive function.[3,4,5] This would aid critical thinking, resulting in positive health actions and avoidance of uncalculated risks.

An Illustrative Case

A 23 year old female was referred to the haematology clinic in November 2020 on account of severe anaemia (Haemoglobin {Hb} – 5.5g/dl). The significant finding on interrogation via history was an unbalanced diet. This young lady, although with a normal body mass index (BMI), was attempting to lose weight to improve her looks. Examination finding of significance was pallor. She was counselled on proper nutrition as management without medication. Her Hb three months later was 11.2g/dl. She was visibly excited. The Full Blood Counts (FBCs) on both occasions are shown in the table below. Notably, it was not only the Hb that improved; all the parameters changed positively.

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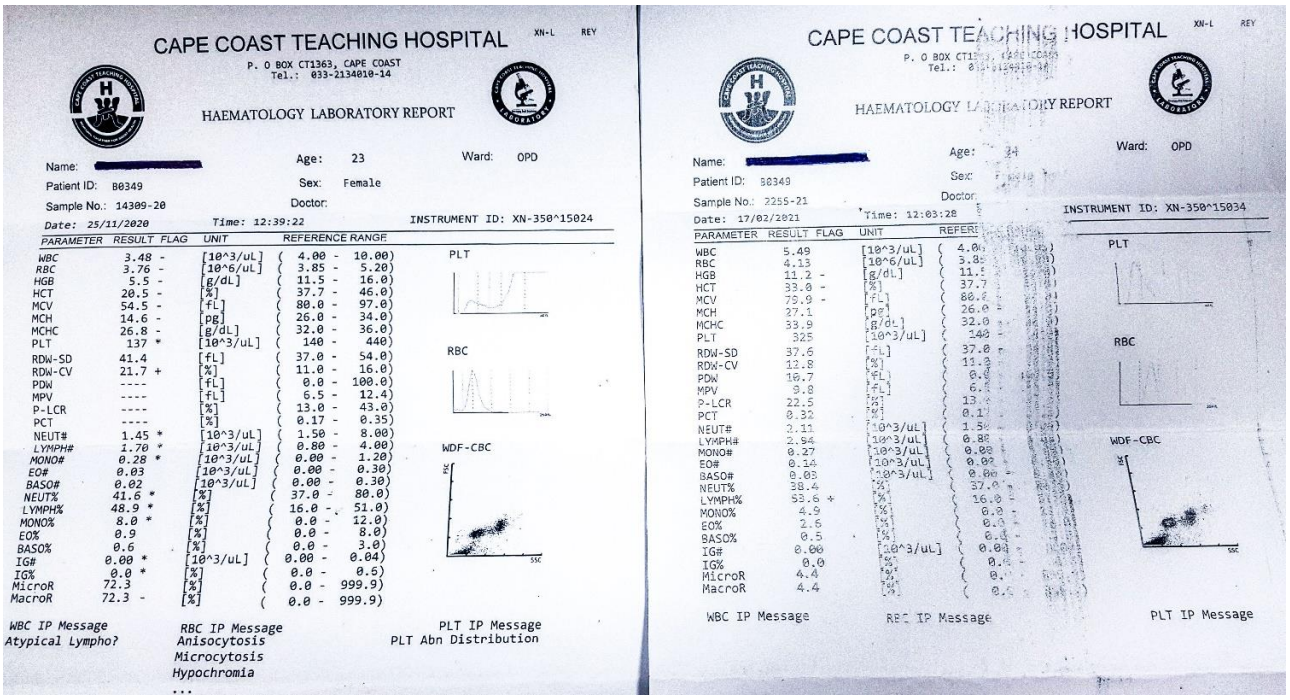
Table 1 Full Blood Count Before and After Dietary Intervention

Parameter	WBC x 10^9/l	RBC x 10^{12}/l	Hb g/dl	HCT %	MCV fl
FBC Nov 2020	3.48	3.76	5.5	20.5	54.5
FBC Feb 2021	5.49	4.13	11.2	33	79.9
Comment ↑ or ↓	↑ 58%	↑	↑ 192%	↑	↑
Parameter	**MCH Pg**	**MCHC g/dl**	**PLT x 10^9/l**	**RDW SD fl**	**RDW CV %**
FBC Nov 2020	14.6	26.8	137	41.4	21.7
FBC Feb 2021	27.1	33.9	325	37.6	12.8
Comment ↑ or ↓	↑	↑	↑ 137%	↓	↓
Parameter	**NEU x 10^9/l**	**LYM x 10^9/l**	**MON x 10^9/l**	**EO x 10^9/l**	**BAS x 10^9/l**
FBC Nov 2020	1.45	1.70	0.28	0.03	0.02
FBC Feb 2021	2.11	2.94	0.27	0.14	0.03
Comment ↑ or ↓	↑	↑	↓	↑	↑

Key: FBC – Full Blood Count; **WBC** – White Blood Cell count; **Hb** – Haemoglobin; **HCT** – Haematocrit; **MCV** – Mean Cell Volume; **MCH** – Mean Cell Haemoglobin; **fl** – femtolitres; **pg** – pictograms; **MCHC** – Mean Cell Haemoglobin Concentration; **PLT** – Platelet count; **RDW** – Red cell Distribution Width; **SD** – Standard Deviation; **CV** – Coefficient of Variation; **NEU** – Neutrophil count; **LYM** – Lymphocyte count; **MON** – Monocyte count; **EO** – Eosinophil count; **BAS** – Basophil count; **Feb** – February; ↓ - Decreased; ↑ - Increased.

The photomicrographs are attached as Picture 1

Picture 1: Photomicrographs of the FBC before and after



Taking the three main parameters individually, the haemoglobin (Hb) went up by 192%, the white cell count (WBC) by 58%, and the platelets (Plt) by 46%.

Discussion

This patient had a false notion of herself. There is the possibility that poor nutrition by itself contributed to this. Iron which is the major mineral component of haemoglobin is a requirement for the carriage of oxygen for all the body's functions. In its deficient state, there is poor cognitive function, sluggish metabolism,[6] and thus reduced global physical and mental activity. The white cells are required for protection against foreign invasion,[7] be it microbes or oncogenic activity; platelets are a requirement for normal haemostasis.[8]

The effect of malnutrition is worst on children where brain development is at its peak. In our communities in Africa where anaemia, and iron deficiency specifically in some populations are as high as 73% and 64% respectively,[9] can it be said that the cognitive development of a great majority is jeopardized even before school? Is the substandard perception of one's abilities a surprise? Could the socio-economic and leadership woes in these environments be attributable to suboptimal childhood development?

Could the differences in FBCs noted across various ethnic populations be nutrition-related? How about the differences in disease patterns? Could we possibly attribute the differences in national developments to nutrition? Maybe, just maybe, nutrition is the great leveller. I invite all to investigate. While waiting for peer review and double-blind studies, feed yourself and those you care for properly, where feeding properly means an adequate mix of protein, carbohydrate, fat, minerals and vitamins (from fruits and vegetables) in quality and quantity at every meal.

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DEVELOPMENT OF POSTGRADUATE EDUCATION AT THE 37 MILITARY HOSPITAL

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Summary

Postgraduate medical education outside the traditional teaching hospital promotes decentralization of postgraduate training. The 37 Military Hospital established one of the earliest postgraduate medical education outside a teaching hospital in Ghana. Prior to this, the hospital faced a problem of external staff training, long training duration, and the inability to train large numbers of doctors at a given period. The article describes the evolution, impact and challenges of establishing postgraduate education at the 37Military hospital.

The postgraduate medical education evolved out of the need to increase the specialist doctors output and retain doctors during training. It started in 2006 with four pioneer students and now has 173 students at various years of residency. The immediate clinical impact of the postgraduate medical education was the reduction in emergency mortality rate and an increase in emergency admissions in the first 2 years. Subsequently, an undergraduate training programme commenced with a current student turnover of 200 per annum. The foreign student pass rate in the national Medical and Dental Council examination for foreign trained graduates has consistently been well above the reported national pass rate per exam. The challenges encountered were myriad but with administrative support a postgraduate unit was established for the postgraduate medical education at 37 Military hospital.

In conclusion, the development of postgraduate medical education is feasible outside tertiary teaching facilities with a dedicated and funded postgraduate unit/college.

Introduction

The development of postgraduate training at the 37 Military Hospital marks one of the earliest attempts to establish a postgraduate training programme outside the traditional university teaching hospitals in Ghana and under a non-university administration. The development of postgraduate training in non- teaching hospitals has evolved in many places and disciplines.[1,2] This article by the Coordinator of the Postgraduate programme gives an account of the evolution, impact, challenges and lessons from the development of postgraduate training at the 37 Military hospital.

Evolution

The idea to establish a postgraduate training at the 37 Military Hospital was borne out of observations and discussions in 2005 on the need for a postgraduate training in surgery in the hospital. The 37 Military Hospital at the time had two systems of postgraduate training for doctors which were either by a scholarship abroad or local training at one of the teaching hospitals in the country. This approach generated a low turnaround of specialist for the hospital as only a few were training at any particular point in time. This resulted in a lack of retention of middle level workforce in the hospital in their pursuit of formal postgraduate medical education and general apathy by those who had to stay and acquire skill by observation and apprenticeship. Additionally, the surgical department was a large single unit undertaking the services of all subspecialties in surgery. Confronted with these problems, the head of the surgical department, Col. S.D Mante, initiated discussion on establishing a postgraduate medical education programme in surgery to train the middle level staff to specialist level and to expand the scope of surgical services in the Military Hospital. The was aimed at developing subspecialty units within the surgical department and to deal with human resource challenges. The programme started at the surgical department for medical officers. The original intended name for the postgraduate training was 'Postgraduate Residency Training Programme in Surgery'. The initial interactions and communication were therefore with the Department of Anatomy of the University of Ghana Medical School for a basic sciences training in course in anatomy. This marked the beginning of formal postgraduate training at the 37 Military Hospital.

Coincidentally, the return of other locally trained specialists to the 37 Military Hospital in the early 2000 had rekindled the need for a postgraduate training in other departments of the hospital albeit at a slower pace. As a result, the evolution of postgraduate training in surgery was favourably received by the hospital administration and military high command as complimentary and strategic to the vision of the Ghana Armed Forces Medical Service (GAFMS). It was, however, agreed that the scope of the training programme had to be expanded to cover all departments of the hospital. A proposal to the Ministry of Defence was accepted, given the needed support and a consultant

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was engaged to assist in the establishment of the postgraduate training for doctors at the 37 Military Hospital. The desire to establish postgraduate training in surgery will reflect in the initial activities of the college and its future direction. On the 21st June 2006 at the Burma Hall, the postgraduate training at the 37 Military Hospital was inaugurated with the keynote address by the 23rd President of the West African College of Surgeons Prof. E.D Yeboah. The launch established the – 'Military Postgraduate Residency Training Programme' and the 'Postgraduate College'. The postgraduate college became the training centre for membership and fellowship awarding colleges in Ghana and West Africa by implementing the Military Postgraduate Residency Programme. The idea was to have a college which in future will provide postgraduate training for all medical and paramedical staff. The head of surgery, Col S. D. Mante was appointed the first Coordinator for the programme and College. The author and current Coordinator, Dr. E. Asumanu was appointed the Deputy Coordinator for the programme and the college. The effect of this was the creation of the first semi - autonomous postgraduate training within a tertiary hospital system and outside the administration of a mainstream university in Ghana.

The college started as a postgraduate office created in the hospital's library with the librarian as the administrator, a deputy coordinator and coordinator as its principal officers. Subsequently, a new postgraduate building with administrative offices for permanent staff was provided and named the Postgraduate College. The college`s administrative structure now had a governing board, a coordinator reporting to the Director General of GAFMS (the equivalent of Director General of the Ghana Health Services) and two deputy coordinators in charge of academic and administration. A dedicated funding source was also made available for the smooth running of the programme. External faculty members were engaged as part of the requirements for accreditation and to ensure the programme becomes fully functional. With the complement of both internal and external faculty members, the programme had a successful official take off in 2006 with two programmes namely Surgery as well as Obstetrics and Gynaecology for the West African College of Surgeons and the Ghana College of Physicians and Surgeons. The postgraduate college has remained a purposely built postgraduate training centre for these and other colleges in Ghana and West Africa. The foundation faculty members had to teach basic science courses and introduce regular assessments. The teaching and learning activities have continued to be structured along regular continuous and formative assessment with mock examination prior to each college examination. Faculty training in teaching and learning has been held with support from University of Ghana`s College of Education through a workshop to improve capacity in teaching. The workshop has enabled faculty members to adopt innovative teaching methods in their engagement of students as well as the incorporation of best teaching practices. In order to enhance its capacity in research, the postgraduate programme has established an Institutional Review Board on 26th April 2012. Chaired by a bioethicist, the seven - member panel meets quarterly and in emergencies to consider proposals for approval. A total of 705 local and international proposals have so far been reviewed.

Over the past 16 years, the postgraduate training has expanded from two to nine training programmes namely Anaesthesia, Paediatrics, Internal Medicine, Surgery, Obstetrics and Gynaecology, ENT, Opthalmology, Maxillofacial Surgery and Radiology. These are programmes accredited by colleges in Ghana and West Africa for postgraduate training. The postgraduate college acts as a training centre for the Ghana College of Physicians and Surgeons, West African College of Surgeons as well as West African College of Physicians. The college now admits residents from the hospital, other institutions in the country and foreign students for these colleges. The programme started with four pioneer students in 2006 and as at 2021 a total of 173 residents had been admitted for both the Ghana and West African colleges. The trainees from the colleges in Ghana are admitted following placement by their respective colleges into the military postgraduate training. The trainees from the West African colleges apply individually to the military postgraduate training to be admitted into the appropriate programme.

Our postgraduate training thrives on collaboration with the hospital, local and external institutions for mutual benefit. Here are a few examples: A strong collaboration with the 37 Military Hospital has been key to the survival of the college and the success of the postgraduate education. Our continued collaboration with the Korle Bu Teaching hospital and University of Ghana Medical School has provided an avenue for enhanced training. As part of the external collaboration, the West African College of Surgeons conducted its membership examination in surgery at the 37 Military Hospital when staff of its traditional examination site in Ghana embarked on an industrial action in October 2011. Our college partnered with the Komfo Anokye Teaching Hospital and the Liverpool School of Tropical Medicine in the implementation of the research training programme dubbed 'Diploma in Project Design and Management' in the southern zone of Ghana. This programme has now been adopted by the Ghana College of Physicians and Surgeons as a diploma course in its curriculum. The postgraduate college has also collaborated with many other international institutions for mutual benefit.

Impact

The impact of the postgraduate training is summarized under the following themes: specialist output, quality of emergency service, membership enrolment and examination outcome as well as undergraduate training.

Specialist Output

The postgraduate training achieved its objective of providing trained middle and senior level staff for care delivery. Compared to the pre-postgraduate programme period, the number of specialist and senior specialist has seen an exponential growth. The average specialist/senior specialist output has been five per year compared to the pre-postgraduate period of about one in five years. As most of the founding faculty have retired or are retiring, it is gratifying to note that the programme has resulted in the creation of many specialty units under the leadership of its trainees.

Of particular mention are the creation of new speciality units as well as the presence of specialists and senior specialists who are products of the postgraduate residency training programme at the 37 Military hospital. The following indicates the numbers per specialty – Paediatrics (5), Plastic Surgery (4), Urology (3), Cardiothoracic (1), General Surgery (3), Orthopedics (3), Obstetrics and Gynaecology (7), Anaesthesia (3), Internal Medicine (6). This is by far the largest pool of in-house trained specialist outside the teaching hospitals in Ghana.

Quality of Emergency Services Delivery

The immediate impact of postgraduate residency programme was evident in the quality of healthcare outcomes. A study comparing outcomes a year before and after the programme at 37 Military Hospital reported emergency mortality reduced from 27.8% to 7.9% in surgery, 46.3% to 23.2% in medicine,50.0% to 8.4% in paediatrics and 17.5% to 0.8% in gynaecology[3]. The second observation in the study was the increase in emergency cases recorded at the hospital. Surgery and Medicine had a three - fold increase, Gynaecology had a ten - fold increase and Paediatrics had a 20-fold increase.[3] This was attributable to the change in the structure of the emergency care system from a single unit (known as No.1 Reception) to individual specialized units to align with training.

Membership Level Enrolment and Examination Outcome

A pioneer candidate was presented for the exam in surgery in 2008 and now the programme presents averagely 20 candidates per year in examination since 2019. The uptake in the number of residents increased after 10 years of implementation of the postgraduate programme was due to two reasons (Fig1). First, the initial cohort of trainees who graduated after six years added to the faculty of trainers having acquired the necessary experience. The other reason was the success of the initial trainees in surgery as well as obstetrics and gynaecology which resulted in the progressive inclusion of Anaesthesia, Paediatrics, Internal Medicine and Radiology as training posts. The postgraduate programme has achieved a 100% pass rate at the membership level in Surgery as well as Obstetrics and Gynaecology yearly for the past five years in both the Ghana college and physicians and surgeons and the West African college of Surgeons. The other departments though have lower intakes and have also achieved a pass rate of between 50% - 100%.

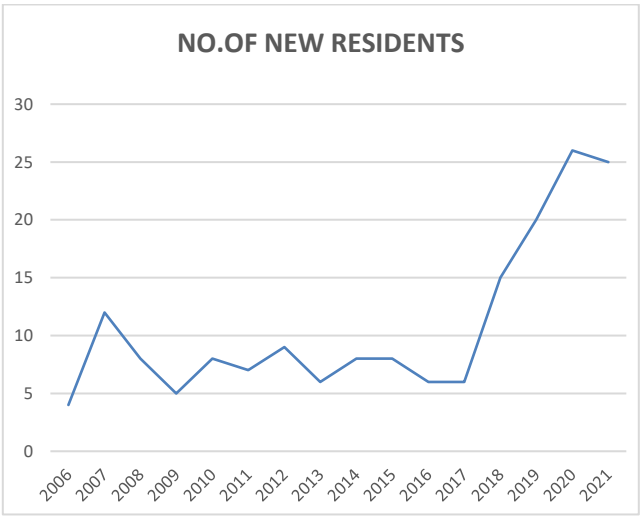

Fig 1. *New Residents Enrolment: 2006- 2021 at the 37 Military Hospital Postgraduate Residency Programme.*

Undergraduate Training

The success of the postgraduate medical education led to the introduction of undergraduate medical education in the area of clinical training in 2015. Currently, the college provides practical clinical training in modules for three local universities and over 43 foreign medical universities. It is worth noting that the postgraduate college established the unit for undergraduate training after 10 years of postgraduate training.

This allowed the college to have its core teaching staff from specialists for undergraduate training programme. This has been a mutually beneficial addition and has improved trainee performance at the membership and fellowship level. The benefit of the postgraduate medical education underscores an unsuccessful attempt at establishing an undergraduate medical school by the military previously as efforts to seek faculty locally and from external donor partners did not materialize.

The student turnover at the hospital was about 200 per year with a ratio of about 1: 1 for local and foreign trained students during the 2020/2021 academic year. As an indicator of our performance, the pass rate for the Medical and Dental Council (MDC) examination for foreign trained doctors in 2020 were 73% and 82% in February and October respectively compared to a reported pass rate of 30.2% by the MDC in 2019. Currently, the hospital regularly receives students from local public and private medical schools for their clinical internship. Their post rotation assessment reports to their universities describe the clinical rotations at the 37 Military Hospital consistently ‘as one of the best’.

Challenges

The development of the postgraduate medical education was not without its challenges at the initial stages, some of which were legitimate. The pioneer group of trainees had to be encouraged to accept the in-house postgraduate programme as good enough and this took some time and effort. The way of skills acquisition by observation and apprenticeship had to be changed to a more evidence based medical practice.

The challenge with faculty members was the reluctance of some to accept the change to an academic structure of teaching with its rigour and supervision. There was a legitimate concern on remuneration demand by some faculty for the full-scale teaching and learning required to successfully pass the college examination. This has not been fully resolved and will require a policy change.

Lessons

The development of postgraduate medical education outside the mainstream teaching hospital is feasible but requires commitment and collaboration. The establishment of a postgraduate training college/unit in a hospital is critical to a successful postgraduate medical education.

To be effective, it must be a stand- alone postgraduate college/unit with a clear vision, a functional administrative structure, a dedicated appointed staff and an appropriate budget line. The third lesson learnt is the improvement in the quality of health indices of the hospital.

Finally, postgraduate medical education outside the teaching hospitals can play a complimentary role in undergraduate training for the mainstream medical universities and is a viable option for establishing distance learning or city campuses for clinical training.

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CASE REPORTS

ACUTE COMPLICATIONS OF LEIOMYOMA DURING PREGNANCY: REPORT OF THREE (3) CASES THAT REQUIRED ANTEPARTUM MYOMECTOMY

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Abstract

Introduction: Some women with uterine leiomyoma can experience life threatening complications during pregnancy. These leiomyomas are usually large and their associated symptoms were either neglected before the onset of the pregnancy or surgical treatment may have been rejected earlier by the patient.

Case Presentation: Three cases of antepartum myomectomy are reported in this paper. They had severe abdominal pains not responding to medical treatment with gross abdominal distention. Additionally, they had severe life-threatening symptoms including right hypochondria pain and shallow breath in case no.2 and intestinal obstruction in case no.3, an acute surgical complication which could not be resolved by conservative management. All three patients had successful antepartum myomectomy using a new flap techinique not previously described in the literature on reported cases of myomectomy during pregnancy. All the patients recovered successfully from the operation and their pregnancies continued to delivery of their babies at term by caesarean section. Cases no.1 and 2 presented in this report were managed in health facilities in Tamale, Northern Region in 2019. Case no.3 was managed in Accra at the Greater Accra Regional Hospital in 2022.

Conclusion: Pregnant women may present with life threatening complications of leiomyomas, antepartum myomectomy can be considered and successfully performed to improve quality of life or prevent maternal mortality. The procedure for the myomectomy in such situation may not be routine but a special approach is required to avoid fatal complications for both mother and foetus.

Keywords: *Myomectomy, Myomectomy during pregnancy, Caesarean myomectomy, Antepartum Myomectomy, Antenatal myomectomy*

Introduction

Leiomyomas are benign tumours of muscles cell origin containing varying amount of fibrous tissue believed to have resulted from degeneration of some of the smooth muscle cells and are the most common tumours found in the female pelvis[1]. Leiomyomas usually develop and are more symptomatic during the reproductive ages. Leiomyoma nodules contain collagen, fibronectin and proteoglycan which are surrounded by pseudocapsule of compressed areolar tissue and smooth muscle cells with very few blood and lymphatic vessels[1,2]. Some subserosal leiomyoma nodules and parasitic leiomyomas usually develop additional sources of blood supply independent of the uterus from the omentum[1,3], small and large bowels, appendix and the parietal peritoneum as they grow bigger and maintain contact with these structures. The prevalence of uterine leiomyomas in pregnancy was found to be 12.3-16.7% by studies done in West Africa[4,5]. The leiomyoma can be solitary or multiple nodules of various sizes from microscopic to term pregnancy size[3] distention of the abdomen with visible nodules distorting shape of the abdomen. The complications that occur are usually symptomatic in the leiomyoma nodules that are affected.

During pregnancy, anastomosis is established between extrauterine sources of blood supply to the leiomyoma such as the omentum in figure I, visceral organs and parietal peritoneum and the uterine, tubal and ovarian blood vessels of the gravid uterus. With advancing gestational age, the uterus hypertrophies with corresponding enlargement of the blood vessels thereby increasing the blood flow through these new blood vessels supplying the leiomyoma. Sometimes there are visible enlarged blood vessels just beneath the serosa layer without penetrating the leiomyoma nodule. Majority of leiomyomas (97.4%) in pregnant women are asymptomatic[6]. They are usually discovered during routine antenatal obstetric ultrasound scan examination. Due to high levels of estrogen and progesterone leiomyomas can grow rapidly during pregnancy with advancing gestational age resulting in red degeneration from infarction and hemorrhage[1,2,3]. These changes during pregnancy are manifested by pain which could be very agonizing and unresponsive to pain medications. Other acute complications such as discomforting

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abdominal distension, respiratory embarrassment, constipation, early satiety and bowel obstruction are due mechanical obstruction by the leiomyoma due to its large size and rapid growth. Gradually symptoms of compression of intra-abdominal organs as the pregnancy advances beyond the first trimester develop.

The majority of the complications of uterine leiomyoma during pregnancy can be successfully managed conservatively without the need for myomectomy during the pregnancy[6]. Acute life-threatening complications of leiomyomas during pregnancy are due to neglect or refusal of surgical treatment in pursuit of non-surgical treatment provided by herbalist and spiritualist before onset of pregnancy. These non-surgical treatments increase morbidity such as anaemia, deep vein thrombosis, urinary retention, constipation etc. with possibility of mortality. Other forms of degenerative changes such as fatty, hyaline, cystic, calcification, and sarcomatous changes also occur during pregnancy though not as common as red degeneration[1,2,3]. Complications specific to pregnancy co-existing with leiomyoma includes malpresentation, obstructed labour, increased risk of caesarean delivery, Postpartum haemorrhage and peripartum hysterectomy[6].

Cases Presentation

Settings

Cases no.1 and 2 in this report were managed in health facilities in Tamale, Northern Region in 2019. Case no.3 was managed in Accra at the Greater Accra Regional Hospital in 2022.

Presurgical Preparations

Once the laparotomy decision is taken, the necessary informed consent procedures are undertaken. Importantly patients are made to consent for blood transfusion and hysterotomy if that becomes necessary. The indications for hysterotomy includes severe or uncontrollable haemorrhage, accidental rupture of the membranes and abruoptio placentae or any other complications requiring use of uterotonics to control any severe haemorrhage from the uterus. Uterotonics can only be effectively used to control haemorrhage effectively only if the uterus is empty. At least three units of whole blood and 2-4 units of fresh frozen plasma for transfusion must be available in the theatre before the start of the operation.

Surgical Procedure

1. The laparotomy incision should be mesogastric midline incision extended towards xiphisternum or symphysis pubis if necessary for exteriorization of large leiomyomas from the abdomen.
2. Anaesthesia type must allow for extension of the incision towards the xiphisternum.
3. Application of tourniquet at the level of internal cervical os should be avoided due to ongoing intrauterine pregnancy so as not to asphyxiate foetus into demise.
4. Ten to twelve large and medium size artery forceps needed for application on the blood vessels supplying the leiomyoma since tourniquet cannot be used.
5. When the abdomen is entered, identify and apply artery forceps or clamps to all extrauterine blood supplies to the leiomyoma as shown in figures 2 and 4, cut and suture with vicryl no. 2 to ligate all extrauterine blood supplies to the leiomyoma.
6. Big blood vessels of uterine origin to the leiomyoma which are visible under the serosa of the affected leiomyoma nodules may also be ligated just beneath the level where the circular incision on the leiomyoma would be made after exteriorization of the leiomyoma as in figure 3. Big artery forceps should be used in addition to secure any bleeding vessels after incisions are made on the leiomyoma.
7. Packing with abdominal towels of the bowels and omentum should be done. The gravid uterus should not be exteriorized. There should be minimal handling of the gravid uterus to minimize risk of loss of the pregnancy.
8. Aim to remove only symptomatic leiomyomas causing the complications during the surgical operation so as not to disturb the pregnancy.

Serosa and pseudocapsule flap technique

1. Make a circular incision on the leiomyoma to create a flap from the serosa and pseudocapsule at a level 3 to 5cm form the base of the pedicle of the leiomyoma as shown in figure 5.
2. Make circular incision from the junction of the uterine muscles and the serosa covering a subserosal leiomyoma as shown in figure 8.
3. Excision of the complicated leiomyoma nodule is done at the level of the circular incision as shown in Figures 6-8 sparing the serosa and pseudocapsule.
4. Portions of the leiomyoma are excised piece meal beneath the circular incision sparing the serosa and pseudocapsule for use as flap for the closure as in figure 9.
5. The incision is closed using vicryl no.1 and 2 interrupted and continuous suturing as may be needed as shown in figures 10-14. The flap in figure 9 provides enough serosa and pseudocapsule to close the incision without having to suture through the myometrium.
6. Hemostasis is completely secured and any redundant portion of the serosa and pseudocapsule may be trimmed off and the repaired areas left as in figures 10-14.
7. The upper abdomen is then washed with normal saline and an abdominal drain left in place through the mesogastric midline incision to monitor for haemorrhage post-operatively. The incision is closed with nylon no.2 continues suturing for the fascia layer and nylon no.0 or 2-0 interrupted

suturing for the skin. The scar of the incision and site of the drain shown in figure 15.

Figure 1*: Extrauterine blood supply to leiomyoma*

Figure 2: *Artery forceps on extrauterine vessels.*

Figure 3*: ligation of uterine vessels beneath the serosa or use artery forceps.*

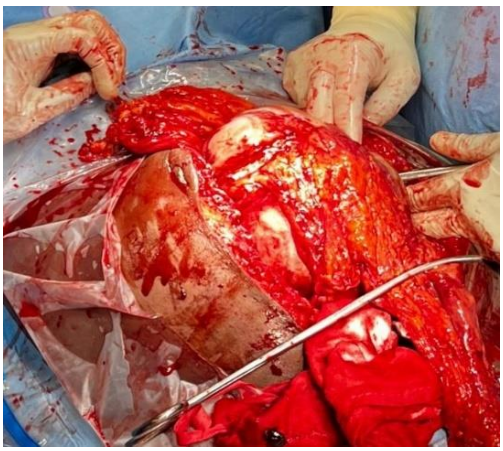

Figure 4*: uterus of case no.3 showing complicated leiomyoma with dilated blood vessels of the omentum and other sources of extrauterine blood supply.*

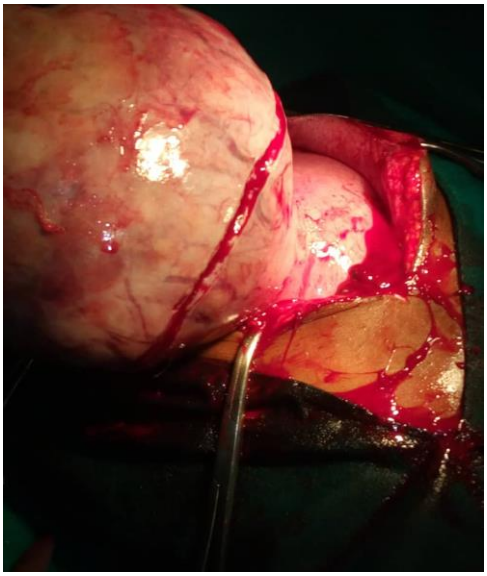

Figure 5*: Showing the circular incision on the serosa and pseudocapsule of the leiomyoma in case no.2.*

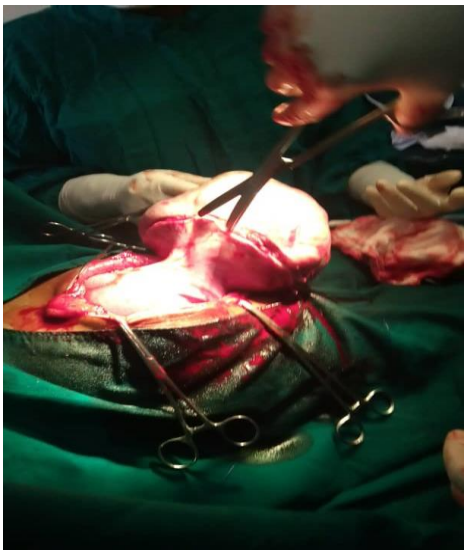

Figure 6*: Developing serosa and pseudocapsule flap 3-5cm from base of the pedunculated leiomyoma in case no.2.*

Figure 7*: Uterus of case no.3 showing complicated leiomyoma excised after circular incision was made on it.*

Figure 8*: Developing serosa and pseudocapsule flap in a subserosal leiomyoma.*

Figure 9*: Lateral view of serosa and pseudocapsule flap in a subserosal leiomyoma.*

Figures 10*: The repair on the posterior part of the gravid uterus in case no.1*

Figure 11*: Shows the repair area on anterior in case no.2. Smaller leiomyomas were left during the myomectomy since they were not symptomatic.*

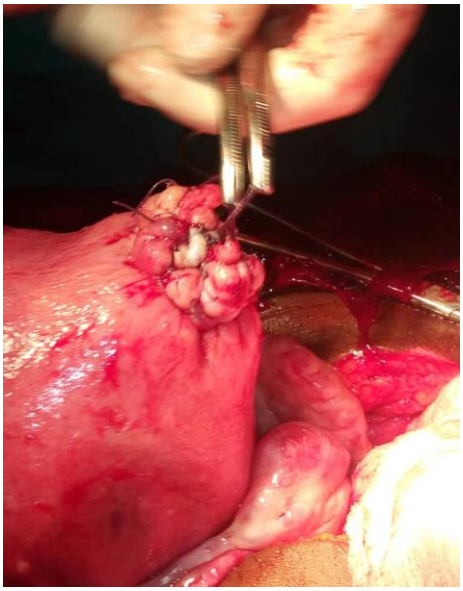

Figure 12*: Repaired uterus using the flap.*

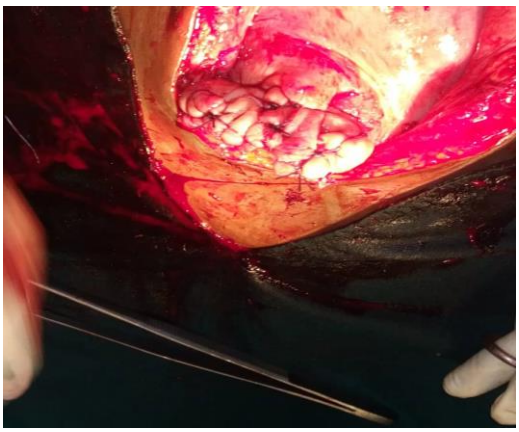

Figure 13*: The repaired area on anterior part of the gravid uterus in case no.2 showing a more prominent stump of the flap in view.*

Figure 14*: Showing the large leiomyoma nodule with smaller parts of it excised piece meal below the circular incision from case no.3.*

Figure 15*: showing scar of the mesogastric midline incision and site of abdominal drain through the incision.*

Case no.1

The first case was a 38-year-old G1P0 who presented at 13 weeks gestation complaining of severe abdominal pains which was unresponsive to pain management. She also had early satiety and insomnia. She knew she had uterine leiomyoma before the onset of the pregnancy but was unwilling to have surgical operation. She expressed her unwillingness to continue with the pregnancy due to the severe pains.

Examination showed a young woman who was in agonizing pain. She was anxious but not pale or jaundiced. Her pulse rate was 106 beats per min and regular with Blood Pressure of 130/90mmHg, with normal heart sounds present. Respiratory rate was 18 cycles per min with adequate air entry and breath sounds. She had a term size abdominal mass which was globular, markedly tender to palpation with no palpable fetal poles. Ultrasound scan reports: Confirmed a viable normal ongoing intrauterine pregnancy at 13 weeks. A fundal uterine leiomyoma 20cmx22cmx18cm was noticed. The liver, spleen, both kidneys and other abdominal organs were normal. There was no ascites or free fluid in the pouch of Douglas.

A diagnosis of degenerating uterine leiomyomas in pregnancy was made. Patient was given im Pethidine 100mg 8hrly for 24hrs each time she was admitted to hospital but unable to stay out of hospital on oral tramadol 100mg 12hourly but was unable to bear the pain without medications beyond 48hrs. Pre-operative investigations and preparations were done and laparotomy was performed after unsuccessful conservative management for two weeks. Findings at laparotomy was large pedunculated leiomyoma about 30cm x 30cm x 25cm, with pedicle about 6cm wide on posterior fundal part of the uterus. The gravid uterus was about 16 weeks size. There were normal tubes and ovaries. The estimated blood loss was 300mls.

She did not receive any blood transfusion, the abdominal drain collected less than 200mls of blood in 72 hours. She remained stable on antibiotics, analgesics and tocolytics and was discharged on the fifth post-operative days on haematinics and antibiotics. Her antenatal care continued without any complications and an elective caesarean section at 38 weeks was performed with delivery of a normal life baby.

Case no. 2

Case 2 was a 27-year-old G1P0 who presented at 24 weeks gestation complaining of severe abdominal pains which is unresponsive to pain management at other health facilities. She also had discomforting abdominal distention, early satiety, insomnia, right hypochondria pain and compression with painful breathing. She was unwilling for surgical treatment for uterine leiomyoma before the onset of the pregnancy because she was afraid of the surgery. She used over the counter pain killers and herbal medications as treatment for the leiomyoma before onset the pregnancy. She wanted to have the operation this time as a way of relieving the pain she was

experiencing. Examination showed a young woman who was in severe pains. she was not pale or jaundiced. The pulse rate was 100 beats per min regular, blood Pressure was 118/87mmHg, normal heart sounds with no murmurs. The respiratory rate was 20 cycles per min with adequate air entry bilaterally. The abdomen was asymmetrically enlarged, term size with palpable very tender mass in the upper abdomen to the right. The gravid uterus was palpable rising above the level of the umbilicus. The fetal heart rate was 148 beats per minute and regular. The liver, spleen and both kidneys not palpable.

Ultrasound scan confirmed a viable normal ongoing intrauterine pregnancy at 24 weeks. A fundal uterine leiomyoma nodule 20cm x 18cm x 16cm was noticed coexisting with smaller uterine leiomyoma nodules. There was no free fluid in the pouch of Douglas. She was diagnosed of degenerating uterine leiomyomas in pregnancy. The patient was given im Pethidine 100mg 8hrly for 24hrs on three occasions that she was admitted within two weeks and often discharged home on Tablets morphine 10mg every four hours in 24 hours when necessary. She was unable to do without treatment for a single day. The necessary pre-operative investigations and preparations were done and laparotomy was performed.

The findings at laparotomy: huge pedunculated leiomyoma about 20cm x 20cm x 20cm, with pedicle about 7cm, right lateral anterior-fudal part of the uterus with level of attachments of the round ligaments. Gravid uterus about 24 weeks size. There were normal tubes and ovaries. The estimated blood loss was 200mls. Abdominal drain collected about 100mls of blood in 72 hours. She remained stable antibiotics, analgesics and tocolytics and was discharged on the fifth post-operative day on haematinics and antibiotics. Her antenatal care continued without any complications and had a caesarean section at 38weeks with delivery of a normal life baby. There were adhesions noticed between anterior abdominal wall and the uterus.

Case No. 3

A 35-year-old JS G3P0 with 2 spontanoues miscarriages presented at GARH as referral from one of the district hospitals in the Greater Accra Region at 21weeks 4days with 3 weeks history of severe abdominal pain and gross distention of the abdomen. She had loss of apepite, early satiety, vommitting and constipation. She also had headaches, dizziness, palpitations, burning sensation in the chest with interminent pains and insomia. Conservative treatment in many health facilities have been unsuccessful. She was middle aged woman, maderately pale but not jaundiced; she looked worried, dehydrated, afebrile and chronically ill. She had lost weight and had mild pitting pedal oedema. The pulse rate was 96 min regular and thread with Blood Pressure of 113/68mmHg, normal heart sounds with no murmurs. The respiratory rate was 20 cycles per min, with SPO2 98% on room air. The chest had adequate air entry and breath sounds. The abdomen was asymmetrically enlarged with palpable tender mass in the upper abdomen. The gravid uterus could be palpated rising above the level of the umbilicus with no distinguishable fundus due to tenderness. The fetal heart rate was 167 beats per minute and regular. She had renal angle tenderness bilaterally. There were no signs of ascites. Bowel sounds were present but reduced. She had a normal vulvar with no discharge or bleeding from the vagina.

She had an obstetric and abdominal ultrasound scan report which showed single intrauterine viable pregnancy at 21weeks. The placenta was low lying with adequate liquor volume. There were multiple intrauterine leiomyomas with largest at the fundus of the uterus measuring more than 25cmx20cmx 20cm. There was bilateral hydronephrosis and hydroureters. The liver and spleen were reported to be normal. Some loops of bowels were noted to be distended. There was no free fluid in the abdomen. A provisional diagnosis of degenerating uterine leiomyomas in pregnancy with intestinal obstruction was made and general surgical consult was requested. Patient was jointly managed conservatively with the general surgical team but no improvement of the obstructive symptoms and abdominal pains so a laparotomy was planned by the joint team on the 5th day of admission at the Greater Accra Regional Hospital. Her initial investigations showed Haemoglobin 8.2g/dl so she was transfused 2 units of whole blood and pre- operative Haemoglobin rose to 11g/dl. Three units of whole blood and four units of fresh frozen plasma was cross matched and brought to the theatre for intra-operative transfusion. Her pre-operative renal function and liver function test were all normal.

Findings at laparotomy: Figures 4,7 and 14

Huge mostly subserosal leiomyoma 30cm x 25cm x 20cm with cystic degeneration at its core, extending from the hepatic flexure of the large bowel in the right hypochondria region to the splenic flexure in the left hypochondria region. Its attachment to the uterus was about 12cm at the right anterior fundal part. There were extra uterine blood supplies to the leiomyoma from enlarged vessels of the omentum, right tubo ovarian structures and the parietal peritoneum of the left lateral upper abdominal wall. There were three areas of adhesions and obstruction of the proximal part of the small bowel on the posterior upper part of the leiomyoma which were separated. The upper abdominal organs were compressed against the diaphragm. The gravid uterus was about 24 weeks' size with multiple smaller intramural leiomyomas and adherent to the anterior abdominal wall below the umbilicus so the tubes and ovaries could be fully visualized. There was purulent ascitic fluid of about 200mls. There was active bleeding from the leiomyoma and other structures during the surgery with estimated blood of 2200ml during the operation.

Post-operative management

She was nursed at the high dependency ward. She had an NG tube in for five post-operative days and was receiving 4-5L of intravenous fluids and parenteral nutrition daily. She received iv antibiotics for five days and tocolytics while the NG tube was still draining actively. She received anticoagulation on the first post-operative day but it was discontinued as the abdominal drain was noted to be more bloody. Her post-operative pain management was with parenteral and rectal suppositories medications for the five days. Her vital signs remained stable throughout the post-operative period until she was discharged. All her preoperative symptoms resolved completely by the fifth day post-operation. Serosanguineous fluid totaling 2250mls was drained during the first 5 days after the operation from 500mls to 50mls on the 5th post-operative day. The NG tube also drained a total of about 3200mls in the first 5 days and removed when bowel activity was normal with the passage of stool and flatus. Average amount of urine was 1500mls produced daily until the foleys catheter was removed. She was discharged on the 10th day post-operation with satisfactory wound healing on haematinics to continue antenatal care on outpatient basis.

Her pregnancy progressed to term and had elective caesarean delivery in November 2022 to live male foetus weighing 3.1kg, myomectomy was also performed at caesarean section for two leiomyoma nodules in the lower uterine segment. The placenta was posterior with minor degree previa. Blood loss was about 1.5L so patient was transfused 2 units of whole blood immediately post operation. Her recovery was normal, haemoglobin checked on the third post-operative day was 10.2g/dl and she discharged home with her baby on fifth day after the operation on oral antibiotics and haematinics. The rest of the puerperium was normal without any complications.

Discussion

Myomectomy during pregnancy is not a surgical procedure that should be routinely scheduled. As much as possible it should be avoided in favor of conservative management of complications of leiomyomas during pregnancy. However, myomectomy during pregnancy would to be performed as a lifesaving operation (Rescue Myomectomy) for patients with neglected leiomyomas which may develop very serious life-threatening complications during pregnancy. Cases of myomectomy during pregnancy have been reported dating back to the past 30 years in the literature[6]. As has been presented in these cases reported, the most common indication for myomectomy during pregnancy was abdominal pain not responding to medical treatment as in other publications[6,7,8]. Case no.3 presented with severe life-threatening surgical complications of intestinal obstruction with unsuccessful conservative management. Pain is a common complication of leiomyoma during pregnancy due to red degeneration with majority of patients having successful conservative or medical management[6,7,8]. Complications specific to myomectomy during pregnancy include haemorrhage, preterm delivery both iatrogenic and spontaneous, increased caesarean delivery due to weak uterine scar and formation of adhesions which can affect future pregnancies.

The techniques of myomectomy as described in the standard literature[1,2,3] has associated limitations in myomectomy during pregnancy if it is to be performed same way. The very high risk of intraoperative and post-operative complications is specifically related to hemorrhage. Though there have been reported cases of myomectomy during pregnancy, there is no description of the operative procedure that was used in most publications. The technique reported by D.E Lolis et al is different from the flap technique used in the three cases reported here. This technique of using the serosa and the pseudocapsule of the leiomyoma was first used on a huge cervical leiomyoma presenting abdominally by the lead author[9]. This technique has been successfully used in both myomectomy and sequential myomectomy plus hysterectomy for leiomyomas at inaccessible locations such as the pouch of Douglas which makes application of tourniquet impossible. The flap technique described in this paper minimizes handing of the gravid uterus, avoids enucleation of leiomyoma nodules from myometrium and extensive deep incisions into the myometrium that would require deeper repairs of the myometrium. This also inimizes blood loss, iatrogenic complications, spontaneous abortion, preterm labour, abruption of the placenta and possible maternal mortality.

Due to the high risk of pregnancy loss that may be associated with myomectomy during pregnancy, the patient must clearly understand the risk of loss of pregnancy associated with the procedure and give consent for blood transfusion, use of uterotonics and hysterotomy should life threatening haemorrhage or other intraoperative complications arise. Myomectomy during pregnancy is still a grey area. There is the likelihood of an increasing trend of complicated leiomyomas during pregnancy due spiritual and medical treatments and lack of assess to surgical treatment of cases requiring myomectomy before pregnancy.

Conclusions

Pregnant women may present with life threatening complications of leiomyomas. Antepartum Myomectomy can be considered and successfully performed to improve quality of life or prevent maternal mortality. The procedure for the myomectomy in such situation may not be routine but a special approach is required to avoid fatal complications for both mother and foetus.

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BILATERAL TUBAL ECTOPIC PREGNANCY: A CASE REPORT

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Abstract

Introduction: Bilateral tubal ectopic pregnancy without prior fertility treatment is rare and, although true incidence is unknown, about 250 cases have been reported in medical literature so far. Its diagnosis is commonly made during surgery as pre-operative diagnosis is difficult. To the best of our knowledge, this is the first reported case of spontaneous bilateral tubal ectopic pregnancy in Ghana.

Case Presentation: We report on a 25-year-old G2P1A who had an exploratory laparotomy done on account of a ruptured right ectopic pregnancy. Examination of the contralateral tube at surgery, however, revealed an unruptured ampullary ectopic pregnancy and diagnosis was thus revised to a bilateral tubal ectopic pregnancy. A right salpingectomy and left salpingostomy were carried out as she had future fertility wish.

Conclusion: Bilateral tubal ectopic pregnancies present a number of diagnostic challenges pre-operatively and examination of the contralateral tube, especially for those cases requiring surgical intervention, cannot be over – emphasized in the management of tubal ectopic pregnancies in general.

Key words: *Case report, bilateral tubal ectopic pregnancy, salpingectomy, salpingostomy*

Introduction

Bilateral tubal ectopic pregnancy is an infrequent variant of ectopic and twin pregnancy, in which there is simultaneous development of fertilized eggs or embryos in both fallopian tubes. Although its incidence is on the ascendency as a result of the rising patronage of assisted reproductive services, spontaneous occurrence is rare. Its clinical presentation, like that for unilateral ectopic pregnancies, varies from incidental discoveries to acute emergencies. Management options are dictated by the clinical presentation, the part of the tube occupied by the pregnancy, the extent of tubal damage, desire for future fertility and available resources.

Case Presentation

We present the case of a 25-year-old trader, who presented with a day's history of cramp-like lower abdominal pain and bleeding per vaginam with associated dizziness. She had a two (2) month history of amenorrhea prior to this presentation and was sexually active with two (2) lifetime sexual partners. She did not have any previous history of treatment for sexually transmitted infections (STI's) or pelvic inflammatory disease (PID). She had no history of intrauterine contraceptive use and had not received any fertility treatments. Her past obstetric, past medical and drug histories were unremarkable. She was single and had primary level education.

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Conflict of Interest: None Declared

At presentation, she had a Glasgow coma score (GCS) of 15/15, but was clinically pale with a blood pressure (BP) of 140/100mmHg, pulse rate of 79bpm, respiratory rate of 24cpm and temperature of 36.9°C. She had generalized abdominal tenderness and guarding with no obvious distension. On pelvic examination, there was no bleeding observed per vaginam. She had a bulky uterus with cervical motion tenderness. Urinary pregnancy test (UPT) done was positive. Bedside clotting time was 4minutes. Random blood sugar (RBS) was 11.8mmol/L. On transabdominal ultrasound, no gestational sac was observed within the uterine cavity, the endometrial stripe appeared thickened. No obvious adnexal masses observed on USG. A culdocentesis was done which yielded about 2mls of non-clotting blood. She was counselled on her condition, the need for immediate surgical intervention and the likelihood of losing the affected tube if ruptured tubal ectopic pregnancy is confirmed intra-op. She gave consent for the procedure and was prepared for an emergency laparotomy on account of hemo-peritoneum secondary to suspected ruptured ectopic gestation. Her complete blood count, done pre-operatively, revealed a hemoglobin level of 5.6g/dL and a platelet count of 172 x 10^3/uL. The intra – operative findings were:

(i)**bilateral ampullary ectopic gestation.**

a) Right tubal (ampullary) gestation was ruptured and measured about 4.5cm x 3cm x 2cm. b. Left tubal gestation was unruptured and measured 1cm x 0.5cm x 0.5cm, [the ampullary part of this tube was ballooned with an appearance which was initially mistaken for a hydrosalpinx (see figure 1) and was almost missed and left untouched. An incision made on the anti-mesenteric border of that portion of the tube exposed dark 'placenta-like' tissue beneath. These were gently removed and sent,

alongside the right tubal gestation, for histopathology].

(ii)**Uterus and ovaries were normal.**

(iii)**Hemoperitoneum of about 1800mls.** Total estimated blood loss was about 2000mls.

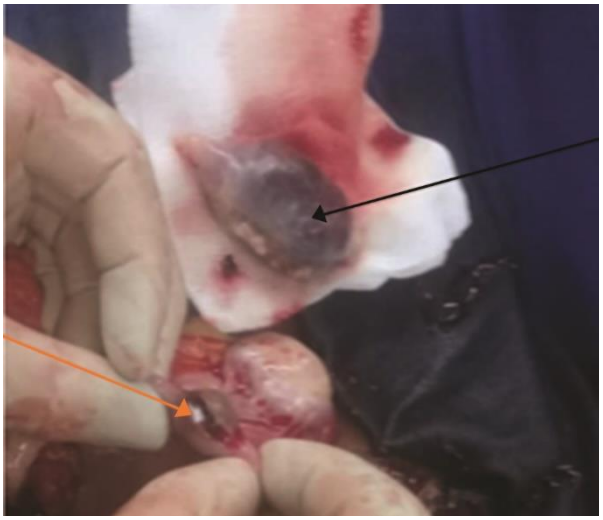

Fig 1*: Bilateral tubal ectopic gestation at surgery. Black arrowhead points to the right tubal gestation. Orange-colored arrowhead points to the left tubal gestation*

A right salpingectomy and left salpingostomy were carried out and specimen sent for histopathology. She was hemotransfused post-operatively and counselled on the intra-operative findings and what was done at surgery. She was informed that her chance for natural conception had reduced due to her condition, as the tubes play an important role in natural conception. She was also informed that the tubal-sparing surgery done in the tube with unruptured pregnancy was to improve her chances of conceiving naturally. This however increases her risk of recurrence; thus, she should report immediately she misses her menses for assessment to determine pregnancy location. The post – operative period was otherwise unremarkable and she was discharged on post op day 2. A follow-up hysterosalpingography (HSG) was scheduled to assess the patency of the left fallopian tube. The client, however, is yet to report for the procedure. Histopathological studies of specimen removed at surgery confirmed the presence of trophoblastic villi, trophoblastic cells and decidua in both tubes (figure 2), consistent with the diagnosis of bilateral tubal ectopic gestation. Also noted in the salpingectomy specimen were findings consistent with salpingitis isthmica nodosa (shown in figure 3), a known risk factor for tubal gestations.

Discussion

Ectopic pregnancies remain an important cause of maternal morbidity and mortality. Incidence varies with figures between 1 in 150 to 1 in 300 deliveries.[1] Facility– based studies in Ghana have reported

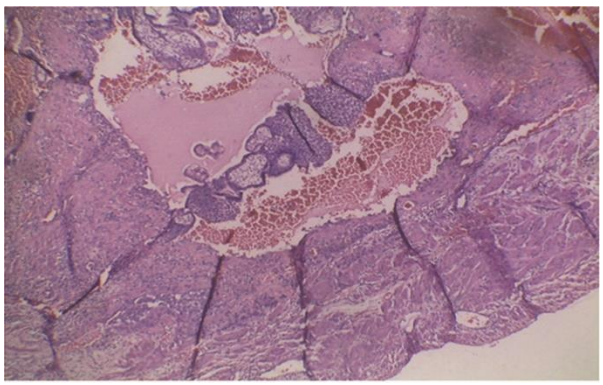

Fig. 2 *chorionic villi and associated decidua infiltrating the muscularis propria with surrounding hemorrhage*

Fig. 3 *invagination of surface tubal epithelium deep into the wall with surrounding smooth muscle bundles consistent with salpingitis isthmica nodosa*

incidences of 10.6% and 2.054% of all gynecological admissions in Komfo Anokye Teaching Hospital (KATH) and the Volta Regional Hospital respectively and 32.90 per 1000 deliveries in Korle – Bu Teaching Hospital (KBTH).[2-4] Statistics in the Cape Coast Teaching Hospital (CCTH) revealed ectopic pregnancies accounted for about 15.7, 24.8 and 20.6 per 1000 deliveries for years 2016, 2017 and 2018 respectively. (CCTH Annual Performance Report; unpublished). The commonest site for ectopic pregnancy is the fallopian tube. Rarer variants of ectopic pregnancy such as cervical, ovarian, broad ligament, caesarean scar and bilateral tubal ectopic pregnancies have also been reported in literature.[5] Ghana has reported cases of cervical and caesarean scar ectopic pregnancy.[6,7] Till date, however, there is no published case report from Ghana on bilateral tubal ectopic pregnancy. Bilateral tubal ectopic pregnancies could arise as a result of fertility treatments or, more rarely, spontaneously. Comparatively, the incidence for bilateral tubal ectopic pregnancy arising from in – vitro fertilization is about 1 in 22 (45 in 1000) ectopic pregnancies as against 1 in 725 to 1 in 1,580 for those arising spontaneously.[8] The description of fetal parts or fetus as well as placental parts from both the tubes was proposed by Fishback in 1939 as the criterion for the diagnosis of bilateral tubal ectopic pregnancy. This was modified in 1953 by Norris who stated that microscopic demonstration of chorionic villi in both tubes was

sufficient for the diagnosis.[9,10] For the patient being presented here, even though fetal parts and placenta were not seen, she had trophoblastic villi, trophoblastic cells and decidua demonstrable in both tubes at histopathology. The diagnosis of bilateral tubal ectopic pregnancy was thus made using the Norris criteria. Describing the exact mechanism by which bilateral tubal ectopic pregnancies arise has been challenging. Proposed theories include multiple ovulation, sequential impregnation (i.e. when fertilization and development of a second oocyte occurs in a pregnant woman) and trans-peritoneal movement of trophoblastic cells from one tube to the other.[11] The risk factors for bilateral tubal ectopic pregnancies are similar to those for unilateral ectopic pregnancies and include assisted reproductive techniques, previous history of pelvic inflammatory disease, diverticulosis of the fallopian tube (salpingitis isthmica nodosa), intra-pelvic adhesions, previous tubal surgery among others. It is worth mentioning, however, that absence of these risk factors does not make the diagnosis unlikely as many of the cases reported did not have identifiable risk factors. Pregnancy outcomes for ectopic pregnancies include death of embryo with spontaneous resolution, tubal rupture or tubal miscarriage with resulting intra-peritoneal hemorrhage, pelvic hematocele or abdominal pregnancy.

In developed countries close to 90% or more of ectopic pregnancies are diagnosed unruptured due to early reporting and early diagnosis with transvaginal ultrasound, serum ß-hCG and laparoscopy. In developing countries, however, diagnosis before rupture is uncommon.[1] Ruptured ectopic pregnancies may end in massive hemorrhage, disseminated intravascular coagulopathy and even death. Prompt diagnosis and early intervention are thus necessary to reduce the mortality associated with it. Prompt diagnosis requires a high level of suspicion, particularly in women in reproductive ages with any of the risk factors for ectopic pregnancy. Our patient had a classical presentation of a two-month period of amenorrhea, associated with a positive pregnancy test, bleeding per vaginam and pain in the lower abdomen. Clinical examination might reveal pallor, hypotension, tachycardia, cool clammy extremities, abdominal distension with generalized tenderness and guarding, cervical motion tenderness and adnexal tenderness on gentle vaginal examination (caution should be taken here as vaginal examination may cause more intraperitoneal bleeding). Culdocentesis has been largely replaced in modern practice by pelvic imaging, image guided aspiration of fluid and minimally invasive surgery. When positive (that is, when the aspirate from the cul-de-sac yields non clotting blood), it is suggestive of an intraperitoneal bleed with a specificity of 80%, sensitivity of about 66%, and a negative predictive value of about 25%.[12]

This patient being presented here, though seemed to have stable vital signs, had all the cardinal symptoms of ectopic gestation (amenorrhea, abdominal pain and vaginal bleeding). In addition, she was pale, had signs of acute abdomen, a positive urinary pregnancy test, an inconclusive ultrasound findings and positive culdocentesis. These raised suspicion of a ruptured ectopic pregnancy for which she was prepared for an exploratory laparotomy. It must be stated, however, that neither clinical signs and symptoms, nor serum ß - hCG can reliably differentiate between a unilateral and bilateral ectopic pregnancy.[9] Ultrasonography, though very useful in modern day practice for pre-operative diagnosis, did not help us much in the management of this case. This is however not surprising as literature shows they are mostly missed. For example, the works done by De Los Rios et al and B. Zhu showed that ultrasound has only rarely picked up bilateral ectopic pregnancy preoperatively (two reviews carried out revealed 6 out of 16 and 2 out of 42 bilateral ectopic pregnancies were correctly identified using ultrasonography) and diagnosis is usually made intra-operatively.[13,14] It is therefore very important for the examination of the contralateral tube to be done in all cases of gestational ectopic so as not to miss bilateral cases. The management of bilateral tubal ectopic gestation depends on the condition of the patient, extent of tubal damage and the desire for future fertility. There are no published guidelines regarding the management approach because of its rarity. However, previous studies have suggested that the principles for unilateral ectopic pregnancies management may be applied to bilateral tubal ectopic pregnancies too. In unruptured bilateral tubal ectopic pregnancies diagnosed pre-operatively, medical management with methotrexate may be given. Surgical management options include salpingectomy (the surgical removal of the affected fallopian tube, either totally or partially); salpingotomy (making an opening into the affected tubes to remove the product of conception and suturing it back) and salpingostomy (which involves making an incision on the anti-mesenteric border of the fallopian tube, removing the products of conception and leaving the incision open to heal by secondary intention). Comparatively, with regards to cumulative probability of ectopic pregnancies, there were no differences between salpingotomy and salpingostomy. Intra-uterine pregnancy, however, occurred earlier with salpingostomy compared to salpingotomy.[15] Tubal conservative surgeries have been considered preferable, where possible, as studies have reported higher rates of intra-uterine pregnancies without an increased risk of ectopic recurrence rates when compared with salpingectomy.[16] Risk of recurrence in the woman presented in this case, however, seems significant – this is because salpingitis isthmica nodosa is usually bilateral and though its presence could not be ascertained in the contralateral tube of this patient, as it was preserved, it carries with it a risk for recurrent ectopic pregnancies.[17]

Conclusion

Spontaneous bilateral ectopic pregnancies, though extremely rare, can occur When ectopic gestations are

picked up on ultrasonography, the contralateral side should also be scanned to rule out a possible bilateral ectopic. Due to the rarity of its pre-operative diagnosis, however, examination of the contralateral tube during surgery for ectopic pregnancy is important in the diagnosis and holistic management of the patient. It is also worth mentioning that submitting specimen excised at surgery for histopathological / histomorphological studies is important as it may provide useful insights into the risk factors attributable to these pregnancies.

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ACKNOWLEGEMENT OF REVIEWERS

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FROM THE PAST

KWASHIORKOR

and

Dr. Cicely Delphine Williams

Cicely Williams

Cicely Williams with severely malnourished child

Children suffering from Kwashiorkor

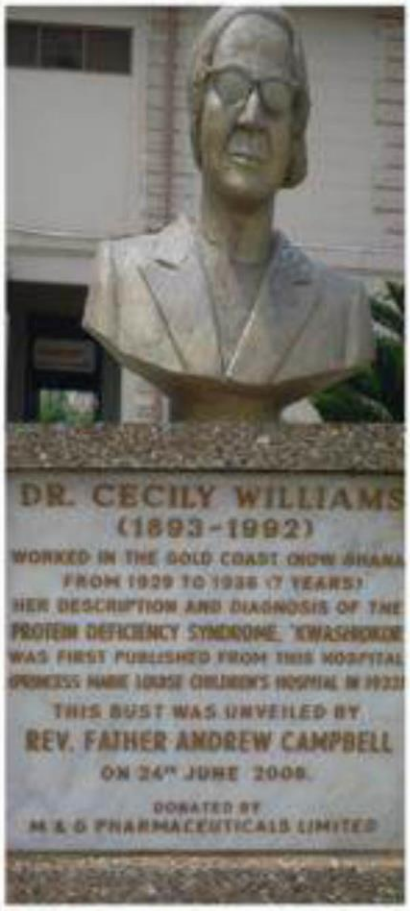
Princess Marie Louis Hospital (PML), where Dr. Williams first described Kwashiorkor

Dr. Cicely Williams was a Jamaican national who worked in the Gold Coast from 1929-1936.

She was the first woman to be appointed in the British Colonial Medical Service to be sent to Gold Coast (now Ghana).

Dr. Williams' most important work in the Gold Coast was her diagnosis of the common and often fatal condition **Kwashiorkor**. She learned that "Kwashiorkor" meant the sickness the older child gets when the next baby is born. This seemed to indicate that, when they were no longer breast-fed, children were not receiving enough to eat. Dr. Cicely Williams discovered that the medical symptom of swollen bellies, diarrhoea, and vomiting was protein-calorie malnutrition. The cure for kwashiorkor was therefore education on children's nutritional needs. She quickly published her diagnosis of kwashiorkor as a protein deficiency disease, which attracted the attention of the medical world.

The first description and diagnoses of the protein deficiency syndrome "Kwashiorkor" was first published from the Princess Marie Louis Children's Hospital.



Due to her efforts in the hospital a sculpture of her was mounted in the hospital in memory of her. (Above)

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Book

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

Book Chapter

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

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