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All correspondence in connection with the journal should be addressed to:

The Editor-in-Chief
Postgraduate Medical Journal of Ghana
P. O. Box MB 429
Accra, Ghana
Tel: 233-302-238650/230703
Fax: 233-302-256727
E-mail: pmjg@gcps.edu.gh
Web: pmjg@gcps.edu.gh/journal
http://afrolib.afro.who.int
http://indexmedicus.afro.who.int

EDITORIAL

MEDICAL EDUCATION AND RESIDENCY TRAINING – THE NEED TO MOVE WITH THE TIMES

Medical education has become an expensive venture for governments nowadays but can be a good business opportunity for private institutions who are able to flow with the times. Most private institutions will prefer to take graduate students for a 4-year medical programme and not the 6-year programme reserved mainly for SHS leavers. Most medical schools that go in for the 6-year programme have limited faculty to take care of the growing numbers of students, which eventually has a negative influence on the graduates produced. Advocacy for a 4-year medical education in Ghana, after the candidate has a BSc degree in the sciences and has written a dissertation/thesis of some sort is the way to go. Such graduates would be mature, would have done research and published peer-review journal articles either alone or with some faculty members. Our 6-year programme students finish medical school having no idea as to how to do research let alone publish journal articles and this attitude is carried over to the residency level.

A 4-year medical programme will admit mostly students who would be fee-paying (with scholarships being made available to the poor in society) which will help employ more faculty and acquire more facilities for training graduate medical students to the highest level.

As a matter of fact, the New York University Grossman Medical School has gone a step further to reduce the number of years one spends in a medical school to become a doctor after a BSc to 3 years! As a carry-over from what happens in our medical schools, our residents are not grounded in research and find it difficult to write papers for publication reputable journals and also, write and defend their dissertations (an excellent introduction to the curricula of medical training colleges). It is exceedingly rare to find a fellow of the present college(s) having written and published four (4) or five (5) peer-review articles before attaining a fellowship qualification. The end result is that many of them get into academia and remain lecturers for many years and are unable to get promoted to the next level.

Having in mind the suggested 4-year medical programme above, where the students would start medical school after having obtained a first degree and having done research and published one or two articles as a prerequisite, such students after graduation should be made to do a one-year housemanship and then have a straight entry (without any primary examinations; chosen by an interview panel in the relevant specialty) to the residency programme. The residency programme should be a minimum of five (5) years: two years junior residency, to learn the rudiments of his/her chosen specialty and three years as a senior resident. The senior residents can be of two streams – one stream for fellows who want to stay out of academia. The second stream will be made of people who would eventually want to go into academia. This group will be required to write a dissertation and successfully defend it besides having written and published 2 - 3 articles during the training period. Also, such residents should be awarded both PhD and Fellowship degrees. This can be attained by the resident registering with the appropriate awarding university for a PhD programme in the chosen specialty; the PhD programme will be supervised by consultants of the relevant college/specialty and the defence of the dissertation would be done in the presence of both a nominated university member (from academic board) and two invited specialty examiners from the relevant college (one of whom should be an external examiner). The resident then takes the fellowship examinations and be made a fellow of the college.

The argument may be that the PhD programme is 4 years in most universities in Ghana. The suggestion here is that, whilst engaged in the junior residency programme, the resident should choose an appropriate agreed topic in the second year of junior residency and start working on the proposal towards finishing the dissertation by the end of the third year of senior residency (in all 4 years). This should satisfy the requirements of such universities. By the way, it is proposed that there should be no examinations by the end of the junior residency period for promotion to the senior residency programme – this should be decided by a panel of assessors in the chosen specialty.

In conclusion, it is possible to change the narrative, the way we always did and still do things, and graduate our medical students earlier and, as a consequence, see to it that the residents finish the programme early too. Using both streams of residency training the hospitals will have personnel to work for them in the form of those who opted out of writing a dissertation and the universities will have academics (who can rise to become vice chancellors), who will competently teach both medical students and residents and also provide service to the hospitals to enhance its status.

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Prof Francis A. Abantanga, MD
School of Medicine, UDS, Tamale

COMMENTARY

NURTURING LEADERSHIP POTENTIAL FOR PERSONAL EFFECT IN MEDICAL PRACTICE

Leadership in practical terms means influencing people towards goals for a desired future which is a change from current situation. The thrust of leadership has been variously expressed but the following two quotes provide the essence of what it is about:

- "Leadership is cause; everything else is effect." - Stephen Adei[1]
- "The single biggest way to impact an organisation is to focus on leadership development. There is almost no limit to the potential of an organisation that recruits good people, raises them up as leaders and continually develops them." - John Maxwell[2]

Some other attributes of the leadership process can be found in expressions such as: leadership is not a position, it's who we are and what we do; leadership is a dynamic condition that changes constantly among the leader and the followers; we need to show leadership at all levels and not just at the top.

Unlike management which seeks to achieve specific set targets through functions such as controlling and directing, leadership seeks to create change which we aspire to through imagination, innovation, novel thinking and creativity for improvement in our lives. We all have innate leadership potential of some sort, even if to different extent in different individuals. What is needed is for each person to be aware of its existence, nurse it and unleash its energies to create changes in our individual lives and that of the family, community, organisation or profession, nation and the world at large. This is because even in the midst of extensive knowledge, proficient skills and abundant resources, effective leadership must be employed to create the changes and improvements we truly desire in our lives. How do we then unearth, or build on, the leadership potential in us, in this case, for personal effect and for improved medical practice?

This commentary looks at a model for nurturing leadership. It explains how to develop our individual capabilities for personal, professional and career advancement in medical practice. The model for this discussion is the Strategic Thinking Action and Reflection (STAR) model of the 'Leadership Seminar for Health Systems Transformation in Developing Countries' a flagship course offered as part of Masters programmes offered at the Kwame Nkrumah University of Science and Technology School of Public Health (KNUST-SPH). This model is an adaption from the STARGuide Leadership framework of Henry Mosley and Benjamin Lozare of the Bill and Melinda Gates Institute for Population and Reproductive Health at the John's Hopkins Bloomberg School of Public Health, and the book, the Fifth Discipline (2006, Random House, Business Books) by Peter M. Senge.

In order to unearth our innate leadership potential and, consequently rediscover ourselves as effective leaders and agents for the change we must be creative to improve our lives by practicing the disciplines of:

- Personal Mastery
- Shared Vision
- Mental Models
- Team Learning
- Systems Thinking

These are the core leadership disciplines and learning organisation tools which must be applied simultaneously and seamlessly in all our endeavours in an all-or-none fashion to release the energies of leadership deep within us, or strengthen our professed leadership skills in order to impact positively on ourself and professional practice.

Personal Mastery

Effective leadership must seek to change oneself first for the better and for assurance of credibility from potential followers before seeking to influence others towards a vision or desired change. The discipline of Personal Mastery therefore enjoins leaders to be introspective at all times, clarify what one wants to really become or achieve, explore how to be creative and purposeful in life and focus efforts and energies towards the goal. For instance, we must not perform with business-as-usual mentality or perform tasks without actively seeking improvements. Indeed, if a task is performed repetitively, Personal Mastery will require that each subsequent performance must be better and even stimulate innovative ways of doing it for better outcomes. Do we prepare, equip and hold ourselves in readiness for any personal or professional challenges? If you were asked, for instance, to present your up-to-date CV, can you make it instantly? Also, are you filling your CV towards your vision or you are using the conveyor-belt approach and just collecting points as they come by? Clearly, to lead yourself for personal effect, an active, continued self-directed learning, taking on leadership roles and increasing responsibility in patient care activities should be aimed at as Personal Mastery is exercised.

Shared Vision.

This discipline is nurtured by having a personal clear mental or visual description of goals you truly desire to

reach. This personal vision will become a shared vision only when other people buy into it. How do you see yourself to have contributed to medical practice, say in five years' time? The response to this question should be a clear picture (your vision) in your mind's eye like a dream. Then looking at your situation or status at present, you must strategise on the interventions and steps you need to take – additional courses, skills training, attitudinal changes, or whatever inputs – to reach that dream. Focusing on the dream and sacrificing or letting go all your other non-desirable competing interests will be crucial to keep you on track towards the vision. Remember that there will be challenges and detractions but you must brace up against them all, especially if your vision is strong and describes what you truly want. Do not allow paths to take you to just where they lead if they don't meet your vision objectives, rather create paths to take you to where you aspire to be; that is the essence of leadership and change.

Mental Models.

Mental Models are our unconscious assumptions, perceptions or deeply held views of how the world is or how things look and work. They control what we do and how we respond to the world around us; they are indeed our reality! They therefore limit the development of our leadership potential, capabilities and what we see or do among others. Nurturing innate leadership potential for personal effect therefore calls on us to genuinely examine and evaluate our views (mental models), and be open-minded and receptive to innovations, new ideas, practices and values. Doing this will release us from being bugged down to, for instance, 'this-will-not-work' syndrome which immediately forestalls anything new we want to try. Issues such as: changing work schedules; re-arranging work teams; revising times of clinical meetings; and the unending work-related conflicts among various health care providers are examples of phenomena which are influenced by our mental models and so prevent us as individuals or groups from making headway for resolution to achieve the changes we must have. So, for the purpose of nurturing our leadership potential, the discipline of mental models enjoins us to embrace new ideas so as to create the needed changes.

Team Learning.

It is important for leadership to align people for action because the desired changes in our lives must be created as a people not as individuals. Team Learning enables groups of people to work together to achieve larger goals way beyond the sum of what can be achieved by the individual members of the group. Of course, individual members must themselves align their own values, resources and practices and feed into the group so that other group members' deficiencies will be compensated for and their strengths enhanced. Let's use an example from the clinical domain to better explain this. In a clinical care team comprising house officers, medical officers, junior and senior residents, specialists and consultants, Team Learning calls for the members to dialogue, work together and align their values, resources (knowledge, skills and attitudes) and practices to achieve the changes the team wants. This will produce extraordinary results by the team, and the individual members will themselves develop at a rate faster than attainable per their specific contributions alone. Indeed, in a team that works, "together everyone achieves more."

Systems Thinking.

Leadership nurtures change. The world operates through complex interconnected and dynamic events, not as isolated unconnected events. Any change instituted somewhere therefore also triggers a series of other changes. These ripple changes are usually not very obvious because their interconnections to the index change may not be evident. There may even be some time lapse before the secondary changes surface, a situation that further blurs the cause-and-effect link between the two. How then can we see beyond isolated events in order to identify the interconnections and deeper patterns so that we can create change effectively with minimal repercussions? The discipline of Systems Thinking is the tool which addresses this challenge in leadership. Any change not properly introduced can create untoward or even reinforcing vicious consequences in favour of what had been targeted for redress. Therefore, to nurture innate leadership potential, either in an individual capacity or for group or team effort, systems thinking enjoins us to see the whole system as well as the parts and interconnections. In other words, to create an enduring change, leadership *must understand the workings of the system to understand the workings of the component parts; and also seek to understand the workings of the component parts to understand the workings of the system.* When changes are made as single events without application of systems thinking it may result in the consequential situation where "today's problems come from yesterday's solutions." Undisputedly, there are several examples of this phenomenon in Ghana and the world at large today.

To conclude, the disciplines discussed in this commentary are meant to enliven our imagination, stimulate new thinking, generate creative tension between the change we want in our personal life and professional work on one hand, and the situation we now find ourselves in on the other, and also facilitate the innovation we have to make towards the change we aspire to.

In the context of medicine, there is no doubt that there has been improvement in medical training and practice in Ghana. New medical and dental schools including private ones have been established. The establishment of the Ghana College of Physicians and Surgeons about two decades ago and the recent addition of subspecialty programmes have completed the full range of medical training from undergraduate to postgraduate at home. This has impacted positively on

the range of specialty services available in-country now, even though not in quantity. However, several challenges crying for change, change that leadership must facilitate, still do exist. For instance, in general, resources for medical care in our hospitals are inadequate, undergraduate training positions are tight, career path development for new doctors is delayed in terms of timelines and entry requirements into postgraduate medical programmes, and the postgraduate training positions are inadequate.

There is therefore the need for individual and collective leadership effort to tackle these challenges head on by adopting the learning organisation mindset to continually expand capacity to face the challenges by creating the change needed to resolve them. The application of the core leadership disciplines in this regard will be apt. Change we must have because "the problems we face cannot be solved by the same level of thinking that created them." (Albert Einstein). Also, and.in the wisdom of Akan traditional philosophy, "when you fall down whilst walking, you need to change the style of your steps because the ground may be slippery

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Kwabena Antwi Danso
Professor of Obstetrics and Gynaecology (KNUST)
Consultant Obstetrician Gynaecologist (KATH)
Tel: +233208183408
Email: kadanso1443@yahoo.com

ORIGINAL ARTICLES

HIP AND KNEE REPLACEMENTS IN GHANA: A 2-YEAR PROSPECTIVE ASSESSMENT OF OUTCOMES

Konadu-Yeboah D[1]; Konadu P[1]; Okrah H[2]; Kwasi K[2]; Sobotie J[2]; Gudugbe S[2]; Boadi S T[2]; Anarfi N[2]; Vormawor K[2]; Pokuaa M[2]

[1]Kwame Nkrumah University of Science and Technology, Kumasi. Ghana; [2] Komfo Anokye Teaching Hospital, Kumasi, Ghana.

Abstract

Objective: Our objective was to assess the outcomes of hip and knee replacements among patients at the Komfo Anokye Teaching Hospital in Ghana.

Methodology: We recruited consenting patients who underwent a hip or knee replacement at the KATH over a 3-year period and followed up each study participant for 2 years. Prosthetic joint function was evaluated at 2 years following joint replacement. Complications of surgery were recorded for each patient during the follow-up period.

Results: A total of 87 hip and knee replacements were performed in 78 patients over the 3-year period. Of the 78 patients enrolled in the study, 67.9% (53) were females and 32.1% (25) were males. Most, 47.2% (37), of the patients were aged between 61 and 80 years, with those less than 40 years constituting 7.7%. At 2 years follow-up, good to excellent outcome was reported in 95.5% THA, 91.2% hip hemiarthroplasty, and 90% TKA patients. The satisfaction rates were 95.5% THA, 97.0% hip hemiarthroplasty and 90% TKA participants.

Conclusion: Women have a higher hip or knee replacement rate (67.9%) than men (32.1%) and the rate of hip or knee replacement increases with age for both men and women. Osteonecrosis of the femoral head is the most common indication for total hip arthroplasty in patients younger than 60 years. The presence of diabetes mellitus and sickle cell disease predicts less favourable patient reported outcomes following a hip or knee replacement. Arthroplasty of the knee or hip provides pain relief and improvement in function with a low complication rate and high patient satisfaction rate.

Key words: *THA: Total Hip Arthroplasty, TKA: Total Knee Arthroplasty, ASA score: American Society of Anaesthesiologists score*

Introduction

Arthroplasty is an orthopaedic surgical procedure that is performed to relieve pain in cases of late stage osteoarthritis or rheumatoid arthritis of the hip or knee, and in neck of femur fractures in the elderly. It may also be performed in limb reconstructions after tumour excision. Hemiarthroplasty is the treatment of choice for femoral neck fractures in elderly patients with a healthy acetabulum, not eligible for total hip arthroplasty. Total knee arthroplasty is one of the great success stories of orthopaedic surgery. In Great Britain, more than 30,000 TKAs are performed every year and in the US the number of TKAs performed annually is estimated to rise by 15.5% from 167,000 in 1992.[1] Joint replacement is an effective treatment for end-stage osteoarthritis of the hip and/or knee. It has been shown that 90% of patients who undergo hip or knee replacement attain pain relief and/or improvement in function. Joint replacement has a mortality risk of 1% making it one of the safest routine surgeries. A successful joint replacement lasts from 10 to 20 years. In the US 1 in 115 Americans over the age of 65 has undergone a joint replacement and approximately 500,000 joint replacements are performed in the US per year. Osteoarthritis is the leading indication for joint replacement.[2] In an analysis of 5579 cases of THA in the US, Baron and his colleagues found that osteoarthritis was the indication for surgery in 83.3% of cases, rheumatoid arthritis accounted for 3.4% and osteonecrosis 6.6%. The authors reported that women had higher hip arthroplasty rate than men and that the rate of THA increases with age for both men and women. Furthermore, Baron and others observed that 2.5% of the patients they studied died within 6 months, 3.7% within one year and mortality was higher in male patients and in patients over 74 years of age and concluded that serious complications following THA were not common. In addition, the authors identified infections in less than 1% of patients and pulmonary embolism in 2% of cases.[3] In a review of a national arthroplasty registry in Malawi, Lubega and co-workers, found that osteonecrosis accounted for THA in 47.9% (35 of 73) and

Corresponding Author: **Dr. Dominic Konadu-Yeboah**
Senior Lecturer, Kwame Nkrumah University of Science and Technology, Kumasi. Ghana, Orthopaedic and Trauma Surgeon, and Head, Directorate of Trauma and Orthopaedics, Komfo Anokye Teaching Hospital, P. O. Box 1934, Kumasi, Ghana
Email Address: domiyk@yahoo.com
Phone Number: (+233)206 300 663
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osteoarthritis in 30.1% (22 of 73)[4] of their cohort of patients.

There are limited data in most parts of the developing world and for that matter in Ghana on patient outcomes after hip or knee arthroplasty. Some traditions and myths in hip and knee arthroplasty have been shown to be unsupported by evidence, namely: the use of plastic adhesive tapes intraoperatively and the use of a separate skin knife.[5] Drains are intended to reduce haematoma but have been found to be of no benefit in THA and TKA though they are still widely used routinely in some centres. Meta-analysis has found that they result in increased total blood loss and increased requirement for haemotransfusion without any difference in haematoma formation. The safety and efficacy of tranexamic acid to control haemorrhage is supported by meta-analysis. The association of tranexamic acid with increased risk of venous thromboembolism is unsubstantiated. Survivorship issues such as bearing-surface wear with polyethylene, acetabular loosening with cemented cups and liner fracture in ceramic-on-ceramic THA exist.[5] The most commonly used approaches for hip arthroplasty are the posterior and lateral approaches. Controversies however, exist as to which of these approaches offers superior outcomes.[5] In a review of 1009 total hip arthroplasties, de Vries and others[4] found that the posterior approach was used in 51.1% of patients. They observed that there were no differences in the rates of surgical site infection and periprosthetic fracture between the approaches used. They found a relatively higher dislocation rate in patients who underwent THA via the posterior approach compared to the lateral approach, 2.9% vrs 1.4%. An uncemented hemi-prosthesis was employed in 62.7% of patients. They noticed that deep surgical site infections and periprosthetic fractures happened more commonly in the uncemented group compared to the cemented prosthesis group. The authors concluded that there were no differences in adverse outcomes between the lateral and the posterior approaches.[5]

However, evidence to support or refute these traditions and myths in the third world is scanty or in some areas non-existent. In addition, there is paucity of data on outcomes of THAs and TKAs that are performed in the developing world. This study was intended to examine the early to mid-term outcomes of hip arthroplasties (THAs and hip hemiarthroplasties) and knee arthroplasties in a tertiary hospital in a developing country. Following TKA, 19% of patients are dissatisfied with their outcome. These outcome measures comprise: re-operations, clinical outcome scores and complications. Walking with a limp, difficulty getting in and out of cars following TKA are factors of poor outcome.[7,8] The dissatisfaction associated with the outcome of TKA occurs when patients experience post-operative complications, failure of the operation to meet pre-operative expectations and patients with less severe radiographic osteoarthritis.[7,8] Factors that predict poor function after TKA are depression, pre-operative pain and comorbidities.[9,10] Peter Söderman and co-workers in an outcome assessment study reported that there were significant differences in Harris hip scores between patients with one affected hip, 96 (37-100) points and those with disabling systemic disease, 79 (34-98) points. A review of the Swedish THA registry showed a 10-year survival rate of 93%.[11]

A study done in South Africa to assess the utility of DVT prophylaxis in patients undergoing elective hip replacement found that the use of DVT prophylaxis reduces mortality rate by 50%.[12] The rate of deep infection reported after knee arthroplasty varies from 1% to 11%.[13] In a review of a national arthroplasty registry in Malawi, it was found that the mean pre-operative Harris hip score was 29 (9 to 59) and the mean post-operative Harris hip score was measured as 85 (79 to 91) giving a mean improvement of 56 points. In the said study in Malawi, it was reported that the mean length of hospital stay by patients was 10 days (7 to 19) days. The authors, in addition, recorded one case of superficial infection, 2 cases of dislocation in 6 months post operatively, 1 case of deep vein thrombosis, 1 case of aseptic loosening at 6 years and reported that the mean age of patients undergoing primary THA was 52 years. In a study of 180 patients, Deshmukh and others[1] found that previous surgery on the knee and the type of prosthesis used influenced re-operation rate after TKA. Deshmukh and colleagues concluded that the perception of the patient of the benefit and quality of life improvement after surgery is more important than the surgeon's evaluation of functional change and X-ray confirmation of optimal implant placement and stability. Therefore, the use of measures and scores to quantify patients' perceptions after arthroplasty is necessary.[1]

The number of infections following revision total knee replacement is greater than that after revision total hip replacement. In a review of an arthroplasty registry in Sweden, Otto and others found that component loosening and infection were the most common indications for revision arthroplasty. The infection rate found by Otto and others was 2.2% in over 2,000 tricompartmental knee arthroplasties.[14] In the US, the overall incidence of deep surgical site infection for both total hip arthroplasty and total knee arthroplasty has increased substantially between 1990 and 2003. In the year 2003, about 1.2% of total hip arthroplasties performed in the US were associated with deep surgical site infection. Total knee arthroplasty in the US was found to have a similar rate of deep infections. Deep infection of the surgical site is a devastating complication of both total hip and total knee replacement with tremendous economic cost.

A total of 27,076 primary hip arthroplasties done in the United States required revision. In Norway, 2.2% (937) of 41,823 primary total hip arthroplasties were revised. By the end of 2004, 2.1% (1154) of 55,519 primary knee implants in the U.S. compared with 3.8%

(532) of 13,969 primary knee implants in Norway necessitated revision. The revision rate for total hip arthroplasty was observed to be higher than that for total knee arthroplasty in the US. Contrary, in Sweden, there was a revision-free total hip arthroplasty survival rate of 96.8% and 96.4% in Norway which was significantly higher than the rate in the US. The rate of revision free survival of total knee arthroplasties was 93.9% in Norway which was lower than the revision rate in the US. Arthroplasties that are done at a younger age tend to need more revisions [15]. In a review of the Swedish Hip Registry, it was found that revision THA constituted 10% of hip arthroplasties and the most common indication for revision was aseptic loosening which accounted for 73% of revisions. The authors however, observed that serious complications and rates of revision of THAs had declined significantly in spite of increasing number of at risk-patients. Revision hip arthroplasties on account of aseptic loosening were commoner in the male gender and in young patients. Young female patients with rheumatoid arthritis and males with a previous fracture of the hip had revision rates that were five times higher than elderly patients. The quality of the surgical technique and implant choice were found to be the most significant factors in decreasing revision risk due to aseptic loosening.[17]

Henrick and others found that 92% of the patients they studied got discharged home within 5 days and 41% within 3 days. They found that patients' satisfaction and outcome after arthroplasty were influenced by age, gender, marital status, co-morbidity, use of walking aids before surgery, haemoglobin level before and after surgery, the need for blood transfusion, ASA score and time between surgery and mobilization. Of their cohort of patients, 5% required re-admission within 3 months post primary THA and 2% needed additional surgery. The indications for re-admission after THA were dislocation, deep infection, fractures and pain. With respect to total knee arthroplasty, 6% (19) of their patients were re-admitted within 3 months and additional surgery was required in 2% of them. Re-admissions following TKA were due to DVT and deep surgical site infections; blood transfusion was required in 22% of patients who underwent THA and 12% of patients who underwent TKA. Blood transfusion was related to co-morbidities, lack of mobilization on the day of surgery and increasing age.[6]

In a review of 1,231 THA patients, 12 to 18 months post-surgery, Nikolajsen and colleagues reported that 28.1% of patients had chronic pain in the operated hip which caused moderate, severe or very severe limitation of activities. They concluded that chronic pain appeared to be a significant problem in at least 12.1% of patients after THA and was influenced by genetic and psychological factors.[18,19] In an outcome assessment of patients after TKA, Mannion and co-workers found that 46.2% of their patients had excellent outcome, 41.2% good outcome and 10.6%, fair outcome. They reported that 1.9% of their patients had a poor outcome. The variation in outcome could not be explained by their data. The authors concluded that in the patients they studied, pre-operative expectation was overly optimistic and recommended that surgeons should relay realistic expectations to patients prior to TKA to improve post-operative patient satisfaction or patient-reported outcome.[20] Psychological factors play an important role in the functional outcome of patients after TKA. Increased body weight has been associated with patellofemoral complications after TKA as well as late loosening and the risk of re-operation. Obesity has been associated with increased perioperative and post-operative morbidity following TKA such as wound infections, prolonged hospital stay and the risk of venous thromboembolism.

Materials and Methods

Sampling: Consecutive sampling method

Study Site

The study was conducted at the trauma and orthopaedic directorate of the Komfo Anokye Teaching Hospital (KATH). The KATH serves as a referral centre for people across Ghana and some neighbouring countries. It provides Trauma and Orthopaedic care for patients 24 hours a day and seven days a week. The centre provides highly specialized trauma and orthopaedic services which include hip and knee arthroplasties. However, arthroplasty cases at the centre, prior to the commencement of this study, August 2015, remained few and undocumented.

Data Gathering

In this study, we enrolled patients who underwent hip hemiarthroplasty, total hip arthroplasty and total knee arthroplasty at the KATH over a 3-year period, from 1st August 2015 to 31st August 2018 and who offered participation consent and followed-up each participant for 2 years. The two-year follow-up was concluded in 2020. Sociodemographic data such as age, gender and occupation of participants were recorded. The indication for arthroplasty was recorded as well as existing comorbidities of participants. In addition, for hip arthroplasty, the surgical approach that was used was recorded for each patient. Whether the procedure was a primary or revision arthroplasty was captured as well. For revision arthroplasties, the indications for revision were recorded.

Surgical and Post-operative Management

Hip arthroplasty (total and hemi), was performed with the use of modified hardinge (lateral), moore (posterior) or watson-jones (anterolateral) approach to the hip. Aesculap B. Braun hip prosthesis was used in the total hip arthroplasties in our cohort. Cemented cup and stem were utilized in patients with inadequate bone stock. Patients with adequate bone stock, received cementless cup and stem. Non-modular bipolar hip prosthesis with a cemented stem was employed in the hip hemiarthroplasties. Total knee arthroplasty was performed via the anterior approach to

the knee and with the use of DePuy Synthes cemented total knee prosthesis. Patella resurfacing was performed in all the TKAs. Tranexamic acid, 1g statim was administered intraoperatively in patients with significant bleeding risk. Patients were mobilized full weight bearing on the affected limb on post-operative day one following primary total hip arthroplasty, hip hemiarthroplasty or total knee arthroplasty, with the aid of a walker (zimmer frame) or a pair of axillary crutches. In revision total hip arthroplasties weight bearing on the prosthetic joint was allowed either on post-operative day 1 or at 6 weeks, depending on the stability of the fixation. No case of revision total knee arthroplasty was performed during the study period. The mean length of hospital stay after a hip or knee replacement was 5 days. No drain was used in any of the primary hip or knee arthroplasties. Following surgery, participants received subcutaneous enoxaparin until post-operative day 7 and continued with oral aspirin for the next 5 weeks. Upon hospital discharge, participants who had not completed their course of enoxaparin, had a written note issued to them by the authors, to be taken to the nearest health facility to complete the 7-day course of subcutaneous enoxaparin. Above knee thromboembolic deterrent stockings were worn on both lower limbs for 6 weeks. The duration of formal physiotherapy ranged from 6 to 8 weeks. All the surgeries were performed by the same team of surgeons using similar techniques.

Physical examination at clinic visits and radiographs were used as tools to gather post-operative data. Furthermore, at each clinic visit, participants who had had total knee arthroplasty completed Tegner activity score and those who had had total hip arthroplasty and hip hemiarthroplasty completed Harris hip score. Telephone calls were used to capture follow-up information in cases where patients missed clinic visits. Outcome data gathering -clinical and radiographic assessment of patients -were conducted by the authors. Study participants were evaluated at 2, 6, 12, 24 weeks, 1year and at 2 years after surgery. Complications of surgery were recorded for each patient. The Likert satisfaction scale was employed to measure the satisfaction of participants with the surgical procedure they had undergone. The validity and reliability of the Harris hip score and the Tegner knee function scale have been proven in several studies.[21]

Study design

Prospective cohort study.

Inclusion criteria

All consenting patients who underwent primary or revision total hip arthroplasty, hip hemiarthroplasty or total knee arthroplasty and who gave informed consent were included in this study.

Exclusion criteria

Patients who refused consent to participate in the study as well as those with pathological neck of femur fractures were not considered for this study.

Statistical analysis

Data were analysed using STATA version 16. Our primary analysis looked at knee or hip pain, stiffness and knee instability as well as excessive wound discharge suggestive of surgical site infection. Descriptive statistics: means, standard deviations and ranges were used to assess demographics, physical examination and outcome data. The analysis of data was performed with 95% confidence intervals. P-values less than 0.05 were considered statistically significant. Chi square test were performed to test association between treatment method and outcomes as well as demographic data; significance was set at $p< 0.05$.

This study was approved by the Komfo Anokye Teaching Hospital Institutional Review Board, KATH IRB/AP/116/20.

Results

A total of 87 hip and knee replacements were performed in 78 patients over the 3-year period. Of the 78 patients enrolled in the study, 67.9% (53) were females and 32.1% (25) were males. Most, 47.2% (37), of the patients were aged between 61 and 80 years, 74.4% (58 of 78) were older than 60 years of which 37 were females and 21males. Participants younger than 40 years constituted 7.7% (6). Overall, the 2-year functional outcome assessment involved 66 patients (4 of the 78 patients died and 8 were lost to follow-up).

Total hip arthroplasty

There were 30 total hip replacements in 25 patients, 14 females, 11 males. Among the 25 patients who underwent THA, 5 had bilateral THA and two of these five patients had both hips replaced at the same sitting. Osteoarthritis of the hip was the indication for surgery in 64% of THA patients (16 of 25 THA patients), femoral neck fracture accounted for 32% (8 of 25 THA patients) and chronic traumatic hip dislocation was the indication in 1 patient, 4%. Out of the 16 patients with osteoarthritis of the hip, primary osteoarthritis was the indication for THA in 31.3% of patients (5 of 16 patients) and osteonecrosis of the femoral head was the indication for THA in 68.8% of patients (11 of 16 patients). Of the 11 patients with osteonecrosis of the femoral head, 36.4% (4 of 11 patients) had sickle cell disease (3 had genotype SC and 1 genotype SS) and 27.3% (3 of 11 patients) had used over-the-counter

topical (2 patients) or oral corticosteroid (1 patient). The use of steroid in these 3 patients was unprescribed. In 4 patients the cause of the femoral head osteonecrosis could not be established. All the femoral neck fractures that underwent total hip replacement occurred following low energy trauma (fall from standing height).

The mean age of the patients with osteonecrosis of the femoral head was 39.3 years (4 males and 7 females). Among the THA patients, 24% (6 of 25) were below 40 years of age. Of the THA patients aged below 40 years, 66.7% (4 of 6) had sickle cell disease and 33.3% (2 of 6) had used over-the-counter corticosteroid.

Overall, 74.4% (58 of 78) of participants who met inclusion criteria were older than 60 years. Cemented cup and stem total hip replacement was performed in 4 hips in 3 patients. Cementless cup and cemented stem hip arthroplasty was carried out in 1 hip in 1 patient. All the other THAs, 83% (25 of 30) involved cementless cup and stem. Complaint of chronic pain in the prosthetic hip was recorded in 16% (4 of 25) THA patients (1 bilateral THA cemented, 3 unilateral, cementless THA). Prosthetic joint dislocation was observed in 1 THA patient at 18 months post operatively. The dislocation occurred during physiotherapy and involved a patient with chronic kidney disease on dialysis, who underwent bilateral THA on account of osteonecrosis of both femoral heads. Cemented cup dislocation was recorded in one patient. Periprosthetic fracture occurred in 2 THAs in two patients (1 was vancouver type AG and the other, vancouver type C). Non-fatal venous thromboembolism was registered in 1 patient (a 64-year-old male with a previous history of pulmonary tuberculosis, who presented with a six-month history of bilateral femoral neck fracture). Two patients underwent revision surgery, one for the revision of a cemented cup dislocation and the other for the fixation of a periprosthetic fracture, vancouver type C with plate and screws. The average modified Harris hip score for total hip replacement patients at 2 years was 92 (range: 54 to 100). Of the patients who underwent THA, 95.5% had good to excellent outcome with a satisfaction rate of 95.5% (i.e participants who were either satisfied or very satisfied).

Hip hemiarthroplasty

There were 44 hemiarthroplasties in 42 patients (two of the hemiarthroplasties were bilateral and were performed at different operative sittings), 29 females, 13 males. There were 3 cases of periprosthetic fracture among the 44 hemiarthroplasties that were performed,] all of which were Vancouver type AG. There was revision of one hemiarthroplasty to a THA on account of breakage of a cemented bipolar femoral stem, 2 years post operatively. The average modified Harris hip score in patients who had hemiarthroplasty was 84 (range 52 to 100). Chronic hip pain was recorded in 1 patient with, bilateral cemented hemiarthroplasty. Overall, good to excellent outcome was reported in 91.2% of hip hemiarthroplasty patients with a satisfaction rate of 97% (satisfied and very satisfied).

Total knee arthroplasty

There were 13 TKAs performed in 11 patients, all on account of osteoarthritis of the knee. The youngest patient who had TKA was 56 years and the oldest was 93 years with a mean age of 72 years. There were 10 females (90.9%) and 1 male (9.1%). Five patients had osteoarthritis of both knees, with equivalent disease severity, and 6 patients had unilateral disease. All the knee replacements were performed under spinal anaesthesia. Of the 13 TKAs, deep surgical site infection was observed in 1 case at 9 days post-surgery. The surgical site infection was recorded in a 57-year old woman with diabetes mellitus. Escherichia coli, sensitive to ciprofloxacin, was isolated from the prosthetic knee joint. The patient underwent washout of the surgical site and put on a course of ciprofloxacin. She got lost to follow-up 2 weeks after the knee washout. One intra-operative periprosthetic fracture at the tip of the femoral component was recorded during TKA in a 93-year-old woman who had a poor bone stock. Patient-reported functional outcome at 2 years following TKA was good to excellent in 90% of patients with a satisfaction rate of 90% (satisfied and very satisfied). A complaint of chronic knee pain was encountered in one patient who had bilateral TKA on account of late stage osteoarthritis of both knees. The Tegner knee score in 10 TKA patients at 2 years ranged from 7 to 10, with a mean score of 9.

In all, 92.3 % of the 78 patients in this study were discharged on post-operative day 3 and eight of the 78 patients (10.3%) were lost to follow-up during the study. One of the THA patients (sickle cell disease patient, genotype SS) and 3 of the hemiarthroplasty patients were dead by 2 years, giving an overall death rate of 5.1% (4 of 78). These deaths happened at home and were reported during follow-up telephone calls. The cause of death in these patients was not known. The mean age of those who died in this study was 87 years. No case of surgical site infection was recorded in the 74 (30 THAs and 44 hemiarthroplasties) hip replacements that were

performed over the 3-year inclusion period at 2 years.

Table 1. The distribution of 87 hip and knee replacements in 78 patients by gender, age, type of procedure performed and indication.

Varriable	Frequency (n=78)	Percentage (%)
Gender		
Female	53	67.9
Male	25	32.1
Age (years)		
<40	6	7.7
40-60	14	18.0
61-80	37	47.2
>80	21	26.9
Precedure performed	**Frequency (n=87)**	
THA	30	34.3
Hip Hemiarthroplasty	44	56.4
TKA	13	16.7
Indication for Total Hip Replacement	**Frequency (n=30)**	
Osteoarthritis of hip	16	64
Femoral neck fracture	8	32
Chronic Traumatic Hip Dislocation	1	4

Table 2. Two-year functional outcome and satisfaction level assessment of 66 patients per surgical procedure

Total hip arthroplasty (n=22, 1 was dead and 2 were lost to follow up) Functional outcome	Frequency (n=22)	Percentage (%)
Fair	1	4.5
Good	2	9.0
Excellent	19	86.4
Level of patient satisfaction		
Unsatisfied	1	4.5
Neutral	0	0.0
Satisfied	0	0.0

Hip hemiarthroplasty (n=34, 3 were dead, 5 were lost to follow up) Functional outcome	Frequency (n=34)	Percentage (%)
Fair	3	8.8
Good	9	26.5
Excellent	22	64.7
Level of patient satisfaction		
Unsatisfied	1	2.9
Neutral	0	0.0
Satisfied	8	23.5
Very satisfied	25	73.5

Total knee arthroplasty (n=10, 1 was lost to follow up) Functional outcome	Frequency (n=10)	Percentage (%)
Fair	1	10.0
Good	2	20.0
Excellent	7	70.0
Level of patient satisfaction		
Unsatisfied	1	10.0
Neutral	0	0.0
Satisfied	2	20.0
Very satisfied	7	70.0

Table 3: Likert scale of satisfaction level

Very satisfied	Satisfied	Not sure	Not satisfied	Not satisfied at all
5	4	3	2	1

The lateral approach to the hip was used in 62 out of 74 hip replacements that were performed. The posterior approach was used in 10 hip replacements and the anterolateral approach was used in 4 THAs in 2 patients. These 2 THAs were performed at the same sitting in each patient. For patients who had hip replacement on account of a fracture of the femoral neck, the left

femoral neck was involved in 67.3% and the right femoral neck in 28.8% of patients. Bilateral femoral neck fracture was present in 3.8% of patients.

Of the cohort of patients studied, 24% (19 of 78) patients had an intercurrent chronic disease. Systemic hypertension was the most common comorbidity among the participants of the study accounting for 31.8% of comorbidities. Diabetes mellitus and sickle cell disease followed systemic hypertension in frequency, each accounting for 18.2% of comorbidities. Asthma made up 9.1%. There was a statistically significant association between the presence of a comorbidity and patient outcomes in terms of re-operation, deep surgical site infection, periprosthetic fracture, survivorship of the prosthetic joint and patient survival at 2-years following a hip or knee replacement, p=0.04. Moreover, there was a statistically significant association between age and functional outcome, being poorer in patients older than 80 years, p=0.03. Infection rate of hip or knee replacement in this study was 1.1% (1 of 87). The overall periprosthetic fracture rate was 5.7% (5 of 87 arthroplasties: 2 out of 30 THAs and 3 out of 44 hemiarthroplasties). The overall prosthetic hip dislocation rate was 2.7% (2 out of 74 hip replacements, 1 THA, 1 hemiarthroplasty). The dissatisfaction rate for THA was 4.5% (1 out of 22 THA patients). No patient was dissatisfied with their TKA at 2 years of follow up. The revision rate for THA was 6.7% (2 out of 30 THAs) and no hip replacement associated infection was recorded. The revision rate for hemiarthroplasty was 2.3% (1 out of 44). Prosthetic hip dislocation rate for THAs was 4.5% (1 of 22 THAs).

I **II**

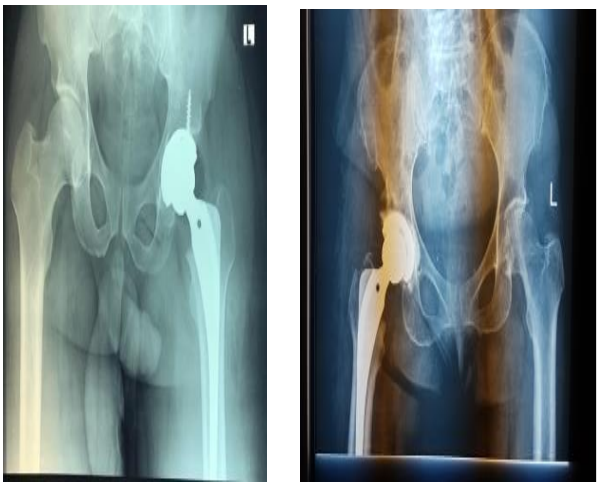

Fig 1: Post-operative x-rays: I cementless left primary total hip replacement, II cemented cup and cementless stem total hip replacement.

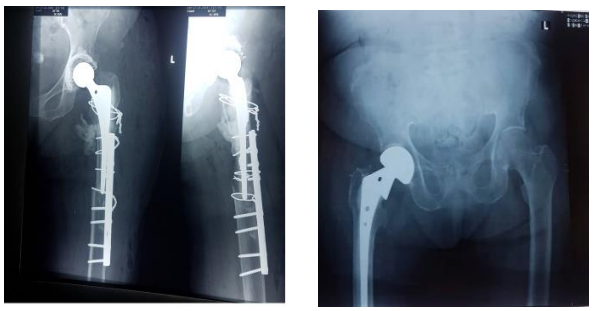

Fig 2. I: revision left total hip replacement, II: right hip hemiarthroplasty

Fig 3. I: implantation of the femoral component in a total knee replacement, II: post-operative x-ray of a left total knee replacement.

Discussion

It was found in this study that 67.9% (53 of 78) of patients studied were females and 32.1% (25 of 78) were males. Most, 47.2% (37), of the patients were aged between 61 and 80 years, with those less than 40 years constituting 7.7% (6). The female preponderance and the higher rate of total joint arthroplasty with increasing age have been demonstrated in several studies.

In an assessment of total hip replacement in the U.S. medicare population, Baron and colleagues[3] found that women had higher hip arthroplasty rate than men and the rate of THA increases with age for both men and women. Osteoarthritis of the hip was the indication for surgery in 64% of the THA patients (16 of 25 THA patients), femoral neck fracture accounted for 32% (8 of 25 THA patients) and chronic traumatic hip dislocation was the indication in 1 patient, constituting 4%. Moreover, the 13 TKAs that were performed were all done on account of osteoarthritis of the knee. The finding of osteoarthritis as the most common indication for total joint arthroplasty in our study is corroborated by several other studies. Baron and colleagues[3] in their study of 5579 cases of THA concluded that osteoarthritis (both primary and secondary) is the leading indication for total joint arthroplasty accounting for 83.3% of cases, rheumatoid arthritis accounted for 3.4% and osteonecrosis 6.6%. In Sweden {6}, primary osteoarthritis accounted for 78% of THAs and osteoarthritis secondary to trauma made up 11%.

Out of the 16 patients with osteoarthritis of the hip, primary osteoarthritis was the indication for THA in 20% of patients (5 of 25 patients) and osteonecrosis of

the femoral head was the indication for THA in 44% of patients (11 of 25 patients). Of the 11 patients with osteonecrosis of the femoral head, 36.4% (4 out of 11 patients) had sickle cell disease, 27.3% (3 out of 11 patients) had used over-the-counter topical or oral steroid. In 4 patients the cause of the femoral head osteonecrosis could not be established. The mean age of the patients with osteonecrosis of the femoral head was 39.3 years. The high rate of osteonecrosis of the femoral head as the indication for THA was found in a similar study in Malawi[4], where a review of a national trauma registry by Lubega and colleagues found that osteonecrosis of the femoral head accounted for 47.9% (35 of 73) of THAs and primary osteoarthritis for 30.1% (22 of 73) THAs.

In our study, deep surgical site infection rate for hip and knee arthroplasties was found to be 1.1% (1 of 87), the overall periprosthetic fracture rate was 5.7% (5 out of 87, 2 out of 30 THAs and 3 out of 44 hemiarthroplasties), non-fatal venous thromboembolism occurred in one patient. The overall prosthetic hip dislocation rate was 2.7% (2 of 74 hip replacements (1 THA, 1 hemiarthroplasty). The infection, periprosthetic and dislocation rates of our study are similar to those found by several other studies. Studies done in the US[13], have reported a deep surgical site infection rate of between 1 and 11%, pulmonary embolism rate of 2% and mortality risk for joint replacement of 1%. Similarly, studies done in Sweden,[14] have reported a deep surgical site infection rate of 2.2%. In addition, the study by Lubega and others[4], in Malawi, on THAs similarly found a prosthetic hip joint dislocation rate of 2.7% (2 of 73), one case of superficial infection, 2 cases of dislocation, 6 months post-surgery and one case of DVT. The mean age of patients undergoing THA in this study was 39.3%. However, Lubega and colleagues[4], in their study in Malawi found a mean age of patients undergoing THA to be 52 years. In Sweden,[13] the mean age of patients undergoing THA was 70 years. The lower mean age of patients undergoing THA in our study is likely due to the occurrence of osteonecrosis of the femoral head in sickle cell disease patients at a younger age, who accounted for 27.3% of patients with osteonecrosis of the femoral head who had THA.

In this study, we found a statistically significant association between age and functional outcome, being poorer in patients older than 80 years, p=0.03. Moreover, a statistically significant association was observed between the presence of a comorbidity and outcomes in terms of re-operation, deep surgical site infection, periprosthetic fracture and patient survival at 2-years following a hip or knee replacement, p=0.04. Bourne and colleagues found in their study that depression and comorbidities predict poor function after TKA. One of the THA patients and 3 of the hemiarthroplasty patients were dead by 2 years giving an overall death rate of 5.1% (4 of 78). The mean age of those who died in this study was 87 years. In a similar study by Kristenson and others,[13] 3.7% of the patients they studied, died within 1 year; they found the mortality rate to be higher in male patients and in patients over 74 years of age. The mean length of hospital stay following hip or knee replacement in our series was 5 days and 92.3% of the 78 patients were discharged on post-operative day 3. Henrick and others,[6] similarly found that 92% of the patients they studied got discharged home within 5 days and 41% within 3 days.

In a study to determine the optimal approach in hip hemiarthroplasty, de Vries and others[5] found a relatively higher dislocation rate in patients who underwent hip arthroplasty via the posterior approach, 2.9% as compared to the lateral approach, 1.4%. In addition, de Vries and colleagues[5] found a higher rate of periprosthetic fracture in the lateral approach compared to the posterior approach. Similarly, in our study, the lateral approach to the hip, was associated with a relatively higher periprosthetic fracture rate (9% for lateral approach vrs 2.4% for posterior approach) in patients who underwent hemiarthroplasties. Our study, however, did not find a difference in the dislocation rate between the lateral and the posterior approaches to the hip. Of their cohort of patients, de Vries and co-workers[5] reported that 5% required re-admission within 3 months post primary THA and 2% needed additional surgery. The indications for re-admission after THA were dislocation, deep infection, fractures and pain. Similarly, in our study, 6.4% (5 of 78) of the patients who underwent hip or knee arthroplasty required re-admission in the first 8 weeks after surgery and the indications for readmission were periprosthetic fracture, dislocation and infection.

The revision rate for THA in this study, was 6.7% (2 out of 30 THAs) and no case of the infection in hip arthroplasty was recorded by 2 years. The revision rate for hemiarthroplasty was 2.3% (1 out of 44) and that of TKA was 2 out of 11 patients. Prosthetic hip dislocation rate for THAs was 4% (1 of 25 THAs). The indications for revision in our study, were periprosthetic fracture, dislocation and infection. Conversely, Robertson and others[14] reported that in Sweden, component loosening and infection were the most common indication for revision arthroplasty.

Ibrahim and others[2] reported that 90% of patients who undergo hip or knee replacement attain pain relief and/or improvement in function and that joint replacement has a mortality risk of 1% making it one of the safest routine surgeries. Also, Gerellick and others[15] in their study observed that for patients undergoing total joint arthroplasty, relief of pain, restoration of function and improved quality of life are the outcomes most highly rated by patients. Similarly, in our series 92.4% (61 of 66) of patients studied had excellent outcome and 89.4% (59 of 66) were very satisfied with the procedure and reported improved function.

The average modified Harris hip score of the THA and hip hemiarthroplasty patients we studied was 92 (range: 54 to 100). These findings are similar to those of Graham and others[23] who in their study concluded that

with modern components, total joint arthroplasty outcomes are superior. Similarly, study by Lubega and others {4} in Malawi, found a mean Harris hip score of 85 (79 to 91).

In this study, a dissatisfaction rate for THA was 4.5% (1 of 22 THA patients) was observed and this involved a patient with chronic kidney disease who was on dialysis. These findings are similar to those found by many other studies. It has been reported that the factors that predict poor function after TKA are depression, pre-operative pain and comorbidities[9,10]. Also, Mannion and others[20] reported a fair outcome in 10.6% and a poor outcome in 1.9% and reported that the dissatisfaction associated with the outcome of TKA occurs when patients experience post-operative complications, failure of the operation to meet pre-operative expectations and patients with less severe radiographic osteoarthritis.[7,8] A study in Sweden, by Robertsson and co-workers[14], on patient satisfaction with outcome after TKA reported a dissatisfaction rate of 19%.

Conclusion

In this study, we found that women have a higher hip or knee replacement rate (67.9%) than men (32.1) and the rate of hip or knee replacement increases with age for both men and women. Osteonecrosis of the femoral head is the most common indication for total hip replacement in patients younger than 60 years. Sickle cell disease (66.7%) and corticosteroid abuse (33.3%) are most commonly associated with hip replacement in patients under the age of 40 years. Periprosthetic fractures are the most (5.7%) commonly encountered complication in this study. The most common indications for readmission and for revision after a hip replacement were periprosthetic fracture, dislocation and infection. The dissatisfaction associated with the outcome of a hip or a knee replacement is associated with the development of post-operative complications. Arthroplasty of the knee or hip is safe at the study site. It provides excellent outcome in most (92.4%, 61 of 66) patients and has low complication and high patient satisfaction (89.4%, 59 of 66) rates.

Limitations

We enrolled 25 total hip replacement, 42 hip hemiarthroplasty and 11 total knee replacement patients over a 3-year period. Our conclusions would have been stronger and the power of the study higher, if a larger sample size had been studied. The cause of death in patients who died at home during the follow-up period, if it had been known would have improved the quality of our study. In addition, measurement of body mass indices of patients who underwent total knee replacement would have enabled the association between obesity and patient reported outcomes after total knee arthroplasty to be determined.

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DEPRESSION AMONG HEALTH WORKERS: A STUDY AT THE HO TEACHING HOSPITAL IN GHANA

Dziwornu E[1]; Dordoye E[1,2]; Anku A[2]; Hohl JE[3]; Oboh L[2]; Addae AK[1,2]

[1] University of Health and Allied Sciences; [2] Ho Teaching Hospital; [3] SRH Hochschule Heidelberg, Germany

Abstract

Objective: The current study is an effort to examine the level of depression and associated factors among health workers in Ghana.

Methodology: The Patient Health Questionnaire 9 (PHQ-9) was used to screen 127 health workers of the Ho Teaching Hospital. These were participants who presented themselves for screening at the facility during the 2019 world mental health celebration in Ghana.

Results: Descriptive analysis revealed that over 30% of participants experience moderate level of depression with females experiencing higher levels than males. However, inferential analysis revealed that differences in the levels of depression are not significant with regards to gender and department/job description, as well as no significance age impact on depression. However, married health worker reported significantly lower level of depression compared to health workers who are not married.

Conclusion: Health workers experience depression. Some factors determine the levels of these condition, thereby requiring further investigations.

Key words: *Depression, Health workers, Ho, Teaching Hospital*

Introduction

Depression and related mental health conditions among health workers in Ghana are under appreciated. Meanwhile, depression is the leading cause of disability,[1] thereby, affecting various aspects of life including work and productivity[2] such as the care the health worker gives to patients. Many experiences in life produce either an immediate or delayed overwhelming mental health consequence(s) such as depression for the individual[3]. Depression is a mental disorder largely affecting the mood of individuals and interrupting their sense of wellbeing emotionally, socially, and occupational functioning. This mental disorder is characterised by loss of interest in pleasurable events.

Depression has strong biological basis. For example, age and gender are strongly implicated in the development of depression.[4] Talukder et al.[5] found in their study that younger people experience higher levels of depression with decreased quality of life than their older counterparts. Factors accounting for depression across the lifespan have been identified to include income, body mass index (BMI), childhood abuse and chronic diseases[6]. For gender, females have been found to experience higher levels of depression than males.[7] Sagud et al.[8] pointed out that females are more prone to depression because they experience hormonal changes at various stages such as during pregnancy, and menstrual cycles. Benneh et al.[9] also indicated that depression in women can arise from childlessness, infidelity and domestic violence.

Meanwhile, social factors also have strong correlations with depression among all groups of people. Factors such as type and nature of job, family or relationship challenges and losses may influence levels of depression.

Healthcare workers such as physicians, nurses, pharmacists and laboratory technicians have health care opportunities at their disposal. Comparatively, they are expected to have easier access to health care than non-health care workers. However, this opportunity does not always amount to utility (perhaps it does for physical health), especially with regards to mental health among health workers. The mental health of healthcare providers/workers is crucial as this translates into how they render their services to patients. The nature of work of the health worker also predisposes them to several risk factors of mental ill-health.[10,11] For example, it has been reported that health workers on shift duties experience more stress and insomnia.[12] Similarly, Perry et al.[13] also found that, nurses experience many mental disorders and are usually on some form of psychoactive medications.

Maharaj et al.[14] reported in their study among 102 Australian nurses that 32.4% of the nurses had high levels of depression and 86.3% reported some depressive symptoms. Regarding stress, the study reported that 41.2% of the participants recorded higher stress levels and 95% reported some level of stress symptoms. They also reported that participants who were not satisfied with job aspects reached a significantly higher level of distress and depression[14].

Corresponding Author: **Dr. Emmanuel Dziwornu**
University of Health and Allied Sciences, PMB. 31, Ho, Volta Region, Ghana
Email Address: edziwornu@uhas.edu.gh
Conflict of Interest: None Declared

Similar results were found with a comprehensive meta-analysis by Mata et al.,[15] who examined the prevalence of depression or depressive symptoms among interns and resident physicians. Overall, they used 54 studies published between January 1963 and September 2015 with 17560 participants. A total of 28.8% of them suffered from depression or depressive symptoms. Further significant increases of depressive symptoms in resident physicians over time and among trainees within a year of beginning were shown.

In a study by Yeboah et al.,[16] the authors examined determinants of workplace stress among 453 healthcare professionals in Ghana. A questionnaire was used to identify the most important and common factors of stress and to relate them to occupation national groups. They were able to prove that physicians and nurses reported the highest amount of stress.

There is limited research on the mental health challenges among health workers in Ghana, making policy decisions regarding interventions at institutional and national levels deficient. Depression, as the leading cause of disability can render health workers incapable of rendering the best services to patients. Little is known about this condition among health workers in Ghana. This underscores the relevance of this current study within a newly inaugurated teaching hospital known as the Ho Teaching Hospital in the Volta region in Ghana.

Aims of the Study

This study aimed to find out the prevalence of depression among health workers in the Ho Teaching Hospital. By this, the study aims at distinguishing which portfolio of health workers express higher levels of depression within the hospital.

Hypotheses

It was therefore hypothesised that, 1) single female health workers will show a significantly higher levels of depression than their married female counterparts, 2) females will have a significantly higher level of depression than males, 3) the age of health workers will significantly correlate with their level of depression, and 4) the job descriptions of the health worker (here seen as the department) will significantly predict depression.

Materials and Methods

Research Design

This study used a cross-sectional survey design. This design allows for the collection of information from across the various sections of a population on a particular subject. Indeed, data for this study was gathered from heath workers across the various departments, gender and ages population under study.

Population / Sample

The target population for this screening was all staff of Ho Teaching Hospital. Ho Teaching Hospital was built in 1998 as the Volta regional hospital. The hospital was upgraded after 21 years to a teaching hospital status in the second quarter of 2019 in order to serve training purposes for the University of Health and Allied Sciences in the same region. Out of the population, one hundred and twenty-seven (127) willingly presented themselves for the screening, thereby making the sampling method a convenient one. This consisted of 38 males and 89 females during a mental health week screening exercise. [Note: We realised that apart from the about 5% of the participants who are national service personnel in the facility during the study, 30.7% of the participants are captured as students. However, these students are actually in the terminal years of their medical training. These are mostly final year medical and physician assistantship students who are working on the wards on daily basis as part of their training. A few of them are postgraduate allied health students (e.g., biomedical laboratory science, medical imaging) who as part of their training are providing services to patients in the hospital on daily basis. As much as they are still students, there are very much into the healthcare activities]. Other demographics of the participants are presented in the following table (**Table 1**).

Table 1 Demographic Information of Participants

Demographic Variable	Frequency	Percentage
Sex		
Male	38	29.9
Female	89	70.1
Age [Mean (Std. Dev.)]	28.45 (8.74)	
Marital status		
Single/ divorced/ separated	92	72.4
Married/ cohabiting	35	27.6
Occupation		
Student	39	30.7
Nursing	55	43.3
NSS	7	5.5
Other staff	26	20.5

Instrument

The Patient Health Questionnaire 9 (PHQ-9) was used for the data collection. It is a self-report screening tool to used assess the presence and severity of depressive symptoms of an individual. The scale is a shorter form of the Primary Care Evaluation of Mental Disorders (PRIME-MD). The PHQ-9 was developed by Spitzer, Williams, Kroenke and the Patient Health Questionnaire Primary Care Study Group in 1999[17]. It includes nine items which screen the participant's

behavior and thinking with regard to the most important depressive symptoms such as interest in things, feeling down, sleep, energy level, eating, self-perception, concentration, speed while doing things and thoughts of suicide. Responses range from "0" (not at all) to "3" (nearly every day). Thus, a total sum between 0 and 27 can be obtained at the end, which indicates the severity of the depression. Usually a total sum above 10 shows presence of depression. The PHQ-9 can be used to diagnose depressive disorders. However, it should be extended by further information and the history of the patient in order to be able to make an adequate diagnosis [18].

Data was collected through a mental health screening exercise organized during the 2019 national mental health week celebration in Ghana. At the Ho Teaching Hospital, permission was sought for the Mental Health Celebration from the hospital management. As part of the celebration in the Volta region of Ghana, among other activities, the staff of Ho teaching Hospital were sensitized on mental health and the need to partake in the screening exercise. An announcement was conveyed to all departmental staff through their respective heads. This announcement was repeated at a staff durbar and on the staff social media platforms. Staff who willingly reported for the screening were informed that the data to be obtained will be used for research purposes as well. Participants were presented with the questionnaire for them to answer to items. Their scores were aggregated and their levels of depression was revealed to them on an individual basis before they left the screening centre. Participants whose depression levels were high were referred to a clinical psychologist or psychiatrist for intervention. Participants were informed that their participation is purely voluntary. Confidentiality was strictly adhered to. The screening took place at the hospital for only a day.

Results

Data collected was entered and analysed using the SPSS version 16. Results are presented in this section in the order of the hypotheses stated above. Prior to this, some descriptive analyses are also presented to buttress the findings.

Descriptive Results

The descriptive results presented in this section show the severity of depression across the various demographics of the participants in the study. This is to present a picture of the level of depression as exhibited among staff at the Ho Teaching Hospital. **Figure 1** presents the general severity of depression among the staff. It is recorded in the pie chart that many participants (37%) experience moderate level of depression. However, it is worth noting that some 7% of the participants experience severe level of depression among the workers.

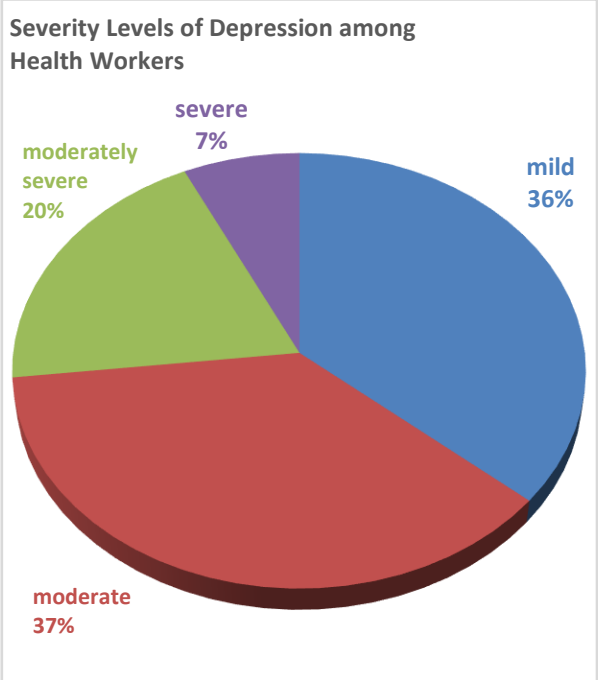

Figure 1
Severity Level of Depression among Participants

In **figure 2** below, it is observed that at all levels, females experience higher severity than males. For example, 8 females as against only one male experience the severe level of depression. As seen in the previous figure that majority of the participants experience moderate depression, it also appears in figure 2 that more females (exceedingly above males) recorded this level of depression.

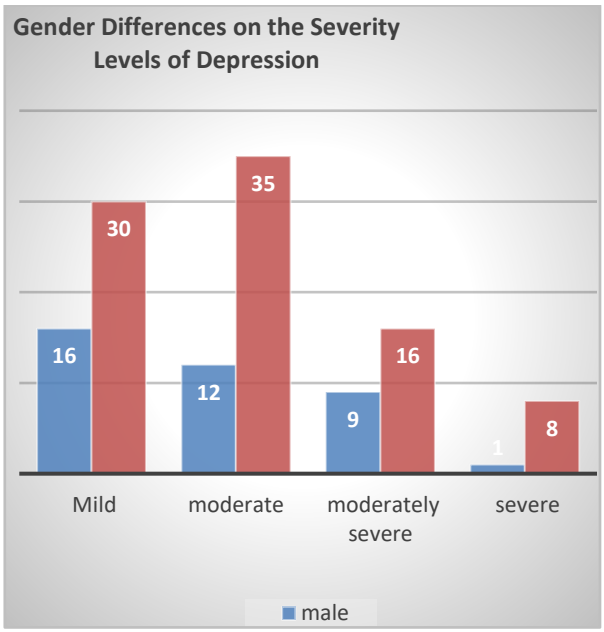

Figure 2
Gender Differences in Severity Level of Depression

Figure 3 also shows the severity levels across marital status. Participants who are single showed higher severity than those who are married. While 8 singles are reporting severe depression, only 1 married reported same. Again, while 19 singles reported moderately severe depression, 6 married reported same.

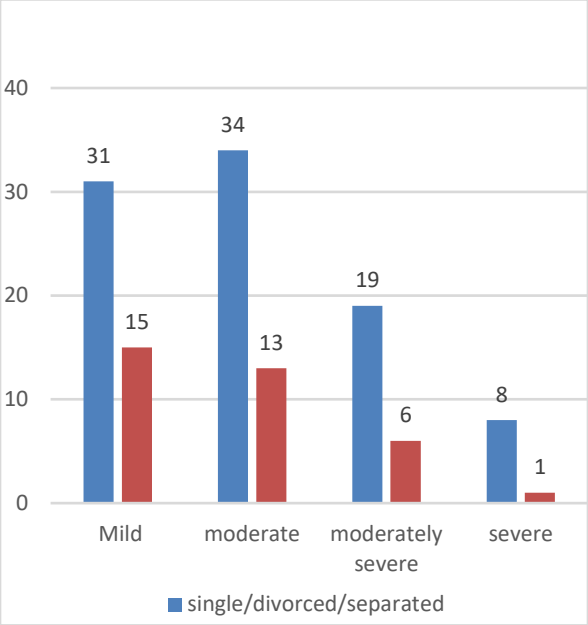

Figure 3
Marital status and Severity level of Depression

From the **figure 4**, it is observed that nurses reported highest on the first severity levels of depression compared to the other job categories. On the highest severity level however, nurses ranked second to students and other staff. Service persons reported the least of the severity levels of depression.

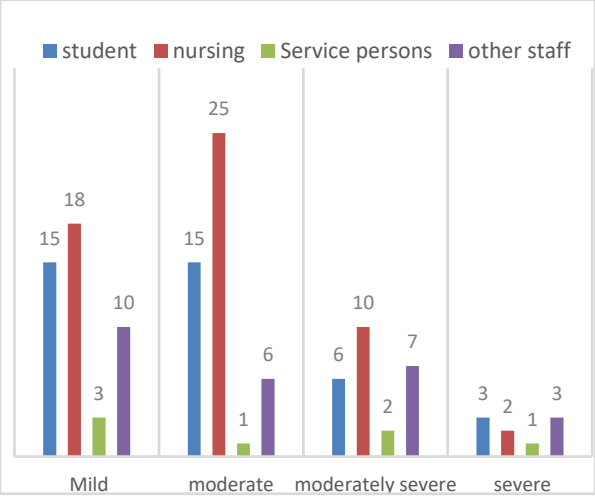

Figure 4
Job category/description and severity level of depression

Hypothesis Testing

The first and second hypotheses predicted sex and marital status differences in depression among health workers. Specifically, single females were predicted to have higher levels of depression than married females in the first hypothesis whereas the second hypothesis predicted a higher depression level for females than males. The results are presented in **tables 2** and **3** below.

Table 2 Descriptive Statistics

Sex of Participants	Marital Status	N	Mean	Std. Dev.
Male	Single/Divorced/ Separated	25	13.20	4.19
	Married/ Cohabiting	13	11.00	2.65
	Total	**38**	**12.45**	**3.85**
Female	Single/Divorced/ Separated	67	13.78	4.74
	Married/ Cohabiting	22	12.41	3.80
	Total	**89**	**13.44**	**4.54**
Total	Single/Divorced/ Separated	92	13.62	4.58
	Married/ Cohabiting	35	11.89	3.45
	Total	**127**	**13.14**	**4.35**

Table 3 Two-Way ANOVA Test of Between-Subjects Effects

Source	Sum of Squares	df	Mean Square	F	p
Sex	22.23	1	22.23	1.19	.28
Marital Status	71.76	1	71.76	3.86	.05
Sex * Marital Status	3.91	1	3.91	.21	.65
Error	2288.96	123	18.61		
Total	24321.00	127			

In **Table 2** above, single females (n=67) had a mean of 13.78 (SD=4.74) and the married females (n=22) had a mean of 12.41 (SD=3.80). From table 3 however, it is shown that the interaction between sex and marital status is not statistically significant [F(1,127)=.21, p=.65]. This indicates that the difference between the means scores of single females and their married female counterparts is not significant. Thus, the first hypothesis is not supported.

However, it was observed from the results in table 3 that marital status in general has a significant effect on depression among health workers [F (1,127) =3.86,

p=.05]. It is observed in table 2 that, the single health workers (n=92) show higher depression levels (mean=13.62, SD=4.58) than the married ones (n=35, mean= 11.89, SD=3.45). The results regarding the second hypothesis that female will show higher depression level than males indicate that there is no significant gender effect on depression among health workers [F(1,127)=1.19, p=.28]. However, female health workers (n=89) scored slightly higher (mean=13.44, SD=4.54) than males (n=38, mean=12.45, SD=3.85). The hypothesis is not supported since the difference between the two groups is not significant.

The third hypothesis predicted a correlation between age and level of depression among health workers. In a similar vein, hypothesis 4 predicted that job description will predict depression among health workers. These two hypotheses were analysed using a hierarchical multiple regression where age is entered into the first model, followed by job descriptions in the second model. Also, since job descriptions are categorical, they were dummy coded into continuous variables with student nurses being the reference point. The results are presented in the following table. In the Table 4 below, a significant model is observed at step 1 where the influence of age on depression is tested (R^2=.02, F=1.41, p<.01). It was observed however that age does not significantly predict depression among health workers (β=-.11, p=.23). This means that the third hypothesis is not supported, indicating that the age of the health worker may not necessarily be the basis for their depression.

Table 4
Hierarchical Multiple Regression showing how Age and Job Description predict Depression

Model		B	Std. Error	β	*t*	*p*
1	**(Constant)**	14.670	1.318		11.134	.000
	Age	-.054	.044	-.108	-1.213	.227
2	**(Constant)**	15.670	1.467		10.681	.000
	Age	-.121	.059	-.243	-2.039	.044
	Nurse	.413	.993	.047	.415	.679
	Others (Lab, admin)	2.828	1.464	.263	1.932	.056
	Service persons	2.935	1.760	.155	1.668	.098

R^2=.02, F=1.471, p<.001 for step 1; ΔR^2 =.05, F=2.106, p<001 for step2

Their fourth and final hypothesis of this study tested for the effect of job category/description on depression among health workers. The result is also presented in the regression table under model 2 above where a significant model was also observed (ΔR^2 =.05, F=2.106, p<001). However, it is observed that none of the job categories significantly predict depression; nurse (β=.05, p=.68), others (β=.26, p=.06), and service persons (β=.16, p=.10). This hypothesis is also not supported.

Discussion

Globally, mental health requires extensive research for understanding and promotion. In Ghana and many developing countries however, in spite of the limited understanding, research efforts have been limited and narrow. There is little evidence on the mental health of health workers in Ghana. Thus, factors that may promote or risk the mental health of health workers is less known. The current study attempted to unravel some of these factors with regards to depression among health workers in the Ho Teaching Hospital.

Inasmuch as the hypotheses were not supported, it provides evidence for the fact that the factors considered may not be of the biggest concerns in mental health among the said population. However, these findings may not apply to other population. For example, in the current study, there was no significant gender difference in depression from the hypothesis tested. This is not the case in the findings of Sagud et al. [8] who indicated that females experience higher levels of depression than males due to differences in biological experience females go through. Similarly, age was not a significant predictor of depression in this study. However, Talukder et al.[5] reported that younger people experience more depression with reasons such as childhood abuse, BMI and income to be accounting for the age impact on depression assigned by Schaakxs et al.[6]

An interesting observation from the results of the current study however is the impact of marital status on depression among health workers. It was observed that health workers who are not married experience higher depression levels than their married counterparts. Marriage may come with its challenges however; it may serve some soothing purposes in stressful situations. Spouses may be available for the health worker to discuss frustrations and other burdens. Generally, social support becomes readily available for the married, as such they would receive comfort, motivation and direction from each other. Regardless of the fact that there were no statistically significant observations made in the results, there is yet the indication from the histograms and pie chart that female experienced higher levels of depression, and nurses compared to the other health workers recorded higher numbers on the levels of depression.

This could still call for concern and attention to such variables in health settings in order to avoid surprise outcomes among such groups on the job. Generally, these findings project an idea of the situation among health workers in the Ho Teaching Hospital and so, can

serve as a basis for follow ups and prospective mental health activities among health workers.

Conclusion

Mental health needs more attention in Ghana. No population in Ghana and every other country is immune to mental health challenges. Several factors form the basis for the development of mental health challenges. Though these factors explored in this study did not give significant and distinguishable outcomes, there are still many others that require scientific exploration.

The study is worthwhile especially among the very population that is tasked with the general health of the population of the country. There is the need to replicate the study in other facilities and populations to understand the picture of mental health in the country. Since avenues such as mental health celebrations, community lectures and many others could be tapped to extract data in order to study and understand Ghana's mental health status.

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DELAYS IN BREAST CANCER TREATMENT SCHEDULES DURING THE COVID-19 PANDEMIC AND PATIENT EXPERIENCE WITH SAFETY PROTOCOLS: A TERTIARY HOSPITAL EXPERIENCE IN GHANA

Nsaful J [1,2]; Dedey F [1,2]; Ayirebi-Acquah E [2]; Nartey E [1]; Clegg-Lamptey J N [1,2]

[1]Department of Surgery, University of Ghana Medical School, College of Health Sciences, University of Ghana, Accra, Ghana; [2]Department of Surgery, Korle Bu Teaching Hospital, Accra, Ghana; [3]Centre for Tropical Clinical Pharmacology & Therapeutics, University of Ghana Medical School, College of Health Sciences, University of Ghana, Accra, Ghana.

Abstract

Objective: As at 30th September 2020 in Ghana 46,626 confirmed cases of COVID-19 with 301 related deaths had been reported. All over the world and in Ghana, elective surgeries including cancer surgeries were delayed. Korle Bu Teaching Hospital had to adjust by performing fewer elective surgeries. The hospital also put into place COVID-19 safety protocols to protect both patients and staff. These included temperature checks, handwashing, limited number of visitors and health education at the Out-patient Departments. This study set out to evaluate how the pandemic affected access to breast cancer treatment, particularly surgery and the patients' experience with the COVID-19 safety protocols.

Methodology: This was a cross-sectional study conducted on all patients who had surgery for breast cancer during the COVID-19 pandemic, from April to September 2020. The areas assessed were OPD, chemotherapy and surgery appointments. Categorical variables were reported as percentages and continuous variables as mean (± SD) or median (with IQR). Descriptive analysis used to represent delays in OPD, Chemotherapy and Surgery appointments.

Results: A total of 103 breast cancer surgeries were identified. Seventy-seven (74.8%) of these consented to participate in the study. This study documented 10.4% delays in OPD attendance, 24.5% delays in chemotherapy sessions and 61.0% postponement of surgeries with a mean waiting time to surgery of 6.4 weeks [SD 3.8]. The enforcement of the COVID-19 safety protocols and the practice of physical distancing made the majority (72.7%) feel safe.

Conclusion: Healthcare capacity and planning should support the national agenda to fight the pandemic without undue delays in cancer care.

Key words: *breast cancer, COVID-19, delay, surgery*

Introduction

On 11th of March WHO declared COVID-19 a global pandemic.[1] On March 12th 2020 the first two cases were confirmed in Ghana.[2] As at 30th September 2020 close to 35 million cases had been diagnosed worldwide with over 1 million global deaths and 46,626 confirmed cases in Ghana with 301 related deaths.[3]

The pandemic has taken a toll on health care systems all over the world and Ghana was not an exception. Hospitals in Ghana were burdened with increasing numbers of COVID-19 cases and resources including personnel were diverted to fighting the pandemic.

World over, elective surgeries including cancer surgeries were delayed to create space for COVID-19 patients, to make more health workers available at treatment centres and to limit exposure of patients and health workers to the virus. Lockdowns and travel restrictions reduced accessibility to oncology services. The economy was also hard hit and out of pocket payments for treatment were even more of a challenge than usual.

Korle Bu Teaching Hospital (KBTH) in Ghana is a referral tertiary centre for many diseases including breast cancer and attends to patients from within the country and the West African subregion. Though the lockdown in Ghana was only 3 weeks travel restrictions at the land borders persisted making movement difficult for patients from neighbouring countries. The hospital's operations were affected by the re-assignment of some health workers (including anaesthetists to man the intensive care units) to designated COVID-19 treatment centres, some theatres and theatre staff were solely dedicated to confirmed COVID-19 cases who required surgeries. Some staff were not available because they had to be isolated or quarantined due to COVID-19 infection or exposure. This became a challenge resulting in a back log of breast cancer surgeries. Regular surgical services at KBTH resumed in September 2020, after Ghana's first peak of the pandemic.

In the UK, breast cancer screening services were suspended during which time routine diagnostics were deferred, only symptomatic cases had diagnostic tests

Corresponding Author: **Dr. Josephine Nsaful**
University of Ghana Medical School, College of Health Sciences, University of Ghana. Department of Surgery, Korle Bu Teaching Hospital.
Email Address: josco19@yahoo.com
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and procedures.[4] Consequently, a national, population-based study in England estimated an expected 7.9 – 9.6% increase in breast cancer deaths at 5 years post-diagnosis.[4] Cancer screening services resumed with a huge backlog. At KBTH the usual large free breast screening clinics that characterise the October breast cancer awareness month were also cancelled.

The Korle Bu Teaching Hospital put into place COVID-19 safety protocols to protect both patients and staff. These included temperature checks, handwashing, limited number of visitors and health education at the Out-patient Departments (OPDs). This study set out to evaluate breast cancer patients' experience with the COVID-19 safety protocols and access to treatment, particularly surgery, during the first peak of the pandemic in Ghana.

Materials and Methods

This was a cross-sectional study conducted on all patients who had surgery for breast cancer at the Breast Surgery Unit of the Korle Bu Teaching Hospital in Accra during the COVID-19 pandemic, from April to September 2020.

Data extraction

The following information was extracted from their clinical notes;

- delays in OPD appointments,
- delays in scheduled chemotherapy,
- re-scheduling/postponement of surgery and
- waiting time for surgery.

Patient interviews

Patients were interviewed on the COVID health education they received, the enforcement of safety protocols instituted by the hospital, how these measures made them feel, and on their perspective of how the pandemic had affected their treatment.

Data analysis

Categorical variables were reported as percentages and continuous variables as mean ± standard deviation (SD)or median (with interquartile range, IQR). Descriptive analysis was used to represent delays at the OPD, Chemotherapy suite and Surgery appointments.

Results

A total of 103 breast cancer surgeries were identified from the records of the unit. Seventy-seven of these consented to participate in the study. Of the 26 who did not participate, 7 lived out of Accra, 4 declined to give consent and 15 patients (including one male) could not be reached by phone. All 77 patients interviewed were female. The age range of the study participants was 30 to 81 years with a median age of 50 years [IQR 41-59].

COVID-19 safety protocols

Forty-five (58%) patients recalled that they were educated on COVID-19 during hospital visits. However, 3 patients (3.9%) denied being given any education on the topic and the rest did not recall whether or not they were educated on COVID-19. All 77 patients responded having to comply with compulsory wearing of facemasks, handwashing protocols, and temperature checks at the entrance of the department. A vast majority of the study participants (93.5%, n=72) responded noticing enforcement of physical distancing at the OPD but only 31 (felt 40.3%) they were physically distanced from the staff. As a result of these protocols instituted by the hospital 72.7% of respondents felt safe during hospital visits whilst 14.3% were afraid, 3.9% felt uncomfortable, 1.3% felt anxious and 7.8% were indifferent.

OPD delays

Table 1 shows the OPD delays of study participants as extracted from the clinic folders. Whilst 69 (89.6 %) of patients never experienced any delay in scheduled OPD visits, 8 (10.4%) patients did. Two of them had their OPD appointments delayed by the breast unit. Six self-delayed their OPD appointments; 2 due to fear of exposure to COVID-19, 2 due to movement restrictions during the lockdown, 1 due to inadequate finances and movement restrictions and 1 due to delay in histopathology report. Prior to the pandemic the breast unit does not reschedule OPD appointments as clinics are always in session. It is not known how often prior to the pandemic patients on their own accord delay appointments for personal reasons.

Table 1. Delays in scheduled OPD visits and chemotherapy sessions

Delay reason		Frequency	Proportion (%)
OPD delay (N=77)			
	None	69	89.6
	Delayed by breast unit	2	2.6
Self-delay due to fear of COVID-19 exposure		2	2.6
Self-delay due to movement restriction during lockdown		2	2.6
	Self-delay due to inadequate finances	1	1.3
Self-delay due to delay in histopathology report		1	1.3
Chemotherapy delay (N=53)			
	None	40	75.5
	Rescheduled by breast unit	7	13.2
Self-delay due to movement restriction during lockdown		2	2.6
	Self-delay due to inadequate finances	4	5.2
Surgery delay (N=77)			
	None	30	39.0
	Breast unit postponement	41	53.2
	Self-delay due to fear of surgery	1	1.3
Self-delay due to fear of exposure to COVID-19		2	2.6
Self-delay due to COVID-19 related financial constraints		1	1.3
	Self-delay to ill-health during the period	2	2.6

Chemotherapy delays

Fifty-three patients received chemotherapy during the period. Forty (75.5%) patients never had their chemotherapy sessions delayed. Of the13 (24.5%) patients that experienced delays, 7 were rescheduled by the unit (delayed for a week) and 6 self-delayed: 2 due to movement restrictions during the lockdown and 4 due to inadequate finances during the period (**Table 1**). **Figure 1** shows the length of treatment delays for the 13 study participants. The most frequent chemotherapy delay was for 7 days (1 week) (n=6; 46.2%). One (1) study participant had a chemotherapy delay of 16 weeks. Prior to the pandemic the breast unit did not reschedule chemotherapy sessions but rather insists patients adhere to the prescribed treatment schedule unless medically indicated. It is not known how often prior to the pandemic patients on their own accord delay appointments for personal reasons.

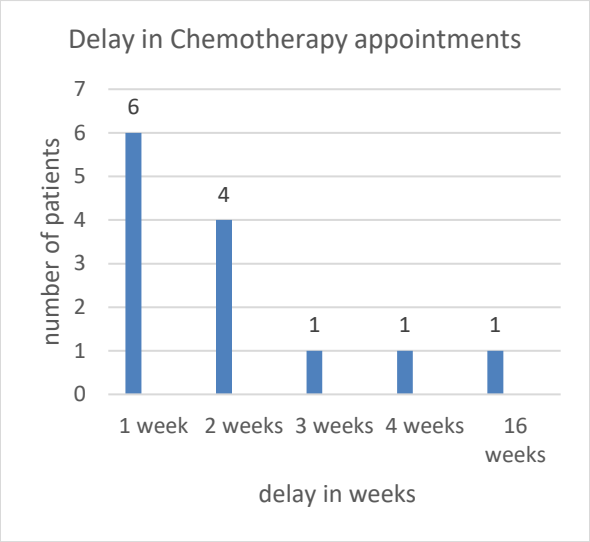

Figure 1. Delays in chemotherapy sessions

Waiting time for surgery

Figure 2 shows the overall waiting time for surgery for all patients, ranged from 1 week to 20 weeks with a mean of 6.4 ± 3.8 weeks. A total of 47 patients (61.0%) had their initial surgery dates re-scheduled whilst 30 (39.0%) had surgery as scheduled (**Table 1**). Of the 47 patients who had rescheduled surgery dates, 41 of them were due to the breast unit postponement and 6 were self-delays (made up of 2 due to fear of exposure to COVID-19, 1 due to COVID-19 related financial constraints, 2 due to ill-health during the period and 1 due to fear of the surgery itself (**Table 1**). Of importance is that the breast unit postponed surgeries for 3 patients on the day of surgery due to COVID-19 related factors. Further analysis shows that the time to initial scheduled surgery dates for all patients were found to range from 1 to 20 weeks with a mean of 4.1 weeks (**figure 3**). However, by the said appointment dates, COVID-related logistic challenges resulted in 61% of patients having their surgeries postponed for varying periods of 1 to 12 weeks (**figure 4**) with a mean postponement of 3.7 weeks [SD 2.78] from the originally booked surgery date.

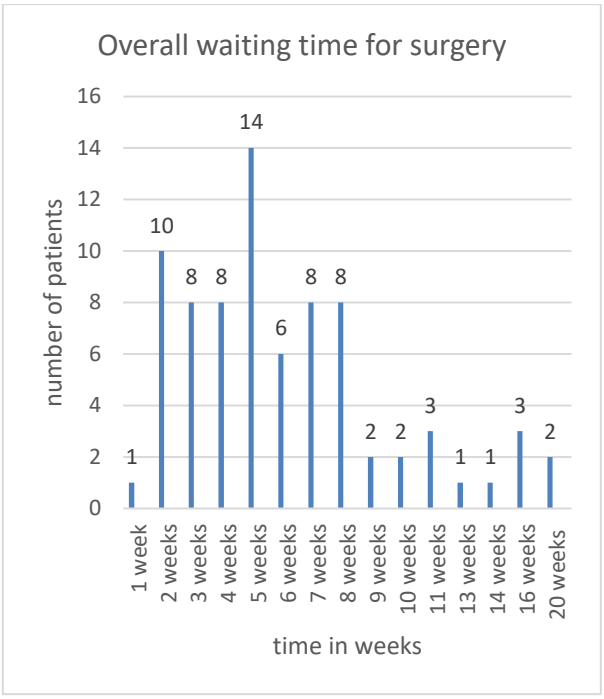

Figure 2. Overall waiting time for surgery

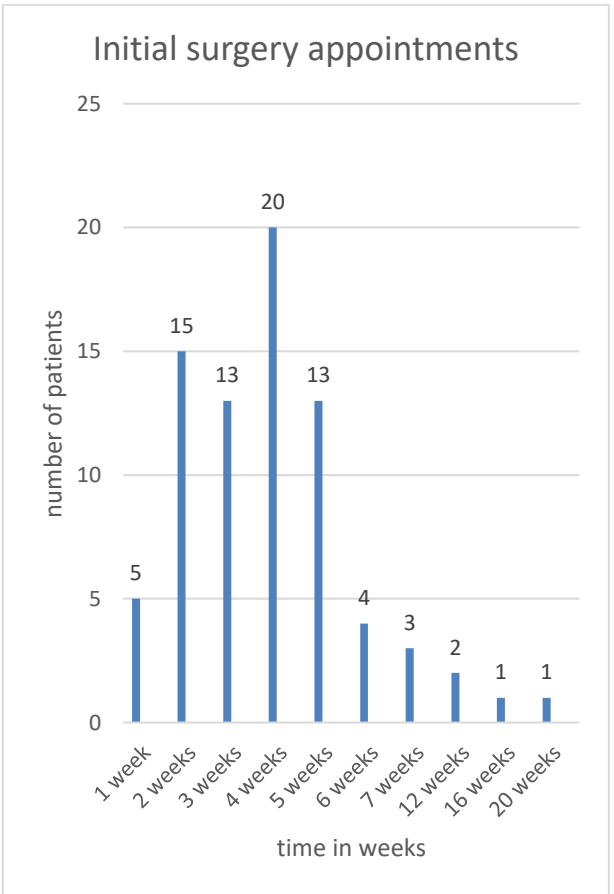

Figure 3. Initial surgery appointments

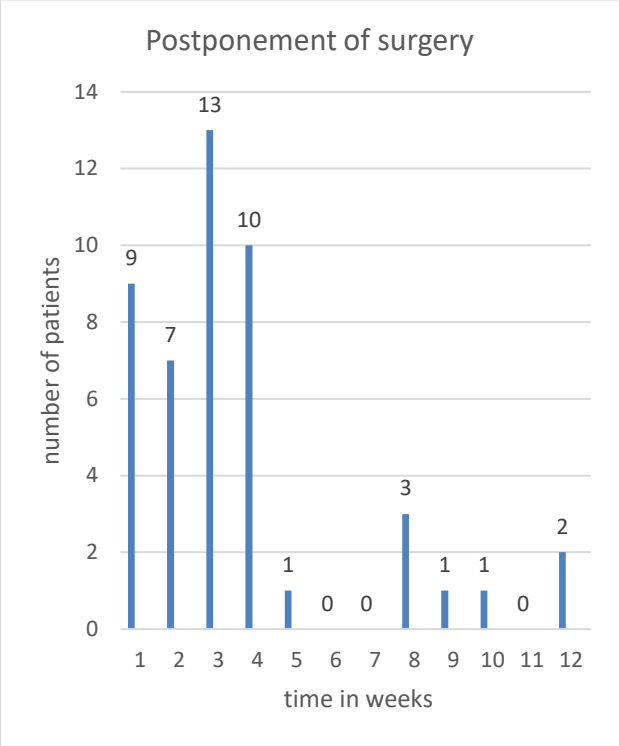

Figure 4. Postponement of surgery

Anecdotally services at the Breast Unit have improved so it is not surprising this study found an improved waiting time to surgery of 4.1 weeks (prior to appointments being postponed) compared with the 5 weeks median waiting time as reported in 2013.[9] Overall patients who were initially scheduled to wait 4.1 weeks to surgery now had to wait 6.4 weeks to surgery with 61% of them suffering postponements of 3.7 weeks. Prior to the pandemic the rate of postponement was only 7.5%.

It has already been established in Ghana that the majority of breast cancer patients present late to hospital for various reasons.[10–12] This late presentation has resulted in poor outcomes and high mortality.[10,13] The health care system already has inherent delays prior to the COVID-19 pandemic and with the advent of the pandemic and patients having surgery postponed by as much as 1 to 12 weeks could potentially have adverse effects on patient outcomes.

Long-term effects of postponement of surgery

Bleicher et al found that increased time to surgery was associated with a lower overall survival for stage I and II disease and worse disease-specific mortality for stage I disease. Breast cancer specific mortality increased with each 60-day interval. They recommended minimizing the time to surgery to reduce patient anxiety and reduce the risk of poorer outcomes.[14] This is corroborated by another population-based study from Singapore which demonstrated a lower overall survival for non-metastatic cancer in patients who had surgery >90 days post diagnosis than in those who had surgery in less than 30 days. Worsening survival was also noted for those who had similar delays in starting adjuvant therapy after surgery.[15]

Long-term effects of delays during the pandemic are yet to be assessed but have been estimated in a UK report that possibly up to 0.7 life-years will be lost per patient from a 2-month delay in referrals.[16]

COVID restrictions

The KBTH serves as a major referral centre in the subregion and the Breast Unit regularly receives patients from sub-Saharan Africa. With movement restrictions in Accra from 30th March to 20th April 2020 and the closure of international borders a few patients were denied access to the facility. Two patients were unable to honour scheduled OPD appointments and 2 were unable to report for chemotherapy as scheduled. Some patients requested medical reports and evidence of hospital appointments to present at security posts when queried about their movements. The economic hardships brought by the pandemic did not spare the patients and even for those who did have treatment as scheduled, they admitted to feeling the brunt. Unfortunately, 1 patient postponed her OPD appointment, 4 did not show up for chemotherapy as scheduled and 1 delayed surgery due to COVID-related financial hardships.

Delays were experienced least in OPD appointments (10%) most of which were self-delayed due to fear of exposure to COVID-19 and movement restrictions during the lockdown period. After the initial surge in the pandemic OPD attendance for new referrals and follow-up cases have been noticed to increase.

Chemotherapy sessions experienced 24.5% delays with a little over half of these due to rescheduling by the breast unit and the rest self-delayed. In the initial couple of weeks of the pandemic the breast unit in an attempt to introduce physical distancing at the congested chemotherapy suite postponed chemotherapy by 1 week for 7 patients. This became necessary in spite of the knowledge that repopulation and resistance of cancer cells is known to encourage tumour regrowth and is accelerated when chemotherapy cycles are unduly delayed.[17]

In a survey of 609 breast cancer survivors in the USA (including those actively being treated) 44% of respondents reported that they had experienced treatment delays due to the COVID-19 pandemic. Most affected was routine follow-up appointments (79%), but delays spanned across all aspects of cancer care; breast reconstruction (66%), diagnostic imaging (60%), laboratory investigations (50%), radiation therapies (30%), infusion therapies (32%), breast cancer surgeries (26%), oral therapy (13%) and genetic counselling and testing (11%).[18]

COVID infection

Cancer patients are immunocompromised from the disease itself and its treatment, therefore are at a higher risk of contracting severe forms of COVID-19 especially if they have surgery or chemotherapy.[19] Available data reveals case fatality rate of COVID-19 is

significantly higher in cancer patients than the overall case fatality rate (5.6% vrs 2.3%).[20,21] This makes cancer treatment risky to the patient. None of the patients in this study were diagnosed with COVID-19 infection. Generally, the infection rate in Ghana and Africa has not been as high as initially feared and perhaps the fear of continued cancer care putting cancer patients at risk of severe forms of COVID-19 infection is not as critical in Ghana as in other countries which have been ravaged by the disease. In the first quarter of 2020 in Hubei province of China a low COVID-19 infection rate of 0.2% was found in early breast cancer patients and the authors conclude that cancer treatment should not be interrupted in areas with such low infection rates.[5]

Patient anxiety and safety protocols

Health workers and hospitals have come to be known as high risk for developing and transmitting the virus as such the general public tend to avoid hospital visits.[22,23] Patient anxiety and fear of contracting COVID-19 from hospitals is keeping cancer patients away from their treatment. Two patients for OPD appointments and 2 patients for surgery appointments admitted fear of exposure to COVID-19 kept them away from hospital. The enforcement of COVID-19 safety protocols by the hospital has been successful as all patients admitted to complying with the compulsory wearing of facemasks, handwashing and temperature checks. These protocols and the practice of physical distancing made the majority (72.7%) feel safe. Despite these measures 19.5% still were afraid, uncomfortable or anxious. Crowding was reduced by limiting visitors to two per in-patient. OPD patients were seen alone for routine consultations, with the exception of those who needed assistance. Hospital visits are a good opportunity for health education which is usually done at the OPD whilst waiting to be seen however, only 58% recall that they received any such education on COVID-19. This calls for the hospital to intensify health educational talks on this all-important topic.

Though patients have been known to delay their breast cancer treatment for a myriad of reasons,[10] delays have not previously been on the part of the unit and a few patients approached us questioning whether the rescheduling of their surgeries and chemotherapy would not adversely affect their outcomes. The psychological impact of treatment delays to cancer patients has been recognised and this emotional distress is known to have negative effects on clinical outcomes of cancer treatment. Various coping strategies have been outlined and the use of telemedicine, social media and virtual patient support groups have been useful.[24]

Conclusion

This study has revealed that breast cancer treatment at KBTH during the first peak of the COVID era in Ghana was characterized by delays particularly for surgery with as much as 61% of elective breast cancer surgeries being postponed. Patients were initially scheduled to wait 4.1 weeks to surgery now had to wait 6.4 weeks to surgery with 61% of them suffering postponements of 3.7 weeks. There were far less delays of 24.5% and 10.4% in chemotherapy and OPD services respectively. Healthcare capacity and planning should support the national agenda to fight the pandemic without undue delays in cancer care.

Recommendations

There is a need in Ghana for the training of Intensivists who are solely dedicated to the running of Intensive Care Units to free up anaesthetists to concentrate on surgeries.

As the nation redistributes resources to fight the pandemic, other healthcare services particularly cancer care should not be interrupted as this could result in poor patient

Declarations

Ethical considerations

Ethical approval was obtained from the Korle Bu Teaching Hospital IRB (KBTH-IRB/000117/2020). Informed consent was sought and obtained from each study participant.

Consent to publish

All authors agreed to content of this paper.

Conflict of interest

Nothing to declare.

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Availability of data

Data is available on request to the corresponding author.

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PREVALENCE, TESTING AND TREATMENT PATTERNS OF MALARIA; A HOSPITAL BASED FIVE-YEAR ANALYSES BY AGE IN KWAEBIBIREM, EASTERN GHANA

Asare BA
Public Health Specialist, Kwaebibirem District Eastern Region, Ghana.

Abstract

Objective: Malaria, caused by single-celled microorganisms of the plasmodium group, is a mosquito-borne infectious disease that affects humans and other animals. Objectives prioritizing control and elimination led to the T3 policy (i.e., *'Test, Treat and Track*') encouraging scale up of diagnostic testing, treatment and surveillance.[3] This study analyses the prevalence of malaria infection and assesses health institutional compliance with policy directives for testing before treatment of all clinically suspected malaria cases.

Methodology: A 5-year record review of malaria morbidity, 2014-2018, was completed with the DHIMS-2 web-based database using a cross sectional study design.

Results: Despite a downward trend that decreased with increasing age through adolescence, higher proportions of hospital clients aged ≤ 28 days to 17 years were subjected to confirmatory malaria tests. This remained comparatively low among adults. The highest yield of positive malaria tests was observed among patients aged 1 month to 17 years. Malaria's morbidity burden remained highest among hospital clients aged 1 month to 15 years of age while the highest proportion of hospital clients treated without prior confirmatory tests was observed among the ages of 18 to 70 years and above. Proportion of patients treated for malaria without prior confirmatory tests therefore increased with increasing patient age.

Conclusion: Isolated cases of presumptively treated malaria suggest that universal compliance with the first T of the T3 policy is yet unattained, potentially invalidating quality of the other Ts.

Recommendations: Correlates for presumptive treatment should be investigated to facilitate acceleration towards attainment of universal compliance with the T3 policy.

Key Words: *Malaria, testing, treatment, policy, diagnosis, rapid diagnostic test, microscopy*

Introduction

Malaria, caused by single-celled microorganisms of the Plasmodium group, is a mosquito-borne infectious disease that affects humans and other animals. It is typically, but not invariably, characterized by recurrent episodes that may be experienced if not properly treated, while survival of recent infection sufficiently induces a partial resistance associated with milder symptoms during subsequent infections.[1,2] Acquired partial immunity may, however, be lost over months to years without continued exposure.[1,2] Efforts towards control and elimination led to the T3 policy in 2012 i.e. *'Test, Treat and Track*' initiative urging endemic countries, donors and the global malaria community to scale up diagnostic testing, treatment and surveillance for malaria.[3]

The United Nations set the target for the attainment of universal coverages with long-lasting insecticidal nets in 2008 coupled with other essential malaria control interventions by the end of 2010.[4] Significant progress towards achievement of the target of universal coverage was made with the distribution of over 290 million nets in Africa between 2008 and 2010.[4] Control interventions have typically been scaled up with aims to cut malaria morbidity and mortality in high-transmission areas.[4] The scale-up of diagnostic testing, treatment and surveillance has comparatively not received the same degree of attention.[4] Availability of resources required to strengthen these three fundamental pillars of the existing global strategy to fight malaria is likely to be a future challenge in many resource constrained countries.[4] T3 supports malaria-endemic countries to achieve universal coverage with diagnostic testing and antimalarial treatment, as well as strengthening malaria surveillance systems.[4] Endemic countries are contextually within this policy framework to ensure that *every suspected malaria case is tested*, that every confirmed case is treated with a quality-assured antimalarial medicine, and that the disease is tracked through timely and accurate surveillance systems to guide policy and operational decisions.[4] Despite the Africa's non-universal access to diagnostic testing, availability of high quality, inexpensive RDTs has significantly expanded diagnostic testing.[4] Microscopic examination, however, remains the "gold standard" for laboratory confirmation of malaria though their reliability is subject to quality of the laboratories performing the tests.[5] Despite current ratification of the test and treat policy in an estimated 97 countries, health worker compliance remains inconsistently problematic leaving some suspected cases untested but treated with antimalarial medication.[6]

Corresponding Author: **Dr. Brainard Ayisi Asare**
P. O. Box 318, Suhum, Kwaebibirem, Eastern Region, , Ghana.
Phone Number: (+233)0240230036
Email Address: brainardasare@gmail.com
Conflict of Interest: None Declared

Health worker compliance remains a key aspect of the sequential components that determine proportion of clinical events that are effectively treated by the formal health care sector.[6] Extant WHO guidelines emphasize a universal "test and treat" strategy for malaria mainly by use of rapid diagnostic test (RDT) in all areas.[7] Ghana, having subscribed to WHOs test, treat and track policy in 2013 (with aims to replace presumptive treatment with targeted treatment), records better compliance with the policy at community clinics (i.e. CHPS) than hospitals and health centers.[8] Poor compliance is partly attributed to poor clinician compliance with negative tests across all age groups; this is typically premised on a hypothetical concern that 'negative tests do not definitively rule out malaria'.[9] Evidence indicates that some healthcare practitioners in Ghana, (despite increased access to confirmatory diagnostic testing with RDTs in resource-constrained primary health facilities with weak infrastructure for microscopy) still treat febrile patients without testing, or without regard for negative malaria test results.[10] This study aimed to investigate the prevalence of *p. falciparum* malaria cases and assess district health institutional compliance with the WHO policy for confirmatory malaria testing before treatment for all clinically suspected cases in Kwaebibirem, Eastern Ghana.

Materials and Methods

The study was carried out at the Kade District Hospital, Eastern Ghana, through a review of institutional records on malaria morbidity for the period 2014-2018 using a cross sectional study design. Data were abstracted in accordance with the already available DHIMS-2 categorizations for the variable of age group units of the persons reporting to the hospital's Out Patients' Department (OPD). The summary age categorizations could not be disaggregated as the web-based data source does not make provision for any further break down of age groups. Information abstracted for analyses included the institutional malaria morbidity burden, age groups of patents who sought care over the same period, number of cases clinically suspect for malaria and number of cases treated for malaria with or without prior confirmatory testing. Pre-existing age groups from the DHIMS-2 dataset were analyzed across all the above listed variables to identify proportions of clinically suspected cases by age *tested and treated* and *not tested but treated*. The DHIMS-2 web-based health datasets repository comprised the key data source for the record review and subsequent analyses with the intermittent use of Microsoft excel. Permission to carry out the study at the hospital was granted by the hospital's medical superintendent; this was deemed sufficient for completion of the study as datasets used were secondary and devoid of any identifying or traceable variables.

Results

Patterns of clinical suspicion of malaria among OPD attendants with subsequent conduct of confirmatory testing for the disease, 2014-2018, varied across all the studied age categories of patients who sought health care at the hospital's OPD. Subsequent testing for malaria among clinically suspected OPD cases was observably highest among patients aged ≤ 28 days to 17 years of age. Testing, however, declined inversely with increasing patient age through to adolescents of 15-17 years who recorded the lowest testing proportions across this age category.

Clinical suspicion for malaria with subsequent confirmatory testing among patients aged 18-70 years or older over the period 2014-2018 steadily declined from 73.5%, (the highest proportion for this age category suspected and subsequently tested), to adult OPD attendants aged 35-49 years. A plateaued trend, however, further defined the testing patterns for clinically suspected malaria cases among older OPD.

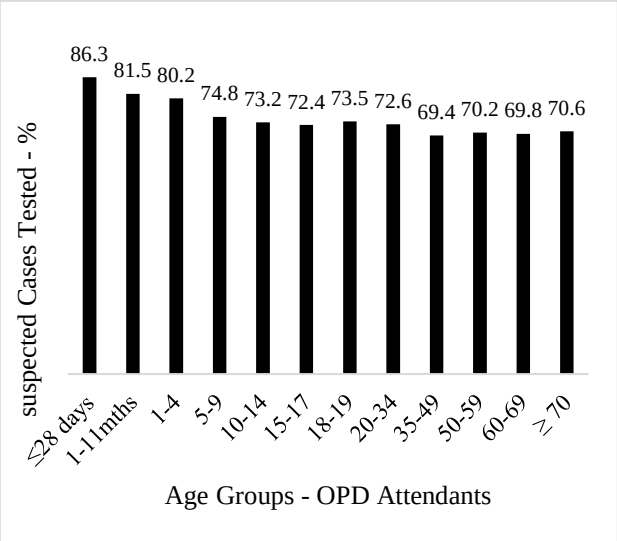

Fig. 1.0: Clinically suspected malaria cases tested for confirmation before treatment, analyzed by age, 2014-2018.

The mean proportion of clinically suspected malaria cases among OPD attendants who subsequently tested positive for malaria aged ≤ 28 days to 17 years over the period 2014-2018 showed the highest yield of malaria positive test results for patients aged 1-11 months through to adolescents aged 10-14. A gentle decline was then observed to 43.6% of the hospital's adolescent OPD patients aged 15-17 years testing positive for malaria. The mean proportions of adult OPD patients clinically suspected for malaria who subsequently tested positive over the period 2014-2018, (i.e. patients aged ≥ 18-70 years), varied insignificantly across patients of

this age category. A marginal comparatively high yield of positive malaria tests was, however, observed among OPD attendants aged 18-19 while that of the remaining older age categories plateaued through to OPD attendants aged ≥ 70 years. At least, 32904, out of the total 66421, i.e. 49.5% of all the clinically suspected cases of malaria, 2014-2018, eventually tested positive to microscopy and RDT used over the period.

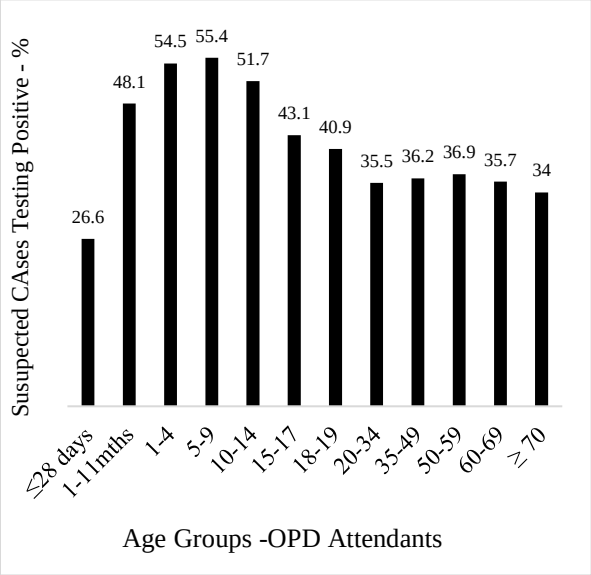

Fig. 2.0: Clinically suspected malaria cases testing positive analyzed by age, 2014-2018

Age group-specific analyses of proportions of OPD attendants who were diagnosed with confirmed malaria (by thick and thick blood film microscopy or Rapid Malaria Diagnostic Testing) among patients aged ≤ 28 days to ≥ 70 years in 2014 showed that hospital clients aged 1 month to 17 years observably recorded the highest malaria infection morbidity burden in 2014. This notably peaked among OPD attendants aged 10-14 years while a gradual decline was recorded for OPD attendants from 15 years to ≥ 70 years. The morbidity burden of confirmed malaria cases among OPD attendants in 2015 showed the highest prevalence of the confirmed malaria morbidity among OPD attendants in the age group of 5-9 years. Patients aged 10-14 years were second in this series while patients aged 1-4 years were third in this series. Occurrence of confirmed malaria among OPD attendants aged 18 years, i.e. adolescents, remained comparatively lower than what was observed for patients aged 1 month to 17 years.

The distribution of confirmed malaria's morbidity burden among OPD attendants in 2016 was similar to that of 2014 and 2015. The peak morbidity burden of confirmed malaria among age-specific OPD attendants was recorded among patients aged 5-9 years while patients aged 10-14 years were second in this series. OPD patients aged 1-4 years ranked third observably while the confirmed malaria cases among OPD patients aged 18 years or older remained comparatively low over the period observed, declining steadily with increasing age. The 2017 distribution of the morbidity burden of confirmed malaria among OPD attendants remained similar to what was previously observed 2014-2016. OPD patients aged 5-9 years recorded the highest proportionate case burden of OPD attendants with confirmed malaria while second in this series was the age category of patients aged 10-14. OPD attendants aged 1-4 years ranked third consistently with observations of the previous years. Contrary to the observed malaria morbidity trend from 2014-2016, a comparatively high malaria morbidity burden was sustained through to the age group of OPD patients aged 19 years. On account of this observed change in morbidity pattern, the prior characteristic, comparatively lower malaria morbidity burden for patients above 17 years was now observed from 19 years in 2017.

The institutional prevalence of confirmed malaria cases among OPD attendants aged 5-9 years remained highest in 2018. The 2018 malaria morbidity burden among OPD attendants aged 17-19 years remained comparatively high consistently with observations for 2017. While OPD attendants aged 10-14 years recorded the second highest age-group specific malaria morbidity, patients aged 1-4 years ranked third in this series. The trend of confirmed malaria cases among OPD attendants, analyzed to show the pattern of occurrence and distribution of malaria infection from the health facility-based perspective, 2014-2018, showed that the morbidity distribution and spread analyzed by age of OPD patients remained essentially unchanged over the five years i.e. 2014-2018. Malaria's morbidity burden remained highest among OPD attendants aged 1 month to adolescents of 17 years. The decline in the morbidity burden across the older patients with increasing age was sustained through all the years from 2014-2018.

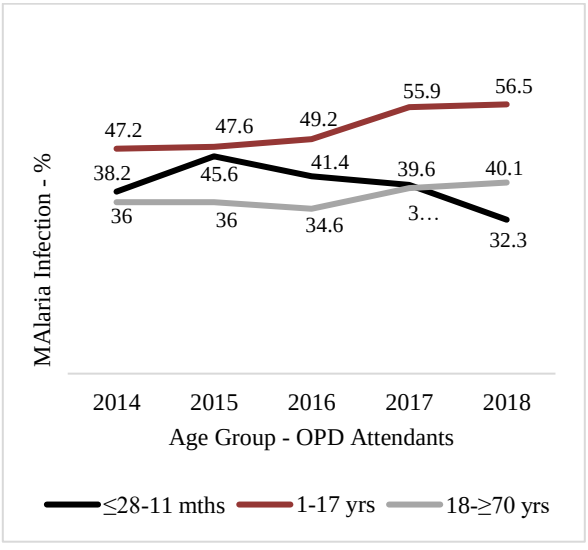

Fig 3.0: Malaria morbidity burden among OPD attendants analyzed by age, 2014-2018

Malaria cases, treated without compliance with policy directives for *confirmation before treatment* were analyzed. This showed that the tendency for treatment of clinically suspected malaria cases not subjected to any confirmatory clinical/laboratory tests (but treated presumptively) increased commensurately with increasing patient age. This trend sharply rose from patients aged 10-14 to patients aged 35-49 after which it observably plateaued through to patients aged ≥ 70 years.

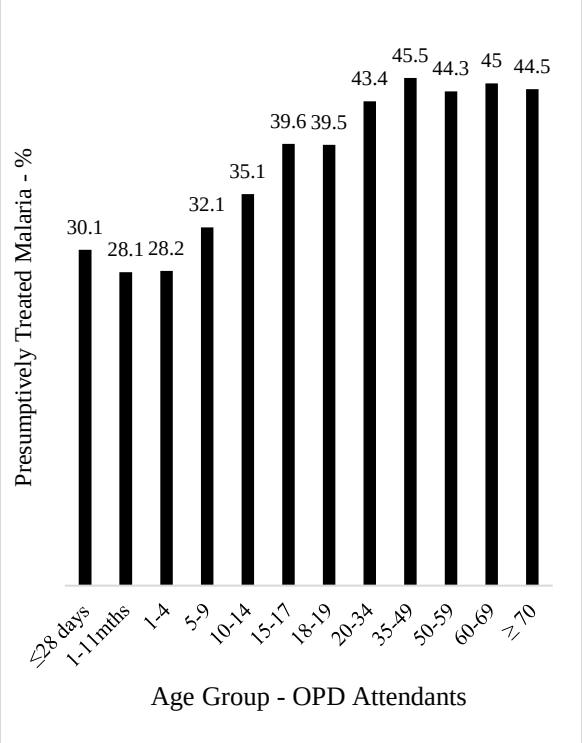

Fig. 4.0: Mean proportion of malaria cases not tested but treated for malaria by age, 2014-2018

The proportions of OPD attendants clinically suspected for malaria and subsequently tested (consistently with current malaria control policy directives) was assessed. This compared with the proportion of the same sub population that was not tested but treated (i.e. treated presumptively for malaria) yielded an inverse relationship. The proportion of OPD attendants treated for malaria without testing increased inversely with decreased confirmatory testing for clinically suspected malaria cases. An increase in proportions of OPD attendants treated without confirmatory malaria testing was observed among hospital clients aged 19 years through to ≥ 70 years. Testing of clinically suspected malaria cases was comparatively lower than was recorded for patients in the younger age categories among such patients.

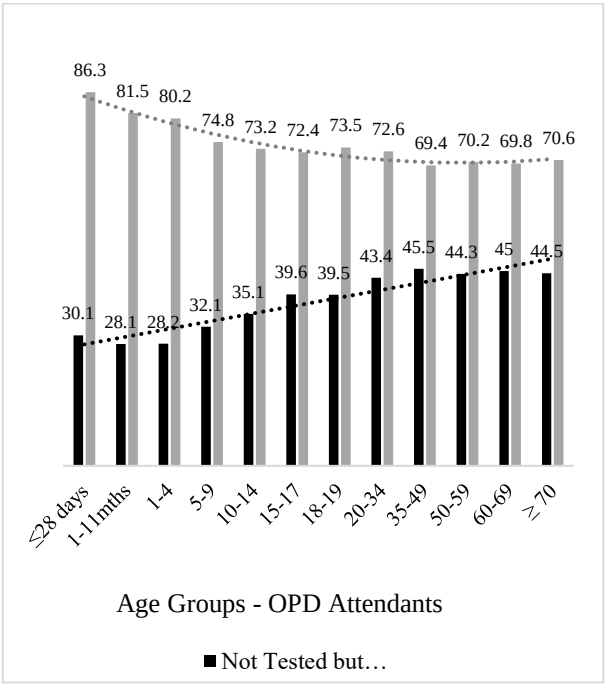

Fig. 5.0: Proportion of malaria cases not tested but treated compared with clinically suspected cases tested before treatment

DISCUSSION

Treatment for malaria, prior to ratification of policy directives recommending confirmation before treatment, was largely based on empirical or presumptive administration of antimalarial medication for all persons who reported to hospitals with conditions characterized by febrility.[8] Testing rates for confirmation of clinically suspected cases, despite notably significant increments, are yet to attain 100% in many malaria endemic areas.[4, 6, 7] Increased availability to testing with Rapid Diagnostic Tests, *RDTs*, for malaria has significantly increased access to confirmatory testing. Thick and thin blood film microscopy, however, remain a resource constrained clinical investigation with comparatively limited access.[4, 7, 8] Confirmatory testing of clinically suspected cases remained observably higher among patients from one month of age through to adolescents who recorded comparatively lower proportions of suspected cases tested. Adults, over the period, presenting with conditions clinically suspected for malaria-maintained testing trends that declined with increasing age. The WHO recommends early and accurate diagnosis of malaria infection (through the conduct of standard malaria infection confirmatory tests i.e. thick and thin blood film microscopy and RDT) to facilitate effective case management and case surveillance; this is adopted in 97 countries.[11] *High-quality* malaria diagnosis further remains universally important as misdiagnosis may affect the accuracy of data on morbidity and mortality.[11] WHO therefore recommends prompt parasitological confirmation of diagnosis either by microscopy or

malaria rapid diagnostic testing, RDT, in all patients suspected to have malaria before treatment is administered. Current evidence attributes factors (that include patient case-load, availability of skilled laboratory technicians, availability of logistics for testing etc.) to challenges opposed to attainment of 100% testing rates.[11] Universal confirmatory testing in endemic areas will significantly impact quality of management of patients with febrile illnesses. It would help identify true positive malaria cases and facilitate adequate clinical attention to non-malaria febrile illnesses.[11] Universal testing further bears cost-effective implications as it limits antimalarial treatment to positive cases while negative cases are further thoroughly assessed for other causes of fever.[11] Since 2010, testing rates have substantially increased and surveys in sub-Saharan Africa indicate an estimated 59% in 2015-2017 from 33% 2010-2012.[11]

An estimated 49.5% of all clinically suspected malaria cases, 2014-2018, eventually tested positive to microscopy and RDT used over the period. Testing rates among clinically suspected cases remained comparatively low among adult OPD attendants and showed an increase with increasing age. Malaria test positivity rate (TPR) is defined as the number of laboratory-confirmed malaria tests per 100 suspected cases examined; it comprises one of WHO's ten core indicators for malaria surveillance in the control phase.[12] It is widely used by malaria surveillance programs as one of several key indicators of temporal trends in malaria incidence.[12] TPR, increases in significance when percentage of suspected cases tested is above 90%.[12] Computation of diagnostic method-specific TPR (microscopy- and RDT-specific TPR) remained a challenge in this study on account of data challenges.[12] The indicator ,TPR, may be used to define malaria endemicity, assess temporal trends in malaria incidence and evaluate impact of malaria control interventions.[13] TPRs of <5% characterize malaria endemic areas moving towards elimination.[13] Microscopy remains the gold standard for diagnosis.[14] The accuracy of clinical diagnosis varies in accordance with the level of endemicity, malaria seasonality and age group, over-diagnosis; RDT thus remains relevant for objective diagnosis of malaria.[14] WHO recommends that parasite-based diagnosis should be used in all cases of suspected malaria with the possible exception of children in high-prevalence areas and certain situations.[14] The use of RDT is, however, recommended by WHO for areas where microscopy is not available.[14]

The peak prevalence of malaria infection 2014-2018 was notably highest among OPD attendants aged 1 month to 14 years followed by adolescents who, in turn, recorded a moderately higher morbidity burden than adults. The adult age category recorded a comparatively lower prevalence that decreased with increasing age over the period. The peak prevalence of severe *p. falciparum* malaria is typically skewed towards younger age groups as the intensity of transmission increases. Evidence of such patterns for uncomplicated malaria, however, remains limited.[15] This peak prevalence age range, aside severe malaria, has also been described for other infections against which immunity is acquired.[15] It bears control implications as, firstly, identification of the age groups with the greatest burden of clinical malaria for a given transmission setting would enable interventions to be targeted to those worst affected. Secondly, it implies that reported declines in malaria transmission intensity and future progress towards malaria elimination, will result in a shift of malaria morbidity towards older children.[15] Evidence, however, also further suggest that hospital patients with malaria parasites are more concentrated in younger children than is clinical malaria in all settings.[15] These severe cases become more concentrated in younger ages with increasing transmission intensity and less seasonality.[15] The institutional in-patient malaria-specific morbidity burden is therefore concentrated in children under-5 years of age in all settings.[15] This trend further shows a shift towards younger ages with increasing intensity of malaria transmission.[15]

Malaria-associated mortality is higher in younger children under-5 years of age than admissions with malaria among older patients, in all settings for which there are comparable data irrespective of transmission intensity.[15] Findings in Ethiopia identified migrant laborers who travel to endemic areas, children under-5 years old, and pregnant women are among high-risk groups affected by a high morbidity burden of malaria.[16] Wide evidence consistently identifies children under-5 years, pregnant women, people living with HIV/AIDS, non-immune migrants and travelers as a high risk sub populations for malaria infection.[17] Children under-5 years of age, the most vulnerable group, further accounted for an estimated 67% of all malaria deaths worldwide in 2018.[17]

Despite notably significant and established increased compliance with policy directives for the conduct of confirmatory tests before treatment, available data indicates some clinically suspected cases are still empirically treated without laboratory confirmation.[4] Testing patterns for clinically suspected OPD attendants decreased as age increased. This eventually translated into higher proportions of OPD attendants who were treated without health facility compliance with the policy for testing before initiating treatment with antimalarial medications. An inverse relationship was established between proportions of OPD attendants clinically suspected for malaria and subsequently tested (consistently with current control policy directives) and the proportion of the same population that was not tested but treated. Identification of explanatory factors that underlie a continued degree of non-compliance with policy directives recommending the conduct of confirmatory tests before treatment was beyond the scope of this study. The WHO T3 policy (for testing before treating and then tracking) is recommended for every suspected malaria case without exception.[4] While

febrility, (prior to increased access to testing facilities), in many endemic countries was typically equated with malaria, recent control efforts have significantly reduced the malaria burden even in high transmission areas in Africa.[4] Continued presumptive treatment could lead to drug wastage and under-treatment of other febrile illnesses that must be investigated further in the event of negative malaria tests.[4]

Enhancing efforts towards attainment of universal testing of all clinically suspected cases (through universal health worker compliance with malaria control protocols) would present unprecedented opportunities for improvement in the accuracy of malaria surveillance data.[4] This would help malaria control programs to specifically respond to surges.[4] The established global shift in malaria case management, observed among health workers in medium- to high -malaria transmission regions indicates a shift from a presumptive treatment approach to a 'test and treat' approach.[6] It further therefore enhances the availability of quality surveillance data.[6] In many countries that have adopted the test and treat protocol, fewer than 50% of ailments characterized by febrility are tested for malaria infection by microscopy or RDT.[6] Health worker compliance, (according to the 'systems effectiveness model), is one of a number of sequential components that collectively determine the proportion of clinical events that are effectively treated by the formal health care sector.[6] The evidence for the 'test and treat policy' has, however, been questioned as there is a risk of over-reliance on parasitological diagnosis in high transmission situations, which still exist.[7] The presence of plasmodium species neither reliably confirms malaria as the cause of fever nor excludes the possibility of other diseases in such areas when a patient has fever or other malaria symptoms.[7]

Evidence suggests that compliance with the T3 strategy in some malaria endemic areas in Ghana is better at community clinics, (i.e. CHPS compounds), than Hospitals and Health Centers.[8] Evidence also further shows that some public primary health care facilities still largely lack diagnostic facilities including microscopes.[8] In situations where testing facilities are available, personnel to cope with the high volumes of work may be inadequate.[8, 9] While facilities for thick and thin blood film microscopy may be limited, availability of RDTs, (at increasingly competitive prices and their improved quality), has substantially simplified and expanded diagnostic capacity in endemic areas.[18] Their use at peripheral facilities and shops and by trained community health workers (CHWs), to whom patients come for care, is currently commonplace.[18] A recent systematic review estimated 78% and 97% health worker compliance with testing before treatment in some endemic areas using RDTs.[18] The review further indicated that an estimated 95% of Community Health Workers, (CHWs), were likely to comply with negative RDT results compared with an estimated 75% of clinicians and nurses at higher levels of heath care service delivery.[18]

Extant literature on malaria diagnosis for improved pediatric fever management in sub-Saharan Africa, however, contrarily emphasizes the need to shift from malaria-focused '*test and treat'* strategies toward Integrated Management of Childhood Illnesses, (*IMCI*).[22] Testing, within an IMCI context, can be used to improve quality care and rational use of both antimalarial and antibiotic medicines.[22]

Conclusion

The study was carried out to investigate the prevalence, testing and treatment patterns of malaria-associated morbidity using a cross sectional record review of health facility-based data covering a period of five years. Findings showed that full compliance with the policy recommending indiscriminate confirmatory malaria testing prior to initiation of treatment is yet to attain universal compliance despite sustained high proportions of tested OPD attendants. Establishing explanatory factors for the sustained failure to attain 100% testing rates for clinically suspected malaria cases was beyond the scope of this study. The conduct of confirmatory malaria tests was higher among younger patients aged 1 month to at least 15 years who commensurately recorded a higher subsequent yield of positive malaria test results. OPD attendants aged 1 month to 15 years therefore recorded the highest yield of positive malaria tests and commensurately therefore recorded the highest malaria morbidity over the period of study. Adult OPD attendants recorded the highest proportions of hospital clients presumptively treated for malaria without the conduct of confirmatory tests which may be explained by the comparatively lower confirmatory malaria tests recorded for the older sub population. Universal coverage for the first T of the T3 policy is yet to be attained.

Recommendations

Research to establish explanatory factors that underlie differential testing patterns among younger and adult clinically suspected cases of malaria should be prioritized. This should further aim to investigate the consistently higher prevalence of malaria infection among children and adolescents despite a myriad of malaria control interventions that particularly target children and pregnant women. Individual health worker tendencies predicting differential confirmatory testing patterns among clinically suspected malaria cases should be further investigated. Identification of correlates for treatment without carrying out confirmatory malaria testing remains key. This may facilitate acceleration of progress towards attainment of universal compliance with policy directives that recommend the conduct of confirmatory testing before initiation of treatment.

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ASSESSMENT ON THE KNOWLEDGE, ATTITUDE AND PRACTICE OF COVID-19 PROTOCOLS AMONGST MEDICAL WORKERS IN JOS, PLATEAU STATE

Shehu M[1]; Izang AM[2]; Shehu H[3]

[1]Department of Paediatrics, College of Medicine and Health Sciences, Bingham University/Bingham University Teaching Hospital Jos, Nigeria; [2]Department of Family medicine, Plateau State Specialist Hospital Jos, Nigeria; [3]Department of Surgery, College of Medicine and Health Sciences, Bingham University/Bingham University Teaching Hospital Jos, Nigeria.

Abstract

Objective: To assesses knowledge, attitudes, and practice on COVID-19 amongst medical HCW in Plateau State Specialist Hospital (PSSH) Jos.

Methodology: The study population consisted of all medical health care workers in Plateau State Specialist Hospital (PSSH) who consented to the study. The study was a cross-sectional study and consecutive sampling was employed. The knowledge, attitude and practice of COVID-19 amongst HCW was assessed using a pretested questionnaire which was analyzed using SPSS version 22.

Results: The nurses had the highest percentage of 58%, followed by doctors with 31%. The major source of information was television with 68%, followed by google with 9%. The knowledge of the medical HCW in PSSH was good with over 80% of the number of questions on knowledge answered correctly with the mark over 70%. Their attitude was fair with 62% of the number of questions gotten correctly with a score of over 70%. Similarly, their practice was also fair with 66% of the questions gotten correctly with over 70%. However, one of the questions on practice was poor with only 45% of the workers answering it correctly. There was a significant association between the attitude and the Job cadre of medical HCW of PSSH.

Conclusion: The knowledge of medical HCW in PSSH on COVID-19 was good. Their attitude and practice were fair. There was a significant association between their knowledge and job cadre. The study showed that there is an attitude and practice gap about COVID-19 amongst the medical HCW in PSSH.

Key words: *Attitude, COVID-19, Healthcare Workers, Knowledge, Practice*

Introduction

The corona virus disease 2019 (COVID-19) is a novel infectious disease caused by severe acute respiratory syndrome corona virus 2 (SARS-COV-2).[1-2] It started in Wuhan, China in December 2019 and has spread worldwide becoming a pandemic.[3-4] The basic risks factor for contacting this disease is viral exposure when people travel to places where the viral infection is prevalent. The virus is primarily spread between people during close contact, through small droplets produced by coughing, sneezing, or breathing. [2,3,5] Infection may also occur when people's hands encounter contaminated food and surfaces and then touching their faces.[4]

Up to 25 million cases were reported across the World with more than 800, 000 deaths as of 30th August 2020. [6] The symptoms of this disease include fever, cough, fatique, myalgia, shortness of breath, loss of smell and taste, while majority of individuals may be asymptomatic. [3,5,7] The usual onset of these symptoms varies from two to fourteen days.[7] Some may progress to pneumonia, viral sepsis, acute respiratory distress syndrome, kidney failure, multiple organ failure, cytokine release syndrome and death.[3, 8-10]

Real-time reverse transcription polymerase chain reaction (rRT-PCR) from a naso-pharyngeal or oropharyngeal swab, bronchial washouts, sputum sample and even blood is currently used to diagnose this infection[5]. Chest–x-ray and computer tomographic scan can be helpful to make diagnosis but are not recommended for routine screening.[11-12]

The preventive measures adopted to curb the spread of the Infection include social distancing/physical distancing, self -isolation, mandatory quarantine, handwashing and wearing of facemask.[13-14] The aim of these preventive measures is to reduce contact of infected persons with people who are not infected and to prevent spread from infected people to large groups. In many regions social distancing and stay-at-home orders (lock-downs) have been able to reduce the transmission rate and delay in the epidemic peak paving the way for eventual vaccine production. [14] The Centers for Disease Control has recommended the use of face mask in public settings where other social distancing measures are difficult to maintain to limit transmission by asymptomatic individuals.[14]

The treatment for COVID-19 is mainly symptomatic and supportive.[15] This may include fluid therapy, oxygen support, improving personal hygiene, diet and supporting other affected vital organs. Extracorporeal membrane oxygenation (ECMO) has also been

Corresponding Author: **Dr. Maryam Shehu**
Department of Paediatrics, College of Medicine and Health Sciences, Bingham University/Bingham University Teaching Hospital Jos, Nigeria.
Email Address: maryamshehu1405@gmail.com
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recommended for respiratory failure.[16-17] Remdesivir, a broad-spectrum antiviral medication has been issued an Emergency Use Authorization (EUA) in the United State for those hospitalized with severe disease, while researchers continue Working on more effective treatments. [18]

The severity of COVID-19 varies. Mild-cases, resembling other common upper respiratory disease recover within two weeks, while those with severe or critical disease may take three to six weeks to recover [16-17]. Children make up a small proportion of cases with less than 1% being under 10 years. Those older than 70 years, pregnant women, and people with pre-existing conditions including hypertension, diabetes mellitus and cardiovascular disease may be at higher risk for severe infection with COVID-19.[17]

The rate of infection of COVID-19 among HCW is said to be 5.5 times higher than the community. Transmission from an HCW to another HCW is said to be 0.8% compared to the 0.1% among non-HCW.[19] At the beginning of the Covid-19 pandemic in China, almost one-third of the people initially infected were HCW. The hospital is the place where people go when they are sick which makes HCW as frontlines because of the nature of their work when there is a new infection, putting them at risk before much is known about the disease.[20-22] A study in Greece showed that 50% of all high-risk exposures were to HCW[23]. Another study by Zheng et al obtained results that 50% of the HCW infected were nurses, closely followed by doctors with 33%. The medical staff were more likely to be infected than non-medical staff .[24]

The knowledge of HCW about COVID-19 have been shown to positively affect their attitude and practice in preventing the disease,[25-26] there is therefore the need to assess the Knowledge, attitude and practice of HCW in the state because HCW at the frontline face substantial risk of infection in this COVID-19 outbreak.

Materials and Methods

The study was a cross-sectional questionnaire-based study among medical health care workers in PSSH. The study was conducted from 1st of April to 30th May 2020. A self-made questionnaire was distributed to HCW who consented to the study. The HCW included doctors, nurses, pharmacist, nurse aids and pharmacist assistants.

The self-administered questionnaire consisting of socio-demographic questions, and 27 questions based on knowledge, attitude and practices related to COVID-19. A total of 109 medical HCW were recruited using consecutive proportionate sampling method.

Ethical clearance was obtained from the Health Research Ethics Committee of the Hospital.

Data analysis

The data collected were analyzed using SPSS version 22. Frequency tables and bar chart were used to describe the data. Chi-square was used to test the association between attitude and job cadre, and practice and educational level. The level of significance was set at $P < 0.05$ and confidence level at 95%.

Results

The male to female ratio of the medical HCW was 1:1, the highest age group was the age group between 31-40 years with 28%, while the least age group was >50 years with 15%. The level of education with the highest percentage was diploma with 31%, closely followed by B.NSc by 22% and MBBS with 20%. Similarly, the Job cadre with the highest percentage was the nurses with 58%, followed by doctors with 31%.

Table 1: Demographic distribution of clinical staff in PSSH

Variable	*Frequency*	*Percentage*
Sex		
Male	50	45.9
Female	50	45.9
No response	9	8.3
Total	109	100.0
Age group		
<30	21	19.3
31-40	31	28.4
41-50	23	21.1
>50	17	15.6
No response	17	15.6
Total	109	100.0
Education		
Primary	0	0.0
Secondary	1	0.9
Diploma	34	31.2
B.Sc	10	9.2
B.NSc	24	22.0
MBBS	22	20.2
Masters	3	2.8
Resident	3	2.8
Consultant	4	3.7
No response	8	7.3
Total	109	100.0
Job in the hospital		
Doctor	34	31.2
Nurse	64	58.7
Pharmacist	10	9.2
Nurse aide/Pharm tech	1	0.9
Total	109	100.0

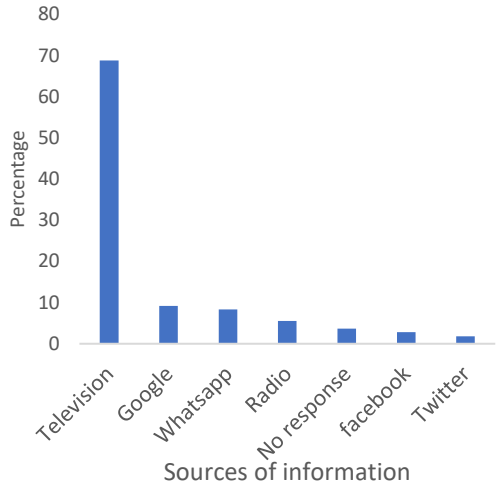

Figure 1. Sources of information

The knowledge of the medical HCW in PSSH was very good with over 80% of the number of questions on knowledge answered correctly with the mark over 70%. However, the variable question on the knowledge on treatment was poor with only 38 (34%) getting the answer correctly.

Table 2: Frequency of knowledge for medical staff in PSSH

Variables	Correct No. (%)	I don't know No. (%)	Incorrect No. (%)	Total No. (%)
V2	104(95.4)	1(0.9)	4(3.7)	109(100.0)
V3	107(98.2)	2(1.8)	0(0.0)	109(100.0)
V4	102(93.6)	7(6.4)	0(0.0)	109(100.0)
V5	108(99.1)	1(0.9)	0(0.0)	109(100.0)
V6	105(96.3)	4(3.7)	0(0.0)	109(100.0)
V7	103(94.5)	6(5.5)	0(0.0)	109(100.0)
V8	89(81.7)	18(16.6)	2(1.8)	109(100.0)
V9	101(92.7)	6(5.5)	2(1.8)	109(100.0)
V10	104(95.4)	3(2.7)	2(1.8)	109(100.0)
V11	38(34.6)	32(29.3)	39(35.8)	109(100.0)
V12	60(55.0)	5(4.6)	44(40.4)	109(100.0)
V13	78(71.6)	13(11.9)	18(16.5)	109(100.0)

The attitude of the medical HCW was fair with 62% of the number of questions gotten correctly with a score of over 70%. The least correct questions gotten was 52% on variable 16. The practice was also fair with 66% of the questions gotten correctly with over 70%. The least correct questions gotten was variable 24 with 45%.

Table 3: Distribution of Attitude and Practice of medical staff in PSSH

Variables	Correct No. (%)	Incorrect No. (%)	I don't know No. (%)	Total No. (%)
V14	86(78.9)	20(18.3)	3(2.8)	109(100.0)
V15	68(62.4)	37(33.9)	4(3.7)	109(100.0)
V16	57(52.3)	50(45.9)	2(1.8)	109(100.0)
V17	88(80.7)	20(18.3)	1(0.9)	109(100.0)
V18	89(81.7)	16(14.7)	4(3.7)	109(100.0)
V19	96(88.1)	6(5.5)	7(6.4)	109(100.0)
V20	102(93.6)	1(0.9)	6(5.5)	109(100.0)
V21	67(61.5)	36(33.0)	6(5.5)	109(100.0)
Practice				
V22	69(63.3)	36(33.0)	4(3.7)	109(100.0)
V23	80(73.4)	25(22.9)	4(3.7)	109(100.0)
V24	50(45.9)	46(42.2)	13(11.9)	109(100.0)
V25	85(78.0)	21(19.3)	3(2.8)	109(100.0)
V26	106(97.2)	0(0.0)	3(2.8)	109(100.0)
V27	91(83.5)	14(12.8)	4(3.7)	109(100.0)

There was no significant association between the practice and the educational level of the medical workers of PSSH.

Var.		Education			
	Sec.	Diploma	B.Sc	BNSc	MBBS
V22					
Yes	0(0.0)	11(35.5)	3(9.7)	9(29.0)	5(16.1)
No	1(1.5)	22(32.8)	7(10.4)	14(20.9)	16(23.9)
Total	1(1.0)	33(33.7)	10(10.2)	23(23.5)	21(21.4)
V23					
Yes	1(1.4)	22(29.7)	6(8.1)	20(27.0)	17(23.0)
No	0(0.0)	10(41.7)	4(16.7)	4(16.7)	4(16.7)
Total	1(1.0)	32(32.7)	10(10.2)	24(24.5)	21(21.4)
V24					
Yes	0(0.0)	15(33.3)	7(15.6)	10(22.2)	12(26.7)
No	1(2.1)	18(37.5)	3(6.3)	10(20.8)	7(14.6)
Total	1(1.1)	33(35.5)	10(10.8)	20(21.5)	19(20.4)
V25					
Yes	0(0.0)	26((32.9)	6(7.6)	20(25.3)	17(21.5)
No	1(5.0)	7(35.0)	4(20.0)	4(20.0)	4(20.0)
Total	1(1.0)	33(33.3)	10(10.1)	24(24.2)	21(21.2)
V26					
Yes	1(1.2)	27(32.1)	8(9.5)	21(25.0)	20(23.8)
No	0(0.0)	6(42.9)	2(14.3)	3(21.4)	0(0.0)
Total	1(1.0)	33(33.7)	10(10.2)	24(24.5)	20(20.4)

Var.	Education					
	Masters	Resident	Consultant	Total	χ^2	p
V22						
Yes	1(3.2)	1(3.2)	1(3.2)	31(100.0)	1.801	0.970
No	2(3.0)	2(3.0)	3(4.5)	67(100.0)		
Total	3(3.1)	3(3.1)	4(4.1)	98(100.0)		
V23						
Yes	3(4.1)	2(2.7)	3(4.1)	74(100.0)	4.647	0.703
No	0(0.0)	1(4.2)	1(4.2)	24(100.0)		
Total	3(3.1)	3(3.1)	4(4.1)	98(100.0)		
V24						
Yes	1(2.2)	0(0.0)	0(0.0)	45(100.0)	11.437	0.121
No	2(4.2)	3(6.3)	4(8.3)	48(100.0)		
Total	3(3.2)	3(3.2)	4(4.3)	93(100.0)		
V25						
Yes	3(3.8)	3(3.8)	4(5.1)	79(100.0)	9.137	0.243
No	0(0.0)	0(0.0)	0(0.0)	20(100.0)		
Total	3(3.0)	3(3.0)	4(4.0)	99(100.0)		
V26						
Yes	2(2.4)	2(2.4)	3(3.6)	84(100.0)	6.391	0.495
No	1(7.1)	1(7.1)	1(7.1)	14(100.0)		
Total	3(3.1)	3(3.1)	4(4.1)	98(100.0)		

There was significant association between the attitude and the Job cadre of medical HCW of PSSH. Two-third of the variables on attitude and Job Cadre had significant relationship. About one-third of the variables on attitude were not significantly associated with Job cadre.

Table 5: Association of Attitude and Job cadre for medical staff in PSSH

Variable	Doctor	Nurse	Pharmacist	Nur-seaide/Pha-rmtech	Total	χ^2	p
V14							
Yes	4 (20.0)	11 (55.0)	4 (20.0)	1(5.0)	20 (100.0)	8.146	0.043
No	28 (32.6)	52 (60.5)	6 (7.0)	0(0.0)	86 (100.0)		
Total	32 (30.2)	63 (59.4)	10 (9.4)	1(0.9)	106 (100.0)		
V15							
Yes	11 (29.7)	21 (56.8)	5 (13.5)	0(0.0)	37 (100.0)	3.302	0.347
No	22 (32.4)	42 (61.8)	3 (4.4)	1(1.5)	68 (100.0)		
Total	33 (31.4)	63 (60.0)	8 (7.6)	1(1.0)	105 (100.0)		
V16							
Yes	14 (28.0)	30 (60.0)	5 (10.0)	1(2.0)	50 (100.0)	1.449	0.694
No	19 (33.3)	33 (57.9)	5 (8.8)	0(0.0)	57 (100.0)		
Total	33 (30.8)	63 (58.9)	10 (9.3)	1(0.9)	107 (100.0)		
V17							
Yes	3 (15.0)	12 (60.0)	5 (25.0)	0 (0.0)	20 (100.0)	8.742	0.033
No	30 (34.1)	52(59.1)	5 (5.7)	1 (1.1)	88 (100.0)		
Total	33 (30.6)	64 (59.3)	10 (9.3)	1 (0.9)	108 (100.0)		
V18							
Yes	3 (18.8)	8 (50.0)	4 (25.0)	1 (6.3)	16 (100.0)	12.733	0.005
No	30 (33.7)	54 (60.7)	5 (5.6)	0 (0.0)	89 (100.0)		
Total	33(31.4)	62(59.0)	9(8.6)	1(1.0	105 (100.0)		
V19							
Yes	26(27.1)	61(63.5)	8(8.3)	1(1.0)	96 (100.0)	5.557	0.135
No	4(66.7)	1(16.7)	1(16.7)	0(0.0)	6(100.0)		
Total	30(29.4)	62(60.8)	9(8.8)	1(1.0)	102(100.0)		
V20							
Yes	32(31.4)	61(59.8)	9(8.8)	0(0.0)	102(100.0)	103.000	0.000
No	0(0.0)	0(0.0)	0(0.0)	1(100.0)	1(100.0)		
Total	32(31.1)	61(59.2)	9(8.7)	1(1.0)	103(100.0)		
V21							
Yes	5(13.9)	27(75.0)	4(11.1)	0(0.0)	36(100.0)	9.249	0.026
No	28(41.8)	33(49.3)	5(7.5)	1(1.5)	67(100.0)		
Total	33(32.0)	60(58.3)	9(8.7)	1(1.0)	103(100.0)		

Discussion

The Knowledge on COVID-19 has been shown to be positively associated with their attitude and practice (25-

28). Therefore, the rationale for this study was to investigate the KAP of medical HCW of PSSH to increase the awareness towards prevention and control of COVID-19 among HCW. Healthcare workers have been shown to be at increased risk of contracting the disease compared to the general population.[19,23]

The findings of this study showed that more than half of the medical work force were nurses, closely followed by doctors, the educational qualification with the highest frequency was diploma which was one-third, followed by BN.Sc and MBBS with about one-fifth each. The result can be explained by the fact that the direct care of patients is done by doctors and nurses. The result is similar to what was obtained by Al-Sulayyim et al and Nepal et al, where most of the medical HCW were nurses closely followed by doctors.[26,27] However, this result is different from what was obtained by Saqlain et al, where the highest number of workers were pharmacist, followed by doctors then nurses.[25] The reason for the different results could be attributed to the fact that the author is a pharmacist and the questionnaires were distributed to his colleagues than other HCW, the sampling technique could be biased or the nature of the set-up at the hospital which exposes the pharmacists more, to direct contact compared with doctors and nurses.

In this study, the knowledge of the medical HCW was good because almost all the questions on knowledge were answered correctly. A plausible reason for this could be because they are all medical HCW, the least level of education for all the medical HCW was diploma, closely followed by BN.Sc and MBBS, there was nobody whose highest level of education is primary school certificate, only one person had Senior School Certificate as its highest education. The result in this study was a little lower (80% vs 93%) than what was obtained by Saqlain et al where the knowledge of the HCW was very good, this could be because of the difference in the instrument used and our study included Nurse aids/Pharmacist technologist apart from Doctors, Nurses and Pharmacist, while Saqlain et al only included Doctors, Pharmacist and Nurses.[25]

The attitude of the medical HCW was fair in this study. About two-third of the questions on attitude were answered correctly. Some of the attitude questions had average scores with only half of them gotten correctly. In the same vein, their practice was also fair with about one-third of the questions answered correctly. However, one of the practice questions was poor with less than half of the workers getting the answer correctly. The result obtained in this study is unlike what was obtained by Saqlain et al, where the attitude and the practice was good, a plausible explanation could be because a different instrument was used and differences in the Job cadre of the HCW recruited for the study. [25]

The result obtained in this study, showed no significant association between the practice and the educational level of the medical workers of PSSH. However, there was significant association between the attitude and the Job cadre the HCW. This could be explained by the fact that the Job cadre is dependent on their level of education and those with high education tend to have a good knowledge of the disease which would go further to influence their attitude. This is similar to what was obtained by Sulayyim et al, Saqlain et al and Nepal et al.[25,27]

There were gaps observed in the attitude and practice of the medical HCW in PSSH, this could be because as at the time of the study, no training has been carried out in the hospital for the medical workers on the prevention and practice of COVID-19. Their knowledge was good because they had various sources of information: from television to google and other social media platforms to obtain information about the virus, but this cannot be compared to organized symposiums and practical training on how to practice prevention control.

Strengths and limitation.

The strength of the study is that the questionnaire was distributed manually despite the pandemic and there were limited open ended questions. Ethical clearance was obtained for the study.

The limitation of the study was that the questionnaire was distributed during the lock down period in the state. The honesty and the ability of the participants to recall answers could not be ascertained.

Conclusion

There was a significant gap in the attitude and practice of the medical HCW in PSSH. There is an urgent need for further educational training on the prevention and control of COVID-19 among the HCW.

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EMERGENCY THORACIC SURGERY IN CHEST TRAUMA AT THE KOMFO ANOKYE TEACHING HOSPITAL IN GHANA: THE ROLE OF STERNOTOMY AND THORACOTOMY

Okyere I[1]; Singh S[2]; Ameyaw E[3]; Okyere P[4]; Yeboah FA[5]; Brenu SG[6]; Tamatey M[7]

[1]Department of Surgery, [2]Department of Anaesthesia and Intensive Care, [3]Department of Child Health, [4]Department of Internal Medicine, [5] Department of Molecular Medicine, School of Medicine and Dentistry, College of Health Sciences, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana; [6] Directorate of Surgery, Komfo Anokye Teaching Hospital, Kumasi, Ghana; [7] Department of Surgery, School of Medical Sciences, University of Health and Allied Sciences, Ho, Ghana.

Abstract

Objective: Chest trauma, as blunt or penetrating injury, account for significant amount of all traumatic injuries. They are associated with high mortality of about 75% of all trauma-related deaths, either from direct or indirect consequence of the injury. Nearly 80-85 % of chest trauma is managed conservatively with only about 10-15 % needing emergency surgery

Methodology: A retrospective cohort study of patients presenting with chest trauma and undergoing emergency thoracic surgery at the Komfo Anokye Teaching Hospital from January 2015 to June 2020 was carried out.

Results: There were 29 patients, with 82.8% (24) being males. The mean age was 33.8 ± 15.0 years with range of 5-65 years. The leading mechanism of chest trauma was penetrating chest injury, which accounted for 51.7% (15). Eighteen (86%) patients underwent exploratory thoracotomy with 5 (10%) having exploratory sternotomy and the remaining 4% undergoing other procedures. Fourteen (82.1%) patients out of the eighteen who underwent the thoracotomy had a left thoracotomy with four (24.1%) patients having right thoracotomy. The major indication for surgery in acute thoracic trauma was traumatic diaphragmatic rupture (62.1%) followed by impalement injury (17.2%), traumatic thoracotomy (6.9%), cardiac tamponade (6.9%), massive haemothorax (3.5%), and vascular injury (3.5%). There were no mortality over the 5-year period.

Conclusion: The leading indication for emergency thoracic surgery in chest trauma was traumatic diaphragmatic rupture caused mostly by penetrating thoracic injury. Thoracotomy was the major emergency thoracic surgical approach performed.

Key words: *Chest trauma, thoracotomy, sternotomy, emergency surgery, Kumasi*

Introduction

Chest trauma, whether as blunt or penetrating injury, account for significant amount of all traumatic injuries. They are associated with high mortality of about 75% of all trauma-related deaths, either as direct or indirect consequence of the thoracic injury. However, nearly 80-85% of chest trauma is managed conservatively with only about 10-15% needing emergency surgery.

We sought to therefore analyse our institutional results of emergency thoracic surgery in chest trauma patients presenting to our accident and emergency centre. These patients underwent either thoracotomy or sternotomy at the Komfo Anokye Teaching Hospital in Kumasi, Ghana over a 5-year period. The purpose of the study was therefore to provide information that would guide practitioners and referring doctors of the possible roles of emergency surgery in chest trauma.

Corresponding Author: **Dr. Isaac Okyere**
Department of Surgery, School of Medicine and Dentistry, College of Health Sciences, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana
Email Address: isaac.okyere@knust.edu.gh
Conflict of Interest: None Declared

Materials and Methods

Patients Selection

A retrospective cohort study carried out at the Cardiovascular and Thoracic Surgery Unit of the Directorate of Surgery at the Komfo Anokye Teaching Hospital involving all patients who underwent either thoracotomy or sternotomy for chest trauma from January 2015 to June 2020. The data were obtained from the theatre records of the patients. The data included the sociodemographics, the mechanism of injury, the type of thoracic surgery, the type of anaesthesia and complications. The analyses for means, frequencies, and standard deviations were performed using Microsoft excel 2010 statistics software and Stata 13.

Study setting

The study site is the cardiovascular and thoracic surgery unit of the department of surgery of the Komfo Anokye Teaching Hospital which was established in 2015.The unit comprises of three subspecialties of surgery as a composite; vascular surgery, adult and paediatric cardiac surgery and

Thoracic Surgery. It currently has one cardiovascular and thoracic surgeon and a thoracic surgeon. It runs two clinics per week and operates twice a week handling all vascular, cardiac and thoracic surgery services. It also runs a daily cardiovascular and thoracic emergency surgery services. The unit has an intensive care unit, one theatre, a pharmacy and one general ward.

Komfo Anokye Teaching Hospital in Kumasi is the second-largest hospital in Ghana and the only tertiary health institution in the middle belt of the country. It is the main referral hospital for the Ashanti, Bono, Bono East, Ahafo, Northern, Savannah, North East, Upper East and Upper West regions of the country. The hospital was built in 1954 and affiliated to the School of Medicine and Dentistry of the Kwame Nkrumah University of Science and Technology, Kumasi-Ghana.

Ethical Approval

The ethical approval for this study was granted by the Committee on Human Research, Publications and Ethics of the Komfo Anokye Teaching Hospital with approval number KATHIRB/AP/097/20.

Results

There were 29 patients, with 82.8% (24) being males and 17.2% (5) being females. The mean age was 33.8 ± 15.0 years with range of 5-65 years. The leading mechanism of chest trauma was penetrating chest injury, which accounted for 51.7% (15), with blunt chest trauma accounting for the remaining 48.3% (14). Eighteen (86%) patients underwent exploratory thoracotomy with 5 (10%) having exploratory sternotomy and the remaining 4% undergoing other procedures. Fourteen (82.1%) patients out of the eighteen who underwent the thoracotomy had a left thoracotomy with four (24.1%) patients having right thoracotomy. Fifteen (82.8%) patients had conventional anaesthesia with five (17.2%) having double-lumen anaesthesia for single lung intubation and isolation. The major indication for emergency thoracic surgery in acute thoracic trauma was traumatic diaphragmatic rupture (62.1%) followed by impalement injury (17.2%), traumatic thoracotomy (6.9%), cardiac tamponade (6.9%), massive haemothorax (3.5%), and vascular injury (3.5%). The leading intrathoracic organ herniation for the traumatic diaphragmatic rupture was the stomach with the greater omentum. There were no mortality over the 5-year period.

Discussion

Thoracic or chest trauma or injuries, be it blunt or penetrating, account for significant amount of all traumatic injuries.[1–3] They are associated with high mortality; about 75% of all trauma-related deaths from either direct or indirect consequences of the injury.[4] A third of all victims of road traffic accidents sustain some form of thoracic injury.[5]

Despite its high incidence, majority of the injuries are managed non-operatively with simple but life-saving procedures such as chest tube insertion or tube thoracostomy.[3,4] Figures as high as 85% have been quoted as being the proportion of thoracic trauma injuries managed conservatively.[6] Moreover, it is also noted that surgical or operative management is less in blunt chest injuries as compared to penetrating injuries with rates of 10% and 30% being quoted respectively. These surgical thoracic trauma injuries usually involve injuries to the heart and great vessels, the lungs and the intercostal vessels.[2,5] Consistent with the reports above, we observed a higher incidence of surgical intervention in patients who presented with penetrating chest injuries, representing 51.7%.

Epidemiology of Chest Trauma

Thoracic trauma has been quoted to contribute about 10-15% of the total burden of traumatic injuries. [7] It has been reported to be the third most common traumatic injury after head and extremity traumas in the United States of America and second only to extremity trauma in Brazil. [7] As shown in **Table 1** and consistent with our findings, several studies have identified a male preponderance in chest trauma,[8–11] with 24 (82.8%) patients out of the 29 patients being males in our series. Even though the incidence of chest trauma as described by Thomas and colleagues from Nigeria was found to be particularly high among the young adult group [9], several studies have sought to elucidate its importance in the paediatric population.[12–14] The mean age of our series was 33.8 years, which was similar to the observation by Thomas et al in Nigeria.[9] We postulate that this similarity in incidence may be seen in most centres in Africa. The plausible explanation for this may be from the young age population of most African countries. Thoracic trauma in paediatric populations account for 10% of trauma cases with majority of the associated injuries being more visceral with less thoracic cage injuries [13]. This has been attributed to the increased chest wall pliability in children with reduced chances of rib fractures.[12,13] Our youngest patient was 5 years and he had a thoracic impalement injury from a pair of scissors to the left chest wall missing the pericardium by 2 mm while playing with a friend. He was referred from a whole day's journey from another part of the country with the scissors in situ thankfully. He was quickly prepared for exploratory thoracotomy upon arrival after aggressive resuscitation and stabilization and underwent successful removal in operating theatre via a left

standard posterolateral thoracotomy. He has been well since and is continuing his childhood endervours.

Table I: The Patients Demographics

Variable	Frequency = 29	Percentage
Age	**33.8 ± 15.0**	
Gender		
Female	5	17.2
Male	24	82.8
Occupation		
Trader	4	13.8
Student	4	13.8
Artisan	8	27.6
Farmer	8	27.6
Unemployed	5	17.2
Level of education		
Basic	15	51.7
None	3	10.3
Secondary	11	37.9
Marital status		
Married	12	41.4
Single	17	58.6

Aetio-Clinico-Pathogenesis of Chest Trauma

According to Zhang *et al,* thoracic trauma is classified based on organ involvement into chest wall, cardiovascular, pulmonary and oesophageal injuries.[15] A study by Khorsandi *et al* listed the spectrum of commonly encountered thoracic injuries to be rib fractures (36.3%), major haemothorax (36.3%), simple pneumothorax (32.9%), cardiac injuries (26%), lung lacerations (21.2%), pericardial lacerations (11.6%), coronary artery laceration (6.1%), cardiac tamponade (3.4%) and haemopericardium without tamponade (1.4%). [1] Thoracic trauma may also be classified based on mechanism of injury into blunt or penetrating thoracic injuries. Blunt chest traumas are generally more common than penetrating chest trauma. This was observed by Demirhan *et al.* who showed that 66% of the over 4000 patients recruited into their study had blunt chest injury. [11] A similar figure was quoted even among the paediatric population by Ceran *et al.* in 2002. An epidemiological study carried out in Brazil by Zanette and associates in 2019 quoted an even higher incidence of 89%,[7] similar to the 90% incidence reported by Ludwig and Koryllos. [16] In contrast to the above observations, we noticed a higher incidence of penetrating trauma in our series in patients with chest trauma needing emergency thoracic surgery accounting for 51.7%.

Blunt chest trauma has been reported to be most commonly caused by road traffic accidents in a number of series.[7,11,13,17,18] Other documented causes include falls from height, violence and occupational injuries.[11,18] Penetrating chest injury, on the other hand, often implicate stab and gunshot wounds as its main causes. Clarke *et al* in a study done in South Africa demonstrated that 90% out of 1186 patients with penetrating chest trauma were due to stab injuries with the remaining 10% being attributed to gunshot injuries. [8] In the paediatric population, a study done in Nigeria showed that falls were the most common cause of chest trauma, with majority of these falls being from trees of economic importance such as those with fruits and palm trees from which palm wine is obtained.[14]

Based on threat to life associated with the thoracic injury, chest injuries may be grouped into immediately life-threatening injuries known as 'the lethal six',(upper airway obstruction, tension pneumothorax, open pneumothorax , massive haemothorax, flail chest , and cardiac tamponade), the potentially life-threatening injuries termed 'the hidden six'(traumatic diaphragmatic rupture, traumatic esophageal rupture, tracheobronchial injuries, myocardial contusion, aortic injury and pulmonary injury) and the non-life threatening injuries (rib fracture, simple pneumothorax, simple haemothorax and thoracic wall contusion). [6,16,19]

Acute and Chronic Indications for Surgery in Chest Trauma

Despite the seemingly high numbers of traumatic chest injuries, surgical intervention is mandated in a small proportion of the patients. Clarke and colleagues, in their review on emergency surgery after penetrating chest trauma in South Africa demonstrated that surgery was employed in only 9% of the 1186 patients reviewed.[8] The indications for surgery in chest trauma can be grouped into immediate or acute indications, relatively immediate and then chronic or long-term indications.[18]

The most common indication for surgical intervention in a retrospective study done in Turkey in 2009 was found to be intra-thoracic haemorrhage [11]. Haemothorax is deemed massive and an absolute indication for surgery if there is an initial drain output of 1500mls (or 15mls/kg) or there is an hourly output of 200mls/hour (2-3mls/kg/hour) for 3-4 consecutive hours. [6,19] However, our series observed that the leading indication for emergency thoracic surgery was traumatic diaphragmatic rupture, which was responsible for 62.1% of the cases. This was followed by impalement injury (17.2%), massive haemothorax (3.5%), traumatic thoracotomy (6.9%), cardiac tamponade (6.9%) and vascular injury (3.5%). The leading intrathoracic organ herniation for the traumatic diaphragmatic rupture was the stomach with the greater omentum. We postulate that the leading indication for thoracic surgery in chest

trauma from diaphragmatic rupture may be due to the presence of a cardiothoracic surgeon, establishing a new cardiovascular and thoracic surgery unit in the hospital Moreover, the cardiothoracic surgeon is usually the one who is called first by the emergency physicians at the emergency and accident centre of our hospital in most cases of chest trauma with suspected traumatic diaphragmatic rupture or injury, especially in cases with associated pleural collections such as haemothorax, pneumothorax or haemopneumothorax or in cases with minimal signs of peritonism. As expected, the cardiothoracic surgeon usually prefers to approach the repair of traumatic diaphragmatic rupture via thoracotomy and therefore this may be the plausible explanation to the finding of traumatic diaphragmatic rupture being the leading indication for emergency thoracic surgery in our series.

The Surgical Approaches to Emergency Surgery in Chest Trauma

In a study by Beşir *et al* which was carried out to assess the surgical approach in managing cases of penetrating cardiac injuries, majority of the patients were managed via thoracotomy with similar report from Mollberg *et al.*[20,21] The surgical approach utilized was made based on the site of injury and the possibility of lung involvement.

Pulmonary, posterior cardiac and oesophageal injuries in that study were mainly approached via thoracotomy due to ease of access while cardiac injuries, especially anterior mediastinal injuries and injuries to the great vessels were best approached via median sternotomy.[20] The trajectory of the injury, the location of the injured organ and the ease of access are factors that influence the choice of surgical approach.[4] A prospective study done in 2002 showed that 14% of 543 patients who had sustained penetrating chest injuries from stab wounds required thoracotomy or sternotomy.[22] Consistent with the reports above and as shown in **Figure 3,** we also observed that the major surgical approach in our series was thoracotomy forming about 86% with sternotomy forming 10%. Eighty-two percent of the thoracotomies were through left thoracotomy with majority being done for traumatic diaphragmatic rupture. Two of the patients sustained open thoracotomy chest injuries with chest wall disruption and had to undergo chest wall reconstruction. One patient had a blast right chest injury with extensive chest wall tissue loss leading to lung herniation from the blast of a gunshot. The other had open thoracotomy injury from a compound harvester farm machine leading to avulsion injury of the left hemithorax with near amputation of the left breast and open abdominal injury with evisceration of small intestines. They all underwent successful surgery and reconstruction of the chest wall primarily.

Three patients had traumatic right diaphragmatic rupture and had to be repaired through right standard posterolateral thoracotomy. They all had herniation of the liver as shown in **Figure 2.** Emergency department thoracotomy (EDT) is a drastic procedure done in the emergency room in patients in extremis mostly after penetrating chest injuries and less often in blunt chest injuries. [4] The main aims of performing an EDT are for effective cardiac compression, control of haemorrhage, evacuation of pleural or cardiac tamponade, cross clamping of the pulmonary hilum in bronchopleural fistula or air embolism and cross-clamping of descending aorta to control lower torso bleeding or shunt blood to the brain and the heart..[3–5] Emergency room thoracotomy is indicated in cases of cardiac arrest in spite of resuscitation. However, its usefulness has been debated in multiple studies as it has been associated with poor outcomes especially in blunt chest injuries. [3] A review of multiple studies by Khorsandi *et al* reported abysmal survival rates ranging between 0-6% [1]. Another study also showed survival rates of 8.8% and 1.4% for penetrating and blunt chest injuries respectively [5]

However, a systematic review of all European articles on EDT in blunt chest trauma by Narvestad *et al* reported a significantly higher rate of 12.6%. Our centre as yet has no experience with Bedside thoracotomy despite our accident and emergency centre being a trauma centre with operating theatre suites and therefore offering the potential for early resuscitation and stabilization leading to early surgical intervention.

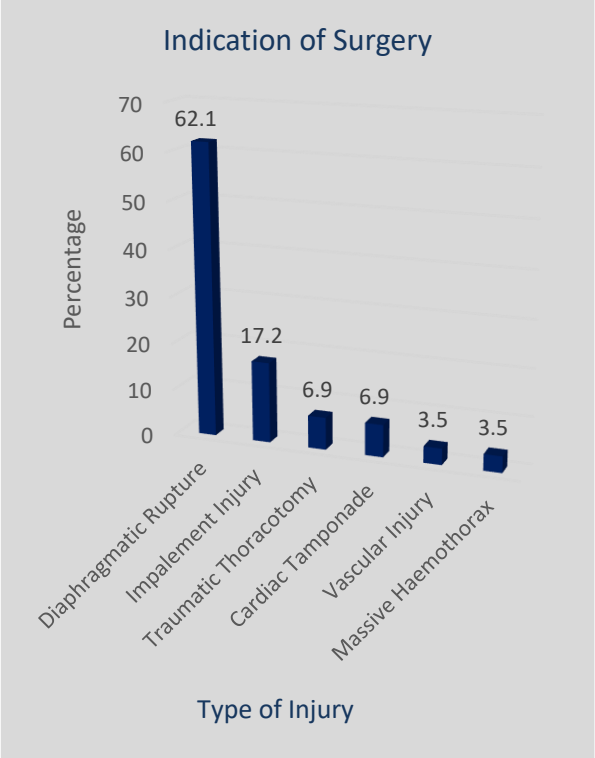

Figure 1: The distribution of Indication of Surgery

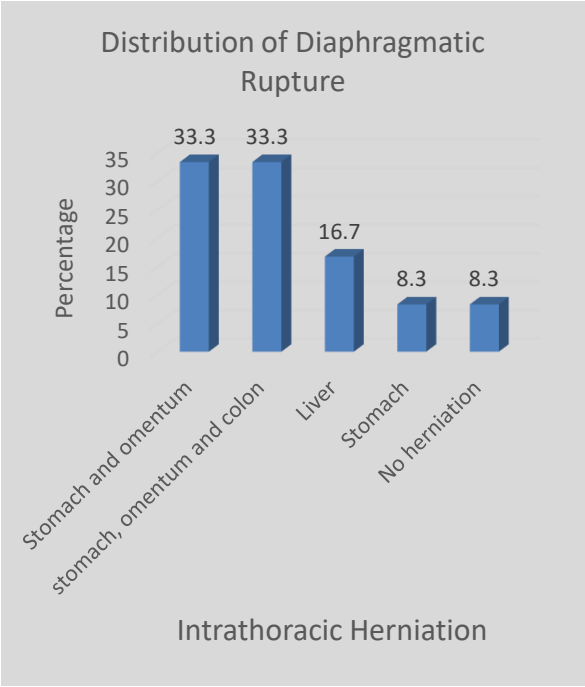

Figure 2: Distribution of Intrathoracic Organ Herniation in Diaphragmatic Rupture

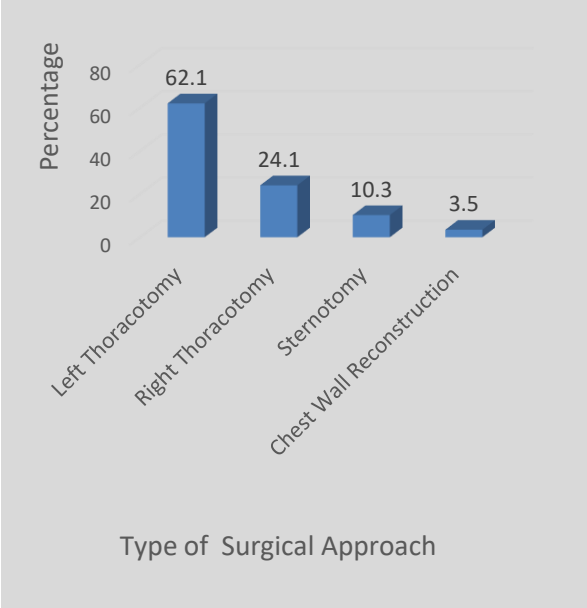

Figure 3: Distribution of Surgical Approach

The Role of Sternotomy and Thoracotomy in Chest Trauma

Thoracotomy in the management of acute thoracic injuries can be done immediately in the emergency room on arrival as indicated above as EDT, in the operating theatre within 1-4 hours on arrival or delayed for conservative management until a surgical indication arises. [4,23] It has been reported to be the most popular approach to operative management in traumatic thoracic injuries. Almost consistent with our series as noted from **Figure 3,** that thoracotomy represented 86.2 % of our thoracic emergency surgery with median sternotomy forming only 10.3%, Mollberg *et al* reported that out of 222 patients who required surgical management on account of thoracic trauma, 57.2% of them were approached via thoracotomy while 18.9% had a median sternotomy done. Its popularity may stem from the fact that it offers access to more organs in the thorax as compared to a median sternotomy.[20,24] However, Clarke *et al.* demonstrated a marginal popularity of sternotomy over thoracotomy in their study. Of the 108 patients who required surgical intervention, 56 out of them (51.8%) were approached via sternotomy while the rest of them had thoracotomy.[8]

Though thoracotomy is indicated in the management of cardiac tamponade and repair of some cardiac injuries, median sternotomy has been advocated because of its ability to provide better exposure of the heart and great vessels as well as ease of cannulation in the event of the need for cardiopulmonary bypass.[24] Despite its relative difficulty, need for experienced hands and associated risk of developing sternal sepsis, median sternotomy is the best approach for gaining access to the anterior mediastinum in emergency settings.[8] Median sternotomy provides optimum exposure in most cases of parasternal stab injuries since the damage is mostly limited to the anterior mediastinum. Moreover, right parasternal gunshot injuries are best approach via median sternotomy. However, due to the difficulty in repairing the posterior wall of the left ventricle if injured, left parasternal gunshot injuries are best explored via a left posterolateral thoracotomy.[4]

Conclusion

The leading indication for emergency thoracic surgery in chest trauma was traumatic diaphragmatic rupture caused mostly by penetrating thoracic injury. Thoracotomy was the major emergency surgical approach performed.

Limitations of the Study

Our study had a small sample size with limited data.

What is already know on this topic

The rate of indication of emergency surgery is low as most chest trauma patients are managed conservatively. There is higher rate of emergency surgery in penetrating chest trauma patients as compared with blunt chest trauma. The commonest indication for emergency surgery in chest trauma is massive haemothorax.

What this study adds

There is a younger age range of patients with chest trauma The commonest indication for emergency surgery in chest trauma is diaphragmatic rupture followed by impalement injury.

Authors' contributions

Isaac Okyere conceived the idea, did data collection and analysis and wrote the manuscript including the literature review. Sanjeev Singh did a critical review of the manuscript. Perditer Okyere did a review of the literature and provided critical revision to the manuscript. Emmanuel Ameyaw contributed to the literature review and manuscript drafting. Samuel Gyasi Brenu provided critical revision to the manuscript. Martin Tamatey did a critical review of the manuscript. Francis Agyemang Yeboah also provided critical revision of the final manuscript. All authors read and approved the final copy of the manuscript.

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ASSESSMENT OF THE IMPACT OF LEVEL OF MATERNAL EDUCATION ON MATERNAL DEATHS IN EASTERN REGION OF GHANA; A HUMAN RIGHTS-BASED APPROACH

Asare BA
Public Health Specialist, Kwaebibirem District Eastern Region, Ghana.

Abstract

Objective: The Human Rights-based Aproach to Social Development aims to positively transform power relations among duty bearers and rights holders with particular attention on social, economic, and cultural rights. This study analyzes the impact of formal education, (an inalienable human right progressively predicting better health, longer life and better health services utilization), on maternal mortality.

Methodology: A retrospective descriptive audit of all institutional maternal death records was completed for data abstraction. All records were assessed for consistency with the ICD-10 maternal death case definition. Data were analyzed across documented levels of education with epi info 3.5.1.

Results: Mean maternal age was generally higher among women with ≤ JHS level of education. Mean gestational age at death varied insignificantly across all levels of education. Women with JHS level of education accounted for the highest proportion of maternal deaths while deaths among women with ≥ SHS level of education, (i.e. ≥ 12 years of formal education), remained low. Deaths among women with informal occupations decreased with increasing level of education. Maternal deaths among women with ≤ JHS level of education occurred in higher proportions among women with spouses or partners of similar levels of education. Women unexposed to formal education poorly attended ANC, mostly needed blood transfusions and were further largely grand multiparous.

Conclusion: All female gender-specific socio-economic, socio-cultural, geographical and religious barriers to accessing ≥ 12 years of formal education should be a research priority and targeted for elimination within the context of the HRBA.

Key Words: *Maternal mortality, maternal death, human rights-based approach to maternal health*

Introduction

The Human Rights-based Aproach to Social Development, HRBA, (promoted by many development agencies, and Non-governmental organizations, NGOs) aims to achieve positive transformation of power relations among duty bearers, (the institutions obligated to fulfill the holders' rights) and rights holders (who do not experience full rights).[1] It prioritizes strengthening capacities of duty bearers while empowering rights holders.[1] While human rights organizations formerly focused on political and civil human rights violations, current attention has shifted to social, economic, and cultural rights.[1] Evolution of human rights, (transitioning from a welfare model and the western idea that rights are asserted through responsibilities, duties, transparency, trust, and accountability), led to the development of the HRBA.[1] The Secretary General to the United Nations (UN) called on all UN agencies to mainstream human rights into all work of the UN in 1997 based on the six underlying principles. They include universality and inalienability, indivisibility, inter-dependence and inter-relatedness, equality and non-discrimination, participation and inclusion and accountability and rule of law.[1] Achieving health goals is generally dependent on increasing access to key interventions whose broad deployment may simply still not be enough.[1] The UN human rights Council highlighted maternal mortality as a health outcome of human rights concern because an estimated 98% are preventable.[2] The Convention on Elimination of all Forms of Discrimination Against Women (CEDAW) is the only human rights treaty that affirms the reproductive rights of women.[2] Gender discrimination, poverty, lack of formal education, inadequate health services, restrictive abortion legislation etc. comprise explanatory factors that underlie and predict maternal deaths.[2] CEDAW indicated that states had human rights responsibilities to guarantee women of all racial and economic backgrounds timely and non-discriminatory access to appropriate maternal health services.[3] Human rights are fundamentally violated when pregnant women or parturients endure preventable suffering that includes morbidity, mortality, injury, mistreatment, abuse, discrimination and denials of information.[4] The HRBA to women and children's health, (increasingly gaining acceptance among a diverse range of stakeholders), has renewed attention to the need to establish links between women's socio-economic characteristics and health.[5] Formal education, (a human right), constitutes an

Corresponding Author: **Dr. Brainard Ayisi Asare**
P. O. Box 318, Suhum Kwaebibirem Eastern Region, Ghana
Phone Number: (+233)0240230036
Email Address: brainardasare@gmail.com
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indicator of social position frequently used in international surveys to explore social inequalities.[6] Progressively higher education is linked with better individual health, longer life, better utilization of health facilities etc.[6] Women's level of education, (relative to those of men), is linked with adverse maternal health outcomes when low.[6] Lack of formal education is highlighted as an important stressor associated with limited finances and decision-making power which affects women during pregnancy and childbirth. This creates vulnerability and increases the likelihood of adverse maternal health outcomes.[6] While recognizing formal education as an inalienable human right important for averting adverse maternal health outcomes, this study analyzes its impact on maternal deaths among women who died in health care facilities in the Eastern Region of Ghana.

Materials and Methods

The study was carried out as a retrospective descriptive audit of all institutional maternal deaths that occurred in the Eastern Region of Ghana between 2011-2016. The retrospective audit started with records dated 2011 as this constitutes the year when the old maternal death audit form transitioned into the current audit form that is comparatively more comprehensive and thus more informative. Records on maternal deaths were acquired from the Eastern Regional Health Directorate. They were meticulously reviewed for abstraction of the study's variables after careful test of consistency of all documented deaths with the with the ICD 10 maternal death case definition. Of the total 526 maternal death audit forms retrieved covering the period 2011-2016, 479 were included through non-probability sampling. The primary inclusion criterion was a record's consistency with the maternal death case definition of ICD 10. Maternal deaths documented to have occurred at home or prior to arrival to a health facility were excluded. They were defined community deaths. Of the 47 audit forms excluded, 22 were suggestive of deaths that occurred on the way to health facilities while 25 records did not indicate the place of death. The later, (i.e., deaths of unspecified locations), were also classified as non-institutional maternal deaths. Referred cases, (whose demise occurred prior to arrival to the referral health facility), were included. They were adjudged cases of the health facility that referred them as part of the continuum of clinical care. Their inclusion into the Eastern Region's institutional maternal deaths is premised on the fact that they were received by a health facility within the Region, managed and referred for further care prior to their demise. Deaths preceded by ingestion of potentially toxic substances, (e.g. herbal preparations or other unspecified substances), were also included. Assumptions of this study held that the primary objective to their ingestion was not suicide but for the termination of unwanted pregnancies. Such substances observably, (from available death audit records), may have triggered a complex cascade of processes that largely ended in direct maternal deaths. Levels of education were analyzed on a five-step scale (in accordance with Ghana's general educational structure) as follows; nil or no exposure to formal education, primary, junior high school (JHS), senior high school (SHS) and tertiary levels of education. Urban or rural community status were defined in accordance with specifications of the Ghana statistical service that classify communities with populations of ≤ 5000 as rural. All data were analyzed with epi info 3.5.1.

Results

The mean maternal age and standard deviation (SD) from the mean maternal age varied insignificantly across the various levels of education. The mean maternal age was generally higher among women with ≤ JHS level of education. With the exception of women of tertiary level of education, maternal ages were characterized by high variability. [**Table 1**].

Table 1. Maternal deaths analyzed by levels of education and characteristics of central tendency, 2011-2016

Levels of education	Maternal age		
	Mean	SD	Variance
Nil education	29.1	7.3	54.1
Primary school	29.6	8.1	66.1
Junior High School	29.2	6.8	46.5
Senior High School	27.1	5.9	35.5
Tertiary	28.3	4.4	19.9

The mean gestational age at death varied insignificantly across maternal levels of education from women unexposed to formal education to women with tertiary level of education. [**Table 2**].

Table 2. Maternal mortality analyzed by mean gestational age at death and levels of education, 2011-2016

Levels of education	Gestational Age - %		
	Mean	SD	Variance
Nil education	30.6	9.5	90.2
Primary school	31.2	9.8	96.2
Junior High School	34.6	7.8	61.7
Senior High School	32.9	11.6	134.8
Tertiary	34.2	8.9	80.6

Maternal deaths were recorded in the highest proportions among women with JHS level of education and remained observably lowest among women of ≥ SHS levels of education. Among women with ≤ JHS level of education, deaths increased with increasing exposure to formal education from women unexposed to formal education through to JHS level of education. [Table 3].

Table 3. Maternal deaths analyzed by levels of education, 2011-2016

Levels of education	Maternal deaths - %
Nil education	20.7
Primary education	20.9
Junior High School	46.7
Senior High School	7.0
Tertiary	4.7

While women unexposed to formal education recorded peak maternal deaths in the age group 21-30 years, deaths among women with a primary level of education observably peaked in the age group 31-40 years. Variations in levels of education among maternal deaths of women of the other age groups remained insignificant. Maternal deaths marginally varied between women resident in urban and rural communities; rural residents generally, however, recorded more maternal deaths. Peak maternal deaths observably occurred among women of JHS level of education for both urban and rural residents. It, however, generally remained comparatively lower among women resident in urban and rural communities with ≥ SHS level of education. Deaths among women with lower levels of education, (i.e. ≤ JHS), with traceable addresses occurred in lower proportions while women of higher levels of education, (i.e. ≥ SHS), contrarily accounted for higher proportions of maternal deaths among women with traceable addresses.

Maternal deaths analyzed by marital status showed that they occurred in lower proportions among both married and single women with ≥ SHS levels of education. Maternal deaths among women documented to have informal occupations decreased with increasing levels of education. Deaths among women with formal occupations were recorded in the highest proportions among women with tertiary level of education. Maternal deaths among women of ≤ JHS levels of education occurred in higher proportions among women with spouses or partners of similar levels of education. Notably, however, the proportion of maternal deaths also observably decreased inversely with increasing spousal or partner's levels of education and spousal or partner's formal occupation status. Women with spouses or partners of tertiary level of education had the least representation among maternal deaths. While direct maternal deaths reduced with increasing level of education, indirect maternal deaths contrarily increased among women with ≥ SHS level of education (despite an insignificant dip recorded for women with JHS level of education. Maternal deaths were, however, generally lower among women with higher levels of education, (i.e. ≥ SHS). [**Table 4**].

Table 4. Maternal deaths analyzed by maternal age, residence, address traceability, marital status, occupation, death type and levels of education, 2012-2016

Characteristic	Levels of education - %				
	Nil	Primary	Junior High	Senior High	Tertiary
Maternal age					
≤ 20 years	11.1	18.3	10.6	12.9	0.0
21-30 years	42.2	34.4	47.8	64.5	61.9
31-40 years	41.1	40.9	37.7	19.4	38.1
≥ 41 years	5.6	6.5	3.9	3.2	0.0
Area of residence					
Urban	12.2	22.4	48.1	9.6	7.7
Rural	21.9	20.9	50.7	5.0	1.5
Traceability of address					
Traceable	10.9	21.4	53.0	9.4	5.3
Not Traceable	35.3	20.8	37.0	3.5	3.5
Marital status					
Married	20.0	21.1	47.1	6.6	5.1
Single/ unclear	22.8	20.7	44.6	8.7	3.3
Occupation					
Formal	0.0	2.4	0.5	19.2	90.5
Informal	100	97.6	99.5	80.8	9.5
Partner's or spousal occupation					
Formal	0.0	0.0	10.0	9.1	66.7
Informal	100	100	90	90.9	33.3
Maternal death type					
Direct	69.4	71.6	74.9	60.7	68.4
Indirect	30.6	28.4	25.1	39.3	31.6

Maternal deaths preceded by blood transfusions, (as part of the continuum of clinical management of a cascade of obstetric complications leading to death), had a comparatively higher representation among women unexposed to formal education. The differential occurrence of maternal deaths among women with ≥ SHS level of education remained low irrespective of prior blood transfusion status. Notably high maternal deaths were documented among women unexposed to formal education who did not attend ANC during pregnancy. This, however, varied insignificantly across the other levels of education (i.e. ≥ primary school level of education). While maternal deaths increased with increasing level of education among ≤ biparous women, deaths among ≥ multiparous women decreased with increasing level of education. The trimester of occurrence of maternal deaths varied insignificantly across all the levels of education. The lowest mortality burden was however still recorded among women of ≥ SHS level of education irrespective of analyses by trimester of occurrence of maternal death.

The majority of maternal deaths that occurred following spontaneous vaginal delivery, (SVD), occurred among women unexposed to formal education. The trend of maternal deaths that occurred following the performance of a cesarean section, (as part of the continuum of clinical management of a cascade of obstetric complications leading to death), increased with increasing level of education. This trend peaked among women with tertiary level of education. The trend of maternal deaths preceded by expulsion of the conceptus ≤ 27 completed weeks of gestation, (as part of a cascade of obstetric complications preceding death), remained marginally highest among women unexposed to formal education. This trend peaked among women with tertiary level of education. Third trimester maternal deaths were recorded in the highest proportions among women with tertiary level of education. Maternal deaths predominantly occurred in advanced pregnancy, (i.e. ≥ 28 completed weeks of gestation), across all levels of education. [**Table. 4**].

Table 4. Maternal deaths analyzed by blood transfusion, ANC attendance, parity, gestational age, pregnancy outcome and levels of education

Characteristic	Levels of education - %				
	Nil	Primary	Junior High	Senior High	Tertiary
Blood transfusion status					
Transfused	14.1	23.1	51.3	8.3	3.2
Not transfused	25.5	19.4	42.9		
ANC attendance					
Attendant	17.0	20.7	50.0	7.2	5.2
Not attendant	36.4	22.1	35.1	5.2	1.3
Parity					
≤ Bipara	26.7	35.6	42.4	60.0	83.3
≥ Multipara	73.3	64.4	57.6	40.0	16.7
Gestational age at death					
≤ 12 weeks	9.1	11.8	9.4	14.8	0.0
13-27 weeks	15.6	11.8	12.2	11.1	18.8
≥ 28 weeks	75.3	76.3	78.5	74.1	81.3
Delivery/abortion status					
SVD	33.0	32.2	32.4	13.8	10.0
CS	21.6	31.0	36.7	44.8	45.0
≤ 27 weeks	14.8	11.5	7.4	10.3	5.0
Conceptus in situ	30.7	25.3	23.4	31.0	40.0
Time of admission					
00:00-06:59	20.9	7.8	15.8	11.5	31.3
07:00-12:59	26.9	35.3	25.2	26.9	50.0
13:00-17:59	26.9	29.4	33.1	42.3	18.8
18:00-23:59	25.4	27.5	25.9	19.2	0.0
Time of death					
00:00-06:59	33.3	16.3	25.4	18.5	37.5
07:00-12:59	16.7	22.4	24.6	29.6	18.8
13:00-17:59	25.8	24.5	24.6	33.3	12.5
18:00-23:59	24.2	36.7	25.4	18.5	31.3

Discussion

The Human Rights-based Aproach to Social Development, HRBA, (applicable to all aspectcs of development), aims to achieve positive transformation of power relations among duty bearers and rights holders.[1] Formal education, a human right, (and an indicator of social position frequently used in international surveys to explore social inequalities), is linked with better individual health, longer life, better utilization of health services etc.[6] Findings of this study showed that women with ≥ SHS level of education, (i.e. women with ≥ 12 years of exposure to formal education), accounted for the lowest maternal death burden in the Eastern Region of Ghana between 2011-2016. This pattern was consistently not amenable to maternal age, urban or rural place of residence, traceability of address, marital status, formal or informal occupations, direct or indirect maternal deaths, blood transfusion status, ANC attendance, parity, gestational age and trimester of gestation. Findings of this study descriptively supported findings of a study that reported that women unexposed to formal education were about three times as likely to die during pregnancy or delivery. The compared study further indicated that women exposed to one and six years of formal education had twice the risk of maternal death of women with ≥ 12 years of formal education.[6]

Boosting female education may be an important policy lever for averting maternal deaths.[7] Emphasis on formal education as a factor (among other important factors) in maternal death is seldom stated.[7] Literature in economics widely documents positive correlations between formal education and other indicators of good health.[7] Findings from a study completed in 29 countries in Africa, Asia, Latin America, and the Middle East reported significant associations between low education

and severe adverse maternal health outcomes (i.e. maternal near miss and maternal death).[8] This relationship persisted in countries with medium and low Human Development Indices (HDI).[8] As descriptively supported by findings of this study, Tunçalp Ö. *et al* indicated that less educated women also had increased odds of presenting to the hospital in a severe condition (i.e. with organ dysfunction on arrival or within 24 hours).[8]

Findings of this study were consistent with findings of a study in Peru that examined the causal effect of women's education on maternal health.[9] The study posited that extending women's years of schooling significantly reduced the probability of several maternal health complications at last pregnancy or birth.[9] Few studies have however been able to determine whether women's level of education has a *causal* effect on maternal health or whether the link between the two is attributable to factors correlated with both, such as household wealth or poverty.[9] Within countries, maternal deaths have largely occurred among the poorest and least educated women who are most vulnerable to maternal death and disability.[10] A World Health Organization (WHO) report on Asia and the Pacific also indicated that maternal death significantly reduces commensurately with increasing female literacy.[10] Unmet need for contraception, (key to averting adverse maternal health outcomes), is mostly prevalent among women who are poor, less educated, younger, and living in rural areas.[10] UNSESCO data also strongly supports the established positive associations between education and social development. UNESCO indicates that exposure of all women to primary education could contribute to reduction of maternal deaths by about 67%.[11] This assertion was however contrary to findings of this study as exposure to primary level of education did not positively impact maternal deaths. Formal education importantly enhances women's capacity for timely recognition of danger signs, quick decision making, etc.[11]

A scientific analysis of 50 years of maternal death data from Chile identified maternal level of education as the single most important factor in averting maternal deaths.[12] It was linked to an enhanced ability to access existing health care services, including skilled attendants for childbirth.[12] Chile, a paragon for maternal health, reduced its maternal mortality ratio (MMR) by 93.8% between 1957-2007.[12] The variables affecting this decrease included the predictable factors of delivery by skilled attendants, complementary nutrition for pregnant women and their children in the primary care clinics and schools, clean facilities, and fertility control.[12] The factor that was defined particularly important and deemed to have positively enhanced the impact of all the others (for averting death) was the educational level of women. Chile's MMR decreased commensurately with every additional year of maternal level of education between 1957-2007.[12] Maternal level of education is therefore defined a major modulator that has helped Chile to reach one of the safest motherhood echelons in the world.[12] It however also paradoxically contributes to decreased fertility which excessively delays motherhood and increases obstetric risks associated with advanced maternal age.[12]

Bangladesh recorded a significant reduction in its maternal death ratio from 574 to 194 per 100 000 live births between 1990-2010 in both urban and rural communities.[13] This achievement was largely attributed to increased utilization of health care services as a result of a revolutionary 80% increase in level of education for women aged 15-24 years.[13] Female literacy in rural Bangladesh exceeds male literacy. Increased female education has, in turn, led to reduced fertility in Banladeh.[13] A Lancet research also highlighted the key role of maternal level of education in saving lives. The Lancet study pointed particularly to the increased average years of schooling for women aged 25-44 years in sub-Saharan Africa that increased from 1.5 in 1980 to 4.4 in 2008.[14] Conclusively, the Lancet research posited that formal education was indispensable in the quest for giving women independence, autonomy and tools they need to make use of available obstetric care services.[14] Findings of this study indicating maternal deaths mostly occurred in advanced pregnancy remain inconclusive as the study was health facility-based. Secondly, maternal deaths occurring in early pregnancy together with community deaths may be defined by a larger degree of underreporting.

As the maternal level of education increases and fertility drops, exposure to maternal health (obstetric) complications diminishes commensurately with the number of pregnancies and births.[9] This is supported by findings of this study indicating that women of higher levels of education were largely uni- or biparous and urban residents.[9, 15] Extant evidence consistently show profound effects of formal education on improved utilization of health services. Findings of global analyses of predictors of maternal deaths also strongly suggest that low female level of education significantly predicts maternal deaths.[15] Universal basic education reduces poverty and contributes to individual economic growth as it enhances opportunities for improved Socio-economic status.[8] The relationship between education and maternal health, (identified in this study and widely established in extant literature), is consistent with the interdependence or interrelatedness of human rights.[8] An individual's ability to read, write and calculate is acknowledged as a human right (among other rights) to be prioritized by duty bearers.[8] An example of the indivisibility and interdependence of human rights includes the fact that the right to health is inextricably linked to an individual's right to formal education.[8] Maternal level of education, (identified among the most important factors for averting maternal deaths), is also defined a factor that enhances the positive effects of all other preventive factors.[16]

Equity requires that male and female interests are treated without discrimination and that materially different interests are treated in ways that adequately respect the differences. Female literacy in Ghana

(71.4%) is lower than male literacy (82%) according to 2015 estimates.[17] Failures to accommodate biological differences between the sexes, (demonstrated in high maternal death rates mostly preventable through cost-effective interventions), can be ameliorated through commitment to the HRBA.[18] Strategic investments to improve quality of life through increased female access to formal education may have the greatest impact on maternal death reduction.[19] In Ghana, about 20% of women aged 15-49 have no exposure to formal education.[19] Sixteen percent have a primary, 40% have a JHS and 18% of women have SHS level of education.[20] Only 8% of women have > SHS level of education.[20] This study also notably pointed to a particularly high maternal death burden among women of JHS level of education. This is conceivably explained by the fact that the JHS level of education, (as indicated above), constitutes the most prevalent level of education attained by women in Ghana. Women in urban areas are more likely to be literate (65%), compared to women in rural areas (41%).[20] This is depicted in this study's finding showing that women's rural residence's representation among maternal deaths generally remained higher. The HRBA posits that preventable maternal death represents a violation of the right to life. It emphasizes that the right to decide freely on the number and spacing of one's children and the right to formal education have a bearing on maternal death.[2, 21]

Conclusion

The HRBA to social development aims to achieve positive transformation of power relations among duty bearers and rights holders through strengthening capacities of duty bearers while empowering rights holders. While recognizing formal education as an inalienable human right important for averting adverse maternal health outcomes, this study identified the following. The mean maternal age was generally higher among women with ≤ JHS level of education. Mean gestational age at death varied insignificantly across all levels of education. Women with JHS level of education accounted the highest proportion of maternal deaths while deaths among women with ≥ SHS level of education remained low. This pattern remained constant among urban and rural residents. Deaths were generally higher among rural residents and comparatively lower among both married and single women with ≥ SHS level of education. Deaths among women with informal occupations decreased with increasing level of education. Maternal deaths among women of ≤ JHS level of education occurred in higher proportions among women with spouses or partners of similar levels of education. Blood transfusions were documented in higher proportions among women unexposed to formal education. They also accounted for higher proportions of deaths among women who did not attend ANC during pregnancy. Grand multiparous women accounted for the peak maternal deaths among women unexposed to formal education and women with primary level of education. Deaths mostly occurred in advanced pregnancy. Women unexposed to formal education were most prevalent among deaths following SVD while deaths following CS mostly occurred among women with tertiary level of education.

Recommendations

All socio-economic, socio-cultural, geographical or religious barriers to accessing formal education to ≥ SHS level, (i.e. ≥ 12 years of education), among females should be progressively modeled as research priorities and targeted for elimination within the context of a HRBA. The impact of Ghana's national free SHS policy, (rolled out in September, 2017 to universally increase access to SHS education), on maternal and general public population health should be prioritized for research after about ≥ 10 years post implementation.[22] The HRBA to assessment of progress towards attainment of all health objectives should remain of national essence. Commitment to and understanding of the HRBA to service delivery at all levels of health care will enhance service provider capacity for recognition of human rights in all aspects of health programming.

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FACTORS INFLUENCING RECEIPT OF RADIATION TREATMENT IN WOMEN WITH CARCINOMA OF THE CERVIX IN GHANA.

Amo-Antwi K[1]; Nartey Y[2]; Nyarko KM[3]; Hill PC[4]; Cox B[4]; Yarney J[5]

[1]Department of Obstetrics and Gynecology, School of Medicine & Dentistry, Kwame Nkrumah University of Science & Technology, Kumasi, Ghana; [2]Division of Epidemiology and Public Health, School of Medicine, University of Nottingham, United Kingdom; [3]Disease Control and Prevention Department, Ghana Health Service, Accra, Ghana; [4]Centre for International Health, Department of Preventive and Social Medicine, Dunedin School of Medicine, University of Otago, New Zealand; [5]National Centre for Radiotherapy and Nuclear Medicine, Korle Bu Teaching Hospital, Accra, Ghana.

Abstract

Objective: We evaluated the influence of demographic and clinical features on access to radiotherapy among women with cervical cancer.

Methodology: A cross-sectional analytical study design was used to review hospital records of women diagnosed with cervical cancer from 1st January 2010 and 31st December 2013 at Ghana's two largest public cancer treatment centres. Basic demographic and clinical data were captured from the records. Multivariate logistic regression was used to determine the odds of receiving radiotherapy in women with carcinoma of the cervix.

Results: One thousand seven hundred twenty-five (1725) women with cervical cancer were studied, of which 955 (57.7%) women received radiotherapy. The likelihood of receiving radiotherapy increased with increasing age (OR: 2.2; 95% confidence interval, CI, 1.5-3.1, 70-79, versus ≤39 years. The indigenous semi-urban dwellers (unadjusted OR: 2.4; 95% CI: 1.6-3.5), and foreign nationals (unadjusted OR: 4.1; 95% CI: 2.5-6.9), were more likely to receive radiation treatment relative to those who resided in the metropolis. Women with three or more comorbidities (unadjusted OR: 0.2; 95% CI: 0.1-0.5), those recruited at the gynaecology unit (unadjusted OR: 0.01; 95% CI: 0.002- 0.01) and subjects with no histological diagnosis (unadjusted OR: 0.004; 95% CI: 0.002-0.01) were likely not to receive radiation treatment. After controlling for other variables, recruitment from the gynaecologic units was significantly associated with a probability of receiving radiation treatment (Adjusted OR: 0.1; 95% CI: 0.01-0.3).

Conclusion: Women diagnosed with cervical cancer at the gynaecologic departments were less likely to access radiation treatment.

Keywords: *Ghana, Gynaecologic Oncology; Radiation treatment; Treatment Default; Cervical cancer.*

Introduction

Cervical cancer is the second most common cancer in Ghanaian women.[1] Human papillomavirus (HPV) infection is established as the cause of cervical cancer, and vaccines such as Cervarix, Gardasil and Gardasil-9, have been developed and are widely available in high-income countries (HICs). The screening for pre-cancer cervical conditions has also been implemented in HICs for the secondary prevention of the disease. In Ghana, just about a quarter (26.94%) of women aged 18 years or above have had Pap smear tests.[2] Although HPV vaccination programs exist, participation by the target population remains low.[3] These factors have led to the majority (65.9-70.8 %) of women with cervical cancer presenting with late disease.[4,5]

Corresponding Author: **Dr. Kwabena Amo-Antwi**
Department of Obstetrics & Gynaecology School of Medicine & Dentistry Kwame Nkrumah University of Science and Technology Kumasi-Ghana
Email: kwabena.amo-antwi@knust.edu.gh; amoantwikwabena@yahoo.com
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The mainstay of treatment for women with locally advanced disease (International Federation of Gynaecologist and Obstetricians Stage, FIGO Stage, IB3-IVA) has changed over the years from radiotherapy alone to concurrent chemoradiation.[6] Several studies have demonstrated the survival advantage of cisplatin-based chemotherapy.[7–9] Primary radiotherapy is also indicated in women with early diseases, but are not good candidates (morbidly obese women with attendant detrimental anaesthetic risk, uncontrolled hypertension, or diabetes mellitus) for radical surgical treatment. The recommended treatment for women with FIGO stage 1A2, 1B1, 1B2 and 2A1 disease is radical hysterectomy and pelvic lymph node dissection, with or without radiotherapy. Post-operative adjuvant radiotherapy (PORT) is considered after surgery, when histopathologic findings suggest lymph node involvement, positive parametrial or surgical margins among other factors.

Like most low- and middle-Income Countries (LMICs), Ghana is faced with a significant resource deficit in the diagnosis and treatment of cervical cancer. In other jurisdictions, geographical variation in access to radiotherapy has been reported in cancer care, while in

others, attendant comorbidities also prevent the receipt of recommended radiation protocol.[10] Where services are available, the cost of treatment often prevents access. Out-of-pocket cost for procedures, investigations, and treatment for women receiving a standard radiation regimen range from US$ 1,525 to US$ 2,129 in a country where the minimum wage is US$ 1.96.[1]

In Ghana, access to radiation services and actual receipt of the treatment in women with cervical cancer is largely unknown. Where radiation services are available, understanding the factors that influence access to treatment can help identify areas where improvement in care is needed, especially considering the poor survival for women with cervical cancer in Ghana.[11] We evaluated the influence of demographic and clinical features on receipt of radiotherapy among women with cervical cancer.

Materials and Methods

The methods for the study have previously been described elsewhere (Nartey et al 2018).[12]

Study design

A cross sectional study design in which hospital records were reviewed.

Study sites and patient navigation

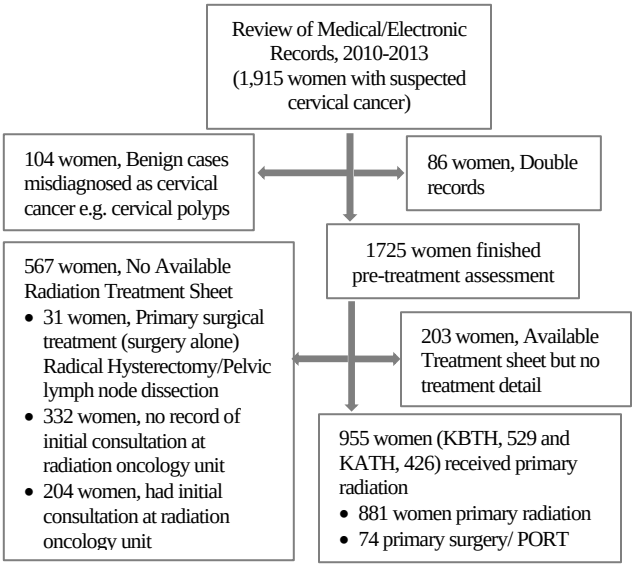
There are two public cancer treatment centres which offer radiotherapy services in Ghana, located in two tertiary hospitals: Korle Bu Teaching Hospital (KBTH), Accra and Komfo Anokye Teaching Hospital (KATH), Kumasi. We excluded the Ghana Swedish Medical Centre (GSMC), a private cancer treatment centre situated in Accra. The study population consisted of all histologically and clinically confirmed cervical cancer cases diagnosed at the Gynaecology and Oncology Units from January 1, 2010, to December 31, 2013.

As per practice, each patient is given an individualized schedule for pre-treatment assessment, definitive treatment, and post-treatment surveillance.[2] Women with signs and symptoms suggestive of cervical cancer undergo pre-treatment assessment at the Gynaecology or Oncology Units. Haematology, serum biochemistry, ultrasonography (USG), histopathology, cystoscopy, sigmoidoscopy, intravenous urography (IVU), computerized tomography (CT) and magnetic resonance imaging (MRI) assessments form the core of investigations done in the pre-treatment assessment of cervical cancer. This evaluation process also seeks to stabilize existing chronic conditions (anaemia, hypertension, diabetes, and others). Image-guided drainage of hydro- and pyometra, insertion of nephrostomy tubes and the application of ancillary surgical and medical protocols are also undertaken when necessary.

All patients are reminded of their appointments a day or two before the due dates. A patient who cannot honour a scheduled visit is often counselled on compliance and given a new date. The patient is labelled as "defaulted treatment" if she failed to honour two or more scheduled visits during pre-treatment assessment or definitive treatment. Treatment default can occur at any stage, up to the completion of the radiation regimen. Early treatment default describes default before treatment initiation. The activities prior to treatment initiation include pre-treatment assessment, simulation for 2-D radiotherapy, or planning for 3-D conformer radiotherapy. The first and second review visits are scheduled at two and four weeks, respectively, after treatment. Subsequently, the patient is seen at three-month intervals for the first year and then every 6 months for the next few years.

Patient record selection

We reviewed paper-based and electronic medical records (including pathology results) at the Oncology and Gynaecology units of the two hospitals and collected information on all newly diagnosed women with invasive cervical cancer within the period (Figure 1). Out of 1725 women with newly diagnosed cervical cancer, 995 (57.7%) received radiation treatment at the two public cancer treatment centres between 1st January 1, 2010, and 31st December 2013. One hundred and five (105), 6.1%, women received radical surgical treatment with or without post-operative radiotherapy (PORT) as treatment for cervical cancer.



[1] Average cost of treatment for locally advanced cervical cancer. An estimate from Gynaecologic Oncology Unit, Department of Obstetrics & Gynaecology, Komfo Anokye Teaching Hospital, 2020.

[2] Departmental protocol on patient navigation during cancer treatment (treatment default and loss-to-follow up), Department of Oncology, Komfo Anokye Teaching Hospital.

Note KATH: Komfo Anokye Teaching Hospital KBTH: Korle Bu Teaching Hospital; PORT: Post-operative adjuvant radiotherapy. Flow chart of the data source of women diagnosed and treated for cervical cancer between January 1, 2010, and December 31, 2013, at the two tertiary hospitals in Ghana is displayed in **Figure 1**.

Data collection

For each unit, available information for women with cervical cancer were extracted from paper-based and electronic medical records onto a standard data collection sheet. The data were reviewed for accuracy and the following variables were used to link the cases between the units: histology report number, unique identification (ID), age, and telephone number. After linking the data from the units and removing duplicates, the data were stripped of all identifiers.

Basic demographic and clinical features, and treatment information were obtained for all cervical cancer patients within the period. A patient recruitment hospital was defined as the hospital where the patient information was obtained. Receipt of radiotherapy was defined by a record of initiation, default or completion of radiation treatment evidenced by the treatment regimen detailed on the radiotherapy sheet. Women with missing treatment information were designated as not having received radiotherapy, similar to the method used by Baldwin et al.[13]

Statistical analysis

STATA version 14.1 (StataCorp, Texas) software was used in all data analyses. We calculated the proportion of various demographic and clinical features according to the recruitment hospitals. The socio-demographic and clinical characteristics were compared using Pearson's chi-square and Fisher's exact tests. We calculated the proportion of women who received radiotherapy in each hospital and then used logistic regression to estimate the bivariate and multivariate odds of receiving radiotherapy for patients with different characteristics. The test for statistical significance did not include missing responses.

Ethical Approval

The study obtained ethical approval from the University of Otago Ethics (Health) Committee, Ghana Health Service Ethical Committee, Committee on Human Research and Publication and Ethics, Kwame Nkrumah University of Science and Technology (CHRPE, KNUST) and KATH.

Results

One thousand seven hundred twenty-five (1725) women with cervical cancer were studied, of which 955 (57.7%) women received radiotherapy. Women seen at KBTH were younger, single, fewer numbers had formal education, and resided in the metropolis or the urban area (p<0.001) (Table 1). Data on educational status was missing in 533 (51.0%) and 411 (60.4%) women in KBTH and KATH, respectively. About one out of five women diagnosed with cervical cancer received no formal education (20.8%).

Table 1: Distribution of key demographic features by hospital of recruitment

Characteristic	KBTH (N=1045)	KATH (N=680)	χ^2 (p-value)
	n (%)	n (%)	
Age group (years)			
≤39	123 (11.8)	63 (9.3)	
40-49	215 (20.6)	149 (22.0)	
50-59	287 (27.5)	161 (23.8)	
60-69	207 (19.9)	109 (16.1)	
70-79	157 (15.1)	148 (21.9)	
≥80	53 (5.1)	47 (6.9)	=0.001
Missing	3	3	
Place of residence			
Metropolis	512 (49.9)	428 (63.7)	
Urban	406 (39.5)	103 (15.3)	
Semi-urban	12 (1.2)	137 (20.4)	
Overseas	96 (9.4)	4 (0.6)	<0.001*
Missing	19	8	
Marital status			
Single	207 (24.4)	6 (1.0)	
Married	447 (52.7)	307 (50.2)	
WDS	194 (22.9)	299 (48.8)	<0.001
Missing	197	68	
Formal education			
NFE	206 (40.2)	152 (56.5)	
Primary	85 (16.6)	38 (14.1)	
High school	182 (35.6)	67 (24.9)	
Tertiary	39 (7.6)	12 (4.5)	<0.001
Missing	533	411	
Employed			
No	209 (24.8)	108 (16.3)	
Yes	635 (75.2)	553 (83.7)	<0.001
Missing	201	19	
Parity			
0-2	209 (20.5)	70 (10.8)	
3-4	263 (25.9)	127 (19.6)	
5+	545 (53.6)	451 (69.6)	<0.001
Missing	28	32	

Note: Number and percentage excludes missing data.
OR: Odd ratio; χ^2: Chi square *Fisher's exact test;
KATH: Komfo Anokye Teaching Hospital
KBTH: Korle Bu Teaching Hospital;

WDS: Widowed/Divorced/Separated**, NFE**: No formal education.

Table 2 illustrates the key clinical features of the hospital of recruitment. The proportion of women with clinically diagnosed cervical cancer was higher in KBTH (27.8%) than in KATH (14.4%) (p<0.001). For 203 (11.7%) women, we could not obtain information on the receipt of radiotherapy. Receiving radiotherapy (p=0.951), chemotherapy (p=0.890), and having a significant past medical history did not vary significantly by the recruitment hospital. Compared with women seen at KATH (101, 14.9%), more women diagnosed at KBTH had missing data on the FIGO stage (313; 30.0%) (p < 0.001). The percentage of women with FIGO stage IV disease was 13.7% at KBTH and 10.7% at KATH. A total of 955 (57.7%) women with cervical cancer received radiotherapy, of which 529 (55.4%) were from KBTH.

Table 2: Key clinical features by hospital of recruitment

Characteristic	KBTH (N=1045)	KATH N=680	χ^2 (p-value)
	n (%)	n (%)	
Basis of diagnosis			
Clinical	291 (27.8)	98 (14.4)	
Histology of primary	754 (72.2)	582 (85.6)	<0.001
Missing	0	0	
Grade of differentiation			
Well	125 (16.6)	47 (8.1)	
Moderately	284 (37.6)	308 (52.9)	
Poorly/ Undifferent-iated	345 (45.8)	227 (39.0)	<0.001
Missing	291	98	
Histological subtype			
SCC	606 (85.2)	513 (89.8)	
ADC/ Adenosquam-ous	95 (13.4)	57 (10.0)	
Other	10 (1.4)	1 (0.2)	=0.002
Missing	334	109	
FIGO Stage			
Stage I	50 (6.8)	40 (6.9)	
Stage II	267 (36.5)	161 (27.8)	
Stage III	315 (43)	316 (54.6)	
Stage IV	100 (13.7)	62 (10.7)	<0.001
Missing	313	101	
Any comorbidity			
No	492 (55.4)	421 (61.9)	
Yes	396 (44.6)	259 (38.1)	=0.010
Missing	157	0	
Any medical history			
No	835 (94.2)	640 (94.1)	
Yes	51 (5.8)	40 (5.9)	=0.916
Missing	159	0	
Received radiotherapy			
No	315 (37.3)	252 (37.2)	
Yes	529 (62.7)	426 (62.8)	=0.951
Missing	201	2	
Received chemotherapy			
No	22 (7.5)	7 (7.9)	
Yes	271(92.5)	81 (92.1)	=0.890
Missing	192	20	

Note: Number and percentage excludes missing data.
FIGO: International Federation of Gynaecology and Obstetrics.
KATH: Komfo Anokye Teaching Hospital; Korle Bu Teaching Hospital;
OR: Odd ratio; χ^2: Chi square*Fisher's exact text

Age at diagnosis, place of residence, marital status, ethnicity, recruitment unit and the basis of diagnosis all showed independent associations with receipt of radiotherapy. The likelihood of receiving radiotherapy increased with increasing age (OR: 2.2; 95% confidence interval, CI, 1.5-3.1) for the age group, 70-79 versus the youngest group (≤39 years) as shown in **Table 3**.

Among women diagnosed with cervical cancer, the indigenous semi-urban dwellers (unadjusted OR: 2.4; 95% CI: 1.6-3.5), and foreign nationals (unadjusted OR: 4.1; 95% CI: 2.5-6.9), were more likely to receive radiation treatment relative to those who resided in a metropolis. Women with three or more comorbidities (unadjusted OR: 0.2; 95% CI: 0.1-0.5), being recruited at the gynaecology unit (unadjusted OR: 0.01; 95% CI: 0.002-0.01) and subjects with no histological diagnosis (unadjusted OR: 0.004; 95% CI: 0.002-0.01) were all less likely to receive radiotherapy. These relationships were not statistically significant after adjusting for all variables in the analyses except for patients recruited from the gynaecology unit (adjusted OR: 0.1; 95% CI: 0.01-0.3). A separate analysis was performed excluding women with unknown information on radiotherapy treatment which reduced the ORs (see additional file 1, **Table S1**).

Additional file 1:
Table S1 presents an overview of the unadjusted and adjusted ORs of having radiotherapy by patients features excluding women with unknown information on radiation therapy. Restricting the analyses to women with information on receipt of radiotherapy reduces both the crude and adjusted ORs in some analysis. For example, the OR for women not residence in Ghana reduces from 4.1 (95% CI: 2.5-6.9) to 3.2 (95% CI: 1.9-5.4). However, some ORs for some variables did not change after inclusion of women with unknown information on receipt of radiotherapy.

Table S1: Results of logistic regression examining the influence of various features on receipt of radiotherapy (excluding women with unknown radiotherapy treatment information)

Characteristics	Received radiotherapy	No radiotherapy	OR *	95% CI	OR †	95% CI
	N (%)	N (%)				
Age group (years)						
≤39	84 (8.8)	64 (11.3)	1.0		1.0	
40-49	172 (18)	142 (25.1)	0.9	0.6-1.4	0.4	0.2-1.2
50-59	259 (27.2)	143 (25.3)	1.4	0.9-2.0	0.6	0.2-1.5
60-69	188 (19.7)	94 (16.7)	1.5	1.0-2.3	0.8	0.3-2.6
70-79	195 (20.4)	86 (15.2)	1.7	1.1-2.6	0.7	0.2-2.1
≥80	56 (5.9)	36 (6.4)	1.2	0.7-2.0	0.8	0.2-3.6
Missing	1	2				
Place of residence						
Metropolis	477 (50.1)	338 (60.5)	1.0		1.0	
Urban	288 (30.3)	162 (29.0)	1.3	1.0-1.6	1.0	0.6-1.7
Semi-urban	106 (11.1)	41 (7.3)	1.8	1.3-2.7	1.7	0.8-3.8
Overseas	81 (8.5)	18 (3.2)	3.2	1.9-5.4		
Missing	3	8				
Marital status						
Single	123 (13.1)	76 (15.6)	1.0	0.7-1.3	0.9	0.4-1.9
Married	462 (49.3)	272 (55.9)	1.0		1.0	
WDS	353 (37.6)	139(28.5)	1.5	1.2-1.9	1.3	0.7-2.4
Missing	17	80				
Formal education						
NFE	235 (45.4)	109 (48.6)	0.6	0.3-1.3	0.5	0.1-2.0
Primary	81 (15.7)	34 (15.2)	0.7	0.3-1.5	0.9	0.2-3.7
High school	166 (32.1)	71 (31.7)	0.7	0.3-1.4	0.8	0.2-3.1
Tertiary	35 (6.8)	10 (4.5)	1.0		1.0	
Missing	438	343				
Employment status						
Yes	734	78.8	421	79.1	1.0	
No	197	21.2	111	20.9	1.0	0.8-1.3
Missing	24		35			
Comorbidity count						
No comorbidity	562 (58.9)	320 (56.4)	1.0			
1 count	318 (33.3)	178 (31.4)	1.0	0.8-1.3		
2 counts	70 (7.3)	51 (9.0)	0.8	0.5-1.2		
3 or more counts	5 (0.5)	18 (3.2)	0.2	0.1-0.4		
Missing	0	0				
Basis of diagnosis						
Histology	951 (99.6)	381 (67.2)	1.0		1.0	
Clinical	4 (0.4)	186 (32.8)	0.01	0.003-0.023	0.2	0.01-2.0
Missing	0	0				
Unit of recruitment						
Oncology	948 (99.3)	305 (53.8)	1.0	1.0	1.0	
Gynaecology	7(0.7)	262 (46.2)	0.01	0.004-0.02	0.1	0.014-0.3
Missing	0	0				

Interval; FIGO: International Federation of gynaecology and Obstetrics; **KATH**: Komfo Anokye Teaching Hospital; Korle Bu Teaching Hospital; **OR**: Odd ratio. **WDS**: Widowed/Divorced/Separated; **NFE**: No formal education. **BT**: Businesswomen/Teachers; **HS**: Headdresses/Seamstresses.

Adjusted for all variables in the analysis except ethnicity, employment status, and commodity count. The numbers of these variables were too small to be included in multivariate analyses.

The following variables were not included in the regression output table: No formal education (relative to tertiary education, adjusted OR: 0.5; 95% CI: 0.1- 2.0), hospital of recruitment (KATH relative to KBTH, Adjusted OR: 1.1; 95% CI: 0.6-2.0), positive history of comorbidity (presence of other chronic condition(s) relative to its absence, adjusted OR: 1.1; 95% CI: 0.4-2.4), parity (Para 5+ relative to para 0-2, adjusted OR: 0.8; 95% CI: 0.4-1.8) and FIGO Stage (Stage II relative to Stage I, unadjusted OR: 0.004; 95% CI: 0.002-0.01).

Discussion

Cervical cancer patients from the gynaecologic departments had reduced access to radiation treatment. Differences in demographic and clinical features were observed among women with cervical cancer at the two largest public cancer treatment centres. Overall, women seen at KBTH were younger and single, less likely to have had formal education, and resided in the metropolis or the urban area.

Capacity exists for surgical oncology at gynaecology departments. About 105 (6.1%) had primary surgical treatment and would not be captured by the radiation treatment records. The reduced access to radiation treatment for cervical cancer patients recruited from the gynaecology unit may be attributable to the proportion of women with operable diseases. The association persisted after adjusting for all variables in the analysis. Secondly, referrals of these patients to the oncology departments are effected after receipt of histology reports. A few die before the cancer confirmation due to the late stage of the disease and its associated commodities. Good record-keeping, patient care coordination, as part of a dedicated patient navigation unit, have been shown to bridge gaps and address diverse needs in cancer care system.[14]

Cancer patients in HICs who resided in urban populations had a better chance of receiving radiation.[13,15] This is contrary to the observation made among our subjects who lived in urban areas. The finding that women with semi-urban residence were more likely to receive radiotherapy than those in the metropolis or urban areas suggested that access to cancer treatment in Ghana may be influenced more by financial rather than geographical barriers. Infrastructural developments and emerging business enterprises offer enhanced opportunities for high-income, non-traditional, commercial, and service ventures for many semi-urban households in Ghana.[16] Although the women with urban or metropolitan residences were younger, they were less likely to have had formal education or employment. They migrate from more impoverished communities searching for non-existent jobs in the metropolis. Ghana's capital, Accra, has many urban poor people.[17]

Medical tourism also provides opportunities for cancer treatment abroad.[18] Cross-border arrangements at destination countries often cover medical bills and bursaries. Consistently, women who resided in other

African countries had a better chance at receiving radiation treatment than indigenous urban or metropolitan dwellers. However, this was not statistically significant after adjusting for confounders, as this could be attributed to the small sample size of the women who resided in other African countries.

Although the government has subsidized the cost of radiotherapy for Ghanaians, the out-of-pocket cost for procedures, investigations, and treatment is still a significant part of the cost of cancer care. Thus, lack of financial resources may hinder some Ghanaian women from receiving radiotherapy. Opportunities to improve access to radiation treatment in cervical cancer should reduce the financial barriers in cancer care. All aspects of the patient journey, from diagnosis through treatment and post-treatment, should be covered by the National Health Insurance Scheme (NHIS). The care of human epidermal growth factor receptor-2 (HER 2) positive breast cancer is covered by the NHIS. Similar advocacy is needed in the care of cervical cancer patients. The total cost of pre-treatment assessment and definitive treatment of cervical cancer patients pales in comparison to that accrued from the use of trastuzumab (Herceptin, range from US$ 1,525 to US$ 2,129) in the care of woman with HER-2 positive breast cancer.

Effective cervical cancer management often requires a multidisciplinary team of radiologists, radiation and gynaecologic oncologists, pathologists, nurses, and other professionals.[19] The Ghana College of Physicians and Surgeons has adequate capacity to train essential clinical staff for cancer care. The establishment of a few more cancer treatment centres in other parts of the country may also reduce treatment default by reducing travel costs and improve oncologic outcomes (overall survival and quality of life). Efforts to improve access to gynaecologic oncologic treatment (radical surgery and radiotherapy) and other ancillary treatment interventions are needed in these parts of the country, especially in the northern regions of Ghana.

The main strength of our study was the rigorous review of medical records. The study provides a representative profile of the cervical cancer population in Ghana. A major limitation of our study was the high proportion of women with missing data for key variables such as education, occupation and FIGO stage, which affected the precision of the results obtained. Another potential limitation was the bias that may result from designating women with unknown information on treatment as not having received radiotherapy. However, the separate restricted analysis showed that the direction of the associations did not change for any of the variables included. We also did not know whether some women were offered radiotherapy but declined. Finally, data on tumour board reviews and decisions were not collected, which might have influenced the receipt of radiation therapy.

Conclusion

The current study revealed that women diagnosed with cervical cancer at the gynaecologic departments were less likely to access radiation treatment. Further studies should look at barriers to radiation treatment following initiation assessment at these units.

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PERIODONTAL HEALTH STATUS OF PREGNANT WOMEN ATTENDING THREE ANTE-NATAL CLINICS IN ACCRA, GHANA

Goka RY[1]; Nyako EA[1]; Sackeyfio J[2]; Hewlett S[1]; Ndanu TA[2]; Konadu AB[1,3]; Ankoh SE[1]

[1]Department of Restorative Dentistry, University of Ghana Dental School, College of Health Sciences, University of Ghana; [2]Department of Community and Preventive Dentistry, University of Ghana Dental School, College of Health Sciences, University of Ghana; [3]Dental/Oral and Maxillofacial Surgery Department, Korle-Bu Teaching Hospital, Accra, Ghana.

Abstract

Objective: To assess the periodontal health status of pregnant Ghanaian women at different gestation periods.

Methodology: A cross-sectional study involving two hundred pregnant women attending the ante-natal clinic at the Korle Bu Teaching Hospital (KBTH), Kaneshie, and Ussher polyclinics was done. Data was obtained by use of a questionnaire and on-site periodontal examination. Variables determined included the socio-demographic characteristics and Community Periodontal Index of Treatment Needs (CPITN) of study participants. A summary description of variables was presented, and cross-tabulations was used to compare responses among the three trimesters.

Results: About one third, (38%) of the study participants were in the third decade of life, with a majority (55%) having had formal education to the basic level. While 72% of women had never seen a dentist, nearly three-quarters (76.2%) had a CPITN of 2 or more.

Conclusion: There is a high prevalence of periodontal disease among pregnant women. Healthcare professionals should therefore consider oral healthcare referrals and education for pregnant women.

Key words: *Pregnant women, Periodontal disease, Periodontal status, Treatment needs*

Introduction

Periodontal diseases (PD) are an inflammatory condition of the supporting tissues of the teeth.[1, 2] They can affect only the gingiva (gingivitis), or the underlying connective tissue, including periodontal ligament and alveolar bone (periodontitis).[1] The Center for Disease Control and Prevention (CDC) reported that the incidence of periodontal diseases increased with age with about 47.2% of adults aged 30 years and 70.1% aged 65 years having the condition.[3]

Pregnancy is accompanied by an increase in the levels of both progesterone and estrogen which, by the third trimester reach levels ten to thirty times what is experienced during the typical menstrual cycle.[4] Elevated progesterone hormone levels are known to stimulate the production of prostaglandins which cause inflammation and induce changes in vascular permeability leading to gingival oedema, hyperemia, and increased inflammatory response to dental plaque and bleeding in periodontal tissues thus increasing the risk of bacterial infections.[5] These hormonal changes that occur make the gingiva more sensitive and make it easier for gingivitis to develop. Some studies have shown that pregnancy does not cause periodontal disease but may exacerbate preexisting unfavorable predisposing factors and preexisting periodontal conditions.[6,7] As the pregnancy progresses, there might be an increased incidence of gingivitis and an increase in the depth of periodontal pockets,[7,8] which might not necessarily result in loss of periodontal clinical attachment level.[7] There is, nonetheless, a consensus that pregnant women suffer a decline in periodontal health status.[9] Aside from periodontal diseases, other oral conditions have also been linked to pregnancy, such as caries and pyogenic granuloma.[10]

Some studies have shown an association between periodontal disease and adverse pregnancy outcomes.[11,12] The various adverse pregnancy outcomes include preterm birth, low birth weight, early pregnancy loss, gestational diabetes mellitus, and preeclampsia.[7,12] Nuamah and Annan did a study on the periodontal status and oral hygiene practices of pregnant and non-pregnant women in Ghana, which was published in 1998.[13] Since then there has been little data published on the periodontal and oral health status of pregnant women which has created a gap in the formation of an oral health policy for pregnant women. It is important to understand the periodontal status and treatment needs of pregnant women in Ghana to help in planning oral health care for them.

This study, therefore, sought to assess the periodontal health status of pregnant women at different gestational periods and to evaluate their periodontal treatment needs, using the Community Periodontal Index and Treatment Needs (CPITN). Some studies

Corresponding Author: **Dr. Akua Boakyewaa Konadu**
University Of Ghana Dental School, Korle-Bu, Accra Ghana.
Email Address: a.konadu@kbth.gov.gh
Phone Number: 0243213100
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have pointed to a relationship between higher gestational age and increased CPITN.[14,15]

Materials and Methods

This was a cross-sectional study involving two hundred (200) pregnant women between the ages of 16 to 43 years who were attending the ante-natal clinics at the Obstetrics Department of Korle Bu Teaching Hospital (KBTH), and the ante-natal clinics at Kaneshie and Ussher polyclinics.

Accra is a Cosmopolitan City. It serves as both the capital of the Greater Accra region and the capital of Ghana. It is one of the most populous cities in the country. The Korle-Bu teaching hospital is the biggest referral center in the country and the two polyclinics (Kaneshie and Ussher) serve a lot of communities in the capital city.

Women attending the antenatal clinic at the three chosen sites and who met the inclusion criteria and gave their consent were recruited for the study. The study was carried out using participant interviews and clinical examinations. A semi-structured questionnaire was administered to all the participants through personal interviews to collect their demographic data and medical history. One dentist and a final year dental student of the University of Ghana Dental School, were calibrated through a series of intensive training before the data collection. The oral examination was done using direct visual screening and adequate artificial light with intra-oral dental mirrors and a periodontal probe (Williams). Only definite teeth cavitations were recorded as dental caries. Retained roots and other oral health conditions were noted. Periodontal examination was done with the Community Periodontal Index and Treatment Needs (CPITN).

CPITN is primarily a screening procedure involving clinical assessment to check for the presence or absence of periodontal pockets, calculus and gingival bleeding. The use of a special CPITN periodontal probe (or its equivalent) is recommended. For epidemiological purposes in adult populations, ten (10) specified index teeth are examined; for persons under 20 years of age, only six index teeth are specified. All teeth are examined and the highest score for each sextant is noted. Only 6 scores are recorded. Individuals are assigned to one of four treatment need categories determined from their CPITN scores.[16]

The PDT Sensor Probes Type U5 (Williams) with graduated markings of 2,3,4,5,7 and 9mm were used to evaluate the depth of the gingival sulcus/periodontal pocket. The presence of gingival bleeding on gentle probing, calculus, or other plaque retaining factors and periodontal pockets, were noted.

The mouth was divided into six sextants and 10 index teeth were recorded. The worst score (highest probing depth) for each of the six sextants was recorded for 10 index teeth, which consisted of all the first two molars and the upper right and the lower left central incisors (teeth numbers:17,16, 11, 26,27,37 36, 31, 46, and 47). For each of the index teeth, four sites involving the mesial and distal aspect of the index tooth and the lingual and buccal surfaces were probed. and the worst score recorded for each of the sextants. For expecting mothers younger than 19 years, only six teeth, the first molars in each quadrant and the central incisors in the first and third quadrants (teeth numbers: 16, 11, 26, 36, 31, and 46,) were examined. This modification was made to avoid classifying the deepened crevices associated with the eruption of molar teeth as periodontal pockets

Treatment needs were considered based on the maximum code for the entire mouth. The treatment recommendation was told to each participant. Oral hygiene education was also given to all participants. Appropriate referrals were given to all participants in need of dental care.

All variables were entered in Microsoft access 2007 and cleaned using Microsoft Excel 2007, analysis was done using SPSS 22.0. A summary description of continuous variables was presented as means and standard deviations and categorical variables as frequencies and percentages. A Chi-square test was used to compare the responses among the three trimesters.

Permission was sought from the institutions where the study was carried out. Consent was obtained from study participants before the study related was carried out. **Table 1** shows the codes and the treatment needs

Table 1: Community Periodontal Index of Treatment Needs (CPITN) codes and treatment needs.

Findings	Code	Treatment needs/Recommendations
No signs of periodontal disease	0	no need for additional treatment
Gingival bleeding after gentle probing	1	Oral hygiene instruction improvement in personal oral hygiene
Supragingival or subgingival calculus	2	Scaling Oral hygiene instruction improvement in personal oral hygiene
Pathologic pockets 4-5 mm deep	3	Periodontal treatment to remove infected tissue Oral hygiene instruction improvement in personal oral hygiene
Pathologic pockets ≥ 6 mm deep	4	Complex Periodontal treatment to remove infected tissue Oral hygiene instruction

Results

The study included 200 women receiving antenatal care in various stages of their pregnancy. 111(55.5%) were in their third trimester, 76(38%) were in their second trimester and 13(6.5%) were in their first trimester the age of the participants ranged from 16-43 years with most of the participants in the 26-30 age group 76(38%) only 2(1%) were in the 46-50 age group.

189(94.5%) had no known underlying medical conditions. The demographics and the underlying medical conditions are shown in **Table 2**.

Table 2: Socio demographic characteristics and medical history of the study participants

Variable	Number(n)	Percentage(%)
Ages of respondents (years)		
16-20	12	6.0
21-25	40	20.0
26-30	76	38.0
31-35	50	25.0
36-40	20	10.0
41-50	2	1.0
Total	200	100.0
Tribe		
Ga	36	18.0
Ewe	31	15.5
Akan	98	49.0
Northern	33	16.5
Other	2	1.0
Total	200	100.0
Educational Level		
None	32	16.0
Basic (Primary and JSS)	100	50.0
Secondary	41	20.5
Tertiary	27	13.5
Total	200	100.0
Number of children		
0	63	31.5
1-2	101	50.5
3-5	33	16.5
≥6	3	1.5
Total	200	100.0
Underlying Medical Condition		
No known medical condition	189	94.5
Asthma	2	1.0
Diabetes Mellitus	1	0.5
Hypertension	5	2.5
Infection(unspecified)	1	0.5
UTI	2	1.0
Total	100	100.0
Last dental visit		
Never	144	72.0
6 months ago	4	2.0
1-2 years ago	11	5.5
2-5 years ago	15	7.5
More than 5 years ago	26	13.0
Total	200	100.0

Fifty per cent of 100(50%) of the participants had basic education. 63(3.5%) had never had a child before and 102(50.5%) had at least one child. The majority 144(72%) of the participant had never been to the dentist before. Those who had been to the dentist before 26(13.0%) visited the dentist over five years before the study.**Table 3** shows the CPITN findings

Table 3: The Community Periodontal Index of Treatment Needs (CPITN) finding in the various trimesters

Findings	CPITN Code	First Trim-ester	Second Trime-ster	Third Trim-ester	Total
No signs of periodontal disease	0	3 (1.5%	10 (5.0%)	31 (15.5%	44 (22.0%)
Gingival bleeding after gentle probing	1	0	1 (0.5%)	2 (1.0%	3(1.5%)
Supragingival or sub gingival calculus	2	10 (5.0%	57 (28.5%	65(32.5 %)	132 (66.0%
Pathologic pockets 4-5 mm deep	3	0	6 (3.0%)	12 (6.0%	18 (9.0%
Pathologic pockets ≥ 6 mm deep	4	0	2 (1.0%)	1 (0.5%	3(1.5%

156(78%) of the participants had some form of periodontal condition. 20(10%) bled from the gingiva during gentle probing. About a third 132(66%) of respondents had supra and sub gingival calculus deposits. Of these, 10(5%) were in the first trimester of pregnancy, 57(28.5%) in the second trimester, and 65(32.5%) in the last trimester of pregnancy. Those with periodontal pockets were in their second and third trimester. 18(9.0%) of the participant had a probing depth of 4-5mm, and 3(1.5%) had a probing depth of ≥6mm as shown in the table above.

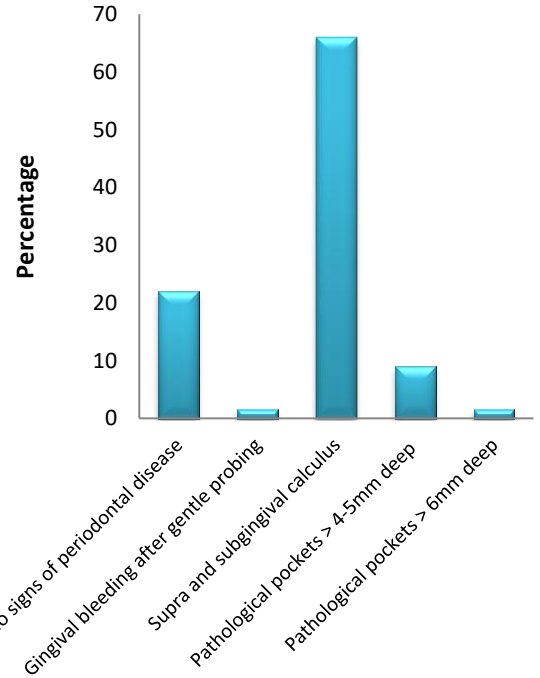

Figure 1: Maximum Score for CPITN

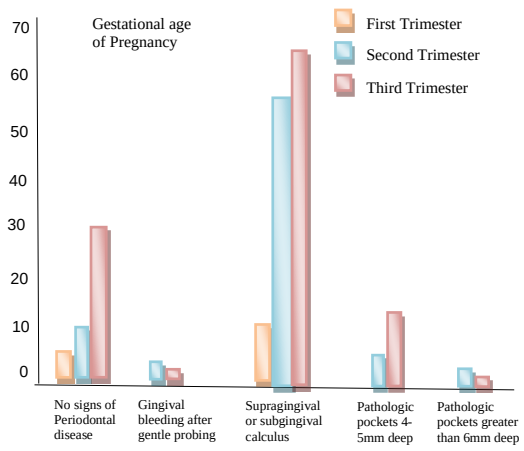

Figure 2: Result of cross tabulation of gestational age against maximum score of CPITN

Figure 2 shows A cross tabulation of the gestational age and the maximum CPITN score

Comparing the incidence of periodontal conditions within the various stages (age of pregnancy) There was a high incidence of calculus deposits and this was mainly during the second and third trimesters. Using the chi-squared test at a $p<0.05$, there was no significant difference ($p=0.696$).

The other dental condition detected are presented in table 4 below.

Table 4: Other dental conditions detected

Dental condition	Number of participants	Percentage
Retained roots only	4	4.7
Retained roots	6	7.0
Dental Caries	28	32.6
Fractured tooth/ teeth only	4	4.7
Gingival recession only	15	17.5
Geographic tongue only	2	2.3
Missing tooth/ teeth only	14	16.3
Retained deciduous tooth only/ teeth	2	2.4
Ectopically erupted tooth/ teeth	1	1.2
Over- erupted tooth/ teeth	2	2.3
Crowding	1	1.2
At least peg-shaped lateral incisor	2	2.3
Attrition	2	2.3
Dento-alveolar abscess	1	1.2
Mouth ulcers	1	1.2
Crossbite	1	1.2
Total	**86**	**100**

Discussion

Improving maternal oral hygiene is important for oral health and may improve pregnancy outcomes. This study assessed the periodontal health status of pregnant women attending three ante-natal clinics in Accra, Ghana (the Korle-Bu Teaching Hospital, the Kaneshie, and the Ussher polyclinics).

The study used CPITN scores to determine the prevalence and severity of periodontal diseases in pregnant women. The prevalence of periodontal disease among the pregnant women attending the antenatal clinic was 156(77.8%). This differs from a study by Nuamah and Annan among pregnant and non-pregnant women attending the outpatient clinic of the Department of Obstetrics and Gynecology of Korle-Bu Teaching Hospital where they reported a prevalence of about 90% among pregnant women.[13] Oral health awareness and the practice of good oral hygiene might have increased in the twenty years between the studies. The difference in methodology might be another reason for the difference in the prevalence.

Regarding the CPITN results, the presence of calculus (supragingival and subgingival calculus) with a CPITN score of 2 was the strongest indication of periodontal disease found in 132(66%) of participants. This is consistent with studies done by Vasiliauskiene I. et al[17] in Lithuania and Wandera M. et al[12] in Eastern Uganda in which 58.6% and 63% of participants respectively had a CPITN score of 2.

The CPITN scores increased as the pregnancy progressed into the second and third trimesters. In addition to the effects of hormonal changes on the periodontium, this might be because about 144(72%) of the participants in this study had never visited the dentist and even those who had visited the dentist, 26(13%), did so over five years ago. In a study done by Maybodi et al[14] that measured the CPITN changes during pregnancy, they found that CPITN increased as the month of pregnancy increased.

In this study 21%, of the participants, had pockets greater or equal to 4mm, all of them were in their second or third trimester. This tallies with results from a study done in Turkey by Yalcin et al,[18] which showed that the plaque index, gingival index, and probing depth scores increased gradually in the first, second, and third trimesters, although oral hygiene instructions were given to the entire study population. In a study done in Brazil by Marianna Vogt et al,[9] more cases of periodontal damage were detected when the examination was performed later in gestation. However, in a similar study done in Uganda gestational age did not influence periodontal status among the pregnant women investigated. In another study done by Lasisi T.J et al.[24] in Southwestern Nigeria and involving only women in the third trimester of pregnancy, 11.7% of the subjects stated that they bled from the gingiva.

In this study, 1.5% of the participants bled from the gingiva during gentle probing. The results of a study by Toygar et al.[20] demonstrated a gingival bleeding prevalence of 24.2% in Turkish pregnant women. The low prevalence of bleeding and deep pockets and high prevalence of calculus is consistent with findings of African populations.[21,22]

There is the need for studies to be carried out on the adverse effects of these periodontal conditions on the pregnancy outcomes in Ghana and awareness created. Of particular concern was the high number of participants (72%) who had never been to see a dentist before. Of the 28% who had seen a dentist before, 7.5% had had their last visit within the past 2 years. Though these results are lower than the 96.1% and 81.1 % of pregnant women who had never had a dental checkup in Mali and Southwestern Nigeria and Mali respectively,[23, 24] there is still much to be done to increase oral health awareness and educate pregnant women about the adverse effects of periodontitis on pregnancy outcomes such as low-weight pre-term babies.

Eighty-six participants had other dental conditions as shown in **Table 3**. Out of this twenty-eight (14%) had only caries or caries in combination with other pathologies and four participants (2%) had pyogenic granuloma in the second and third trimesters, this falls within the reported frequency range of 0-9.6%.[25] This finding is consistent with that obtained by Daley et al[26] who reported that 80% of pyogenic granulomas present clinically in the last two trimesters of pregnancy.

Though the prevalence rate of caries was low, that of periodontal disease was comparable to those of other countries. This coupled with the low dental visit is of concern and calls for an oral healthcare plan for pregnant women. Pregnant women must receive oral health assessment, dental cleaning, and any necessary treatment during pregnancy, as oral health conditions may affect the pregnancy.[27] The second trimester is a good time to schedule a routine visit to a dental professional, however, if a pregnant woman experiences a problem at any time during pregnancy, she is advised to seek professional help immediately.[28]

Oral hygiene education needs to be intensified to empower individuals and to improve community health behaviours regarding oral health. Ghana is yet to see a robust oral health policy that would direct the provision of oral health services to pregnant women. We recommend that Oral health care services should be integrated with antenatal services for all pregnant women. The antenatal care team can be very influential in encouraging women to maintain a high level of oral hygiene, to visit an oral health professional, and to promote completion of all needed treatments during the pregnancy. Routine professional scaling and polishing is required for pregnant women in the country to improve their periodontal health status.

Conclusion

The findings of this study showed that the prevalence of periodontal disease increases with the increasing gestational age of the pregnancy. It is important to take into consideration that the prevention of periodontal inflammation during pregnancy should be a therapeutic objective.

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CASE REPORT

MOREL-LAVALLÉE LESION ON THE LEFT CALF OF A YOUNG GHANAIAN FEMALE – A CASE REPORT

Nyarko OO[1]; Ayisi-Boateng NK[2]; Blay LK[1], Arkorful J[3], Konadu P[1]
[1]Surgical Unit, University Hospital, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana;
[2]Department of Medicine, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana;
[3]Radiology Unit, University Hospital, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

Abstract

Objective: Morel-Lavallée lesions are frequently misdiagnosed soft tissue injuries. They are closed degloving injuries associated with high energy trauma with shearing forces. In this report, we discuss the challenges in making early diagnosis and instituting timely and appropriate management of such cases.
Case Presentation: The index patient is a 36-year-old female who presented with a 3-week history of fluctuant and tender left leg swelling associated with skin bruises after experiencing a blunt trauma secondary to a motor vehicular accident. Ultrasound findings of the left leg showed a collection with internal echoes and septations occupying a space between the subcutaneous area and superficial fascia of the upper and middle third of the left leg. We made a diagnosis of a Morel-Lavallée lesion and performed an open debridement and irrigation.
Conclusion: Early diagnosis and treatment are of utmost importance as misdiagnosis and delayed diagnosis can lead to deleterious consequences and death.

Key words: *Morel-Lavallée lesion, degloving injuries, shearing forces, open debridement and irrigation, case report*

Introduction

Morel-Lavallée lesion was originally described by French surgeon Victor Auguste Francois Morel-Lavallée in 1853.[1] It is a closed soft tissue degloving lesion resulting from high energy direct shearing forces applied to the skin.[2,3] The high energy impact disrupts lymphatic and vascular networks creating a potential space most commonly filled with blood, fat, lymph and debris between the hypodermis and the underlying fascia.[4,5] The contents are converted to serosanguinous fluid as the disease progresses.[4] They commonly present on the pelvis, thighs and knee joint as a result of motor vehicular accidents, fall from heights and high-risk sporting activities.[2,3,6] The lesions can also less commonly present on the lumbosacral, gluteal regions and the lower leg or calf.[7] They are often unilateral and present with swelling, skin bruises and pain. Morel-Lavallée lesions are of concern especially in low resource settings where there is lack of Magnetic Resonance Imaging (MRI), the gold standard for diagnosis.[1,8] The location, size, duration of the lesion and patient-related factors are considered when choosing an appropriate management option for Morel-Lavallée lesions.[5] Management options include open debridement and irrigation, percutaneous drainage with drain placement or conservative management in some cases.[5,7] Morel-Lavallée lesions are associated with a high level of perioperative infections in about 46% to 48% of cases.[4,5] Chronic Morel-Lavallée lesions may also lead to deformities, skin necrosis and pseudocyst formation.[5] We present a rare incidence of a Morel-Lavallée lesion in sub-Saharan Africa on the calf of a 36-year-old woman involved in a motor vehicular accident.

Corresponding Author: **Dr. Obed Ofori Nyarko**
Surgical Unit, University Hospital, KNUST
PMD, University Hospital, KNUST
Email Address:obednyarko360@gmail.com
Conflict of Interest: None Declared

Case Presentation

A 36-year-old woman presented to the outpatient department with a 3-week history of left leg swelling after being involved in a motor vehicular accident. She suffered blunt trauma to the left leg when her vehicle came to an abrupt stop upon collision with an approaching vehicle. She had previously presented to the emergency room right after the accident and X-rays showed no signs of a fracture, hence she was discharged home after she was stabilized. The swelling on the left leg, which was associated with bruises, was noticed immediately after the accident. The swelling gradually increased in size and was associated with pain when

walking. On examination, there was a swelling 20cm by 10 cm in size over the upper and middle third of the left lower leg, it was tender, not warm to touch and fluctuant.

Figure 1: A picture showing the swelling on the lower leg of our index patient

Radiographic images of the left thigh and leg showed no bone fractures (**figure 2**). An ultrasound of the lesion showed a collection with internal echoes and septations measuring >30mls occupying a space between the subcutaneous area and superficial fascia (**figure 3**). Although MRI scan is the mainstay of diagnosing Morel-Lavallée lesion, we were limited by both patient and facility resource-constraint factors, hence, relied on the history, examination and ultrasound findings to make a diagnosis.

Figure 2: A normal x ray of the tibia and fibula of our index patient

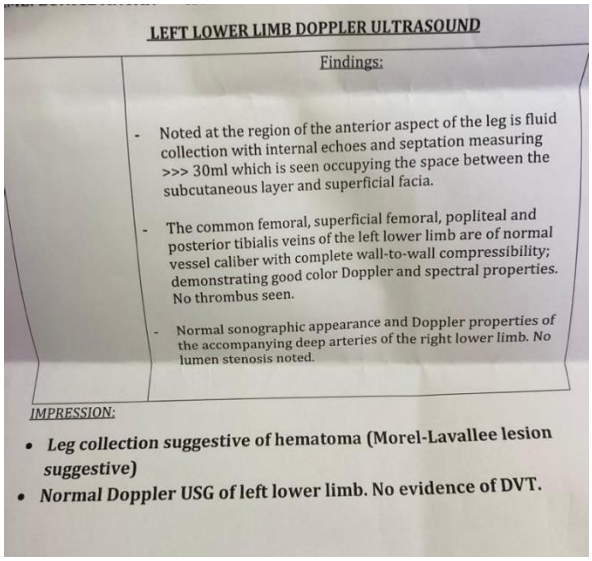

Figure 3: An image of the ultrasound findings of the leg of our index patient

The client was counselled on the condition and prepared for open debridement and irrigation a day after presentation. Approximately 200mls of serosanguinous fluid was drained from the lesions. She was put on antibiotics, analgesia and discharged a day after surgery. She underwent daily dressing changes and did not develop any complications after the procedure.

Discussion

Morel-Lavallée lesions are soft tissue degloving injuries that often go undiagnosed or misdiagnosed as abscesses, fat necrosis or tumours.[5] The patient presented late and this can be attributed to hospital and physician-related factors. These include early discharges in the emergency room especially with cases with no underlying fractures.[2] Morel-Lavallée lesions may present simultaneously with the fractures immediately after the injury or days after the injury.[5] They are said to be present in about 8% of all acetabular fractures.[4] They may also occur with blunt injuries in the absence of fractures. As it was in this case, in Morel-Lavallée lesions, the most common mechanism of injury is a shearing force on a blunt surface.[9] The clinical presentation depends on the energy of impact, site of impact, rate of accumulation of fluid into the potential space and other patient related factors.[5] It may present with swelling and skin bruises which may take days to present and hence delay diagnosis.[5] Our client presented immediately after the traumatic event with swelling and skin bruises, however, negative X-ray findings and a low index of suspicion led to delayed diagnosis. Morel-Lavallée lesions may prove fatal in some cases where there are large blood collections leading to hypovolemic shock.[10] This emphasizes the need for early diagnosis and timely treatment. Trauma cases where there are bruises on the pelvis, thighs and lower legs should also have a high index of suspicion. Polytraumatic cases with

more obvious injuries may distract physicians from the less obvious Morel-Lavallée lesion.[5]

Management options such as open debridement and irrigation used in this case are useful and recommended to remove the culture medium which can foster bacterial colonization of the space.[1,5,11] We chose this treatment option due to its effectiveness in preventing complications of skin necrosis, infections and even death.[1,5] Our index patient presented for daily wound dressing and did not suffer any complications after the procedure. She expressed satisfaction with the level of care and treatment modalities offered her.

Conclusion

We advocate for a high index of suspicion in cases of high energy blunt trauma involving shearing forces to prevent delays in diagnosis of Morel-Lavelle lesions. Early diagnosis and treatment are crucial to prevent complications and death. Once a diagnosis is made, clinicians should critically assess the patient and promptly institute appropriate intervention to achieve positive outcomes.

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FIRST NURSING TRAINING COLLEGE—1945

Nurses' Training College, Korle Bu

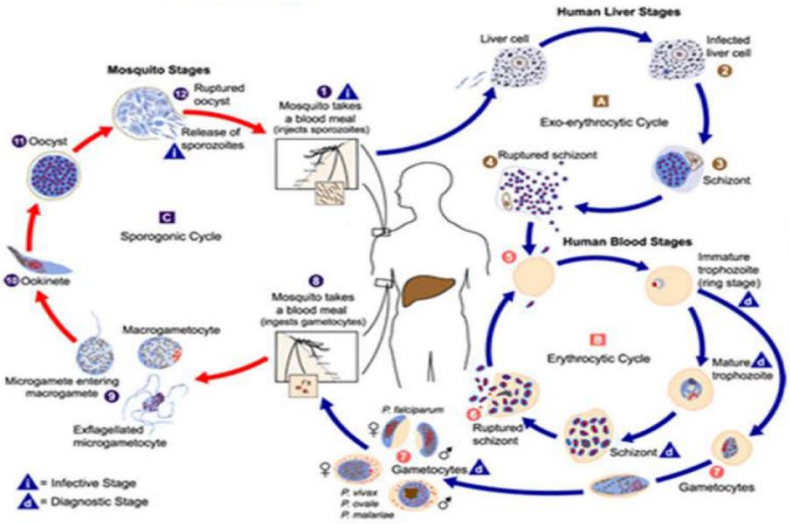
The first training college for nurses in the Gold Coast was established in 1945.

Training started in temporary accommodation in Kumasi. The school then moved to Accra to its present premises at Korle Bu.

When the Nurses Training College was opened, it was reputedly a first class facility and boasted very experienced teaching staff.

MALARIA

The malaria Cycle



The female anopheles mosquito

Child with cerebral malaria

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

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

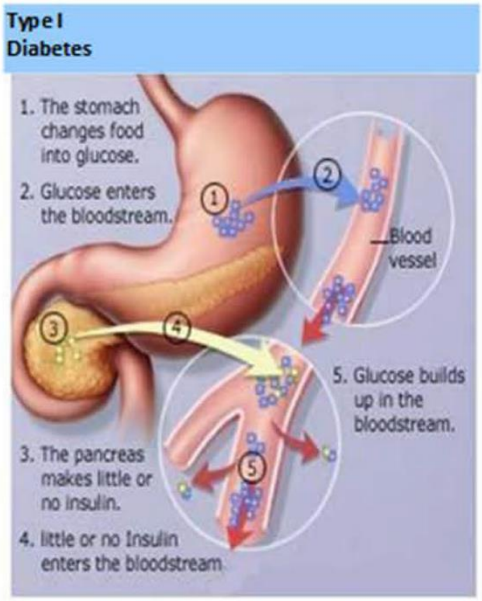
It is characterized clinically by fever, which is often periodic; varying degrees of anaemia; splenic enlargement; and various syndromes resulting from the physiological and pathological involvement of certain organs including the brain, the liver and the kidneys.

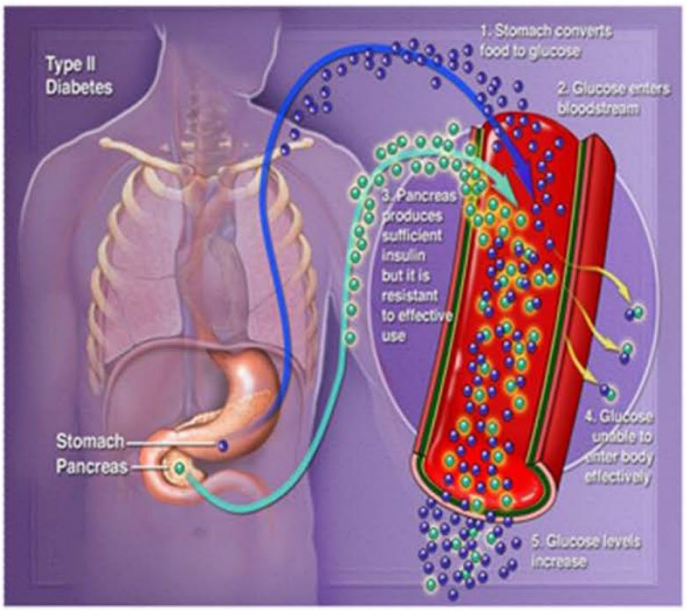
Malaria kills about one million people a year worldwide. It is the leading killer in under 5 mortality in Ghana.

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

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

DIABETES





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

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

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

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