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

The Editor-in-chief,
Ghana Medical Journal,
P. O. Box 1596, Accra, Ghana.
Tel: 233-21-670510/1
Fax: 233-21-670511
E-mail: gmai@ghana.com

Typeset by:
GMA Secretariat
Tel: 233-21-670510/1; Fax: 233-21-670511
E-mail: gmai@ghana.com
Website: www.ghanamedsoc.org
EDITORIAL

Moving the Journal On

Over the last five years or so, the journal has been faithful to its cycle of publication. This could not be without the contribution from authors and the hard work of our reviewers and editors. During the 2004 Annual General Meeting at Cape Coast, members of the association had opportunity to express various views about the journal. These ranged from frustrations to praise. All views expressed have been noted by the Editorial Committee and efforts will be made to address the points raised, particularly with regards to improved communication to authors on the status of their manuscripts.

The peer review process used by the journal involves the use of at least two reviewers per article. There is also an initial pre-review by a member of the Editorial Committee to decide on the suitability of the article before peer review. Comments from reviewers, favourable or not, are sent to authors with the decision of the Editorial Committee. Articles favourably considered for publication when returned after effecting corrections are sent back to one of the reviewers to verify that the reviewers' comments have been carried out. The article is then typeset and sent to one of the editors for editorial polishing before sending to the authors for proof reading. This is a lengthy but necessary procedure if we are to maintain a journal of good repute.

Authors are to ensure that they comply with the Instructions to Authors. Articles that do not conform to the guidelines will be returned without review. The Editorial Committee members have now been assigned specific subject areas to improve on our decision making process.

Structured Abstracts

Authors are encouraged to use structured abstracts in all original and review article submissions with effect from September 2005. We will continue to publish un-structured abstracts for those articles currently under consideration until the March 2006 issue. There are several ways to write structured abstracts depending on the type of study being reported. The following format is provided for guidance. The abstract should not exceed 250 words.

- **Objectives** – This should provide a clear statement of the main aim of the study and the major hypothesis or research question asked
- **Design** – Describe the study design (observational or analytical) indicating such features as pre-post, retrospective, randomization, placebo controlled, case control, criterion etc
- **Setting** – include the level of health care, clinical department, community or groups; number of participating centres
- **Participants** - who, how selected, what entry and exclusion criteria, how many entering and completing the study
- **Interventions** - what, how, for how long
- **Main outcome measures** - those planned in protocol, those finally measured (if different, explain why)
- **Results** - main results with levels of significance and 95% confidence intervals as appropriate.
- **Conclusions** - primary conclusions and their implications, suggest areas for further research if appropriate

Abstracts are the portion of an article frequently read by readers and also captured by indexing services, it is important that they reflect the content of the article.

In studies involving human participants, the journal expects a clear statement on approval by the appropriate institutional review (ethical) committee. Studies involving animals must also state compliance with institutional guidelines on use of animals in research.

The journal will continue to seek avenues to improve its quality and facilitate quick publication of accepted articles. It should be emphasized that although this journal is owned by the Association, it is peer reviewed. Members should not expect that any submission will automatically be published.

*Professor David Ofori-Adjei*
Editor-in-Chief
Ghana Medical Journal
P.O. Box 1596, Accra, Ghana.
ACUTE NORMOVOLAEMIC HAEMODILUTION FOR GYNAECOLOGICAL SURGERY IN KORLE BU TEACHING HOSPITAL: HOW FEASIBLE IT IS?

E. ANITEYE, D. KOTEI, Y. ADU-GYAMFI, S. OBED AND F. PETERSON

Departments of Anaesthesia and Obstetric and Gynaecology, Korle Bu Teaching Hospital, Accra, Ghana.

SUMMARY

Transfusion of allogenic blood and blood products is associated with the risk of infections such as Hepatitis A, B and C and HIV/AIDS. To minimize these risks various forms of autologous blood transfusion techniques including acute normovolaemic haemodilution (ANH), are increasingly being used.

Seventy-four patients scheduled for hysterectomy or myomectomy were enrolled for the study after institutional ethical approval and subject informed consent. One unit of blood (450 mls) was removed from the patients under anaesthesia and before surgery commenced. Blood volume replacement, haemodilution, was achieved with available crystalloids plus gelofusine or hydroxyl ethyl starch (HES). Twenty-one patients had erythropoetin (EPO) therapy as part of their preparation.

The mean age of the patients was 41.5±8.2 years and the mean preoperative haemoglobin and haematocrit were 12.4±1.0g/dl and 37.8% respectively. Mean post-haemodilution haemoglobin was 10.6±0.8g/dl with a haematocrit of 32.2±3.0g/dl. The mean postoperative haemoglobin was 10.7±1.0g/dl and the haematocrit 32.4±3.0%. Mean blood loss was 841±321ml with the bigger losses observed in those patients who had both hysterectomy and myomectomy. There were no untoward ECG or haemodynamic changes. It was concluded that acute ANH for gynaecological surgery is safe, simple and feasible to perform in this environment.

Keywords: Haemoglobin, haematocrit, normovolaemic haemodilution, gynaecological surgery.

INTRODUCTION

Autologous blood transfusion is the collection and subsequent transfusion of a patient's own blood. The technique of autologous blood transfusion includes combinations of preoperative blood donation, acute normovolaemic haemodilution (ANH), intra-operative and post-operative blood salvage. Acute normovolaemic haemodilution consists of the collection of a certain volume of whole blood before commencement of surgery and reinfusing it after haemostasis has been achieved. This is increasingly becoming popular because transfusion of allogenic blood carries the risk of diseases especially HIV/AIDS, hepatitis A, B, and C and cytomegalovirus. There has been an increased awareness of blood safety and blood conservation because of the above reasons. ANH is now part of the surgical management of patients for cardiac and non-cardiac surgery and has been used to avoid the consequences of homologous blood. ANH has also been used extensively in children especially for spine and cancer surgery. ANH is accepted by Jehovah's Witnesses (JW's) so far as there is no break in community between the harvested blood and the circulation. Moderate haemodilution defined as a reduction of the haematocrit (Hct) to approximately 30% has been shown to be safe because of an increased cardiac output, reduced viscosity of blood and increased oxygen delivery.

The cost of normovolaemic haemodilution is just the cost of the citrate-phosphate-dextrose-adrenaline (CPD-) bags. The cost of donating and cross matching allogenic blood for patients is however more expensive. The added advantage is that the blood obtained from ANH does not need any cross matching and has all the blood components that may not be present in stored blood. In gynaecological surgery blood loss could be substantial and most patients are cross-matched for allogenic blood. ANH has been used in the Korle Bu Teaching Hospital (KBTH) for a few gynaecological patients without knowing how effective this was. The study was done to find out how effective it was to carry out ANH in this population.

*Author for correspondence
METHODS
Seventy-four patients aged between 20 and 60 years and ASA I and II risk status scheduled for gynaecological surgery, at the KBTH between 1st January 2000 and 31st January 2002 were enrolled into the study after institutional approval and patient consent. All patients were treated by the same two surgeons. Patients with significant cardiopulmonary disease were excluded from the study. Patients with bleeding uterine fibroids with haemoglobin less than 8.0g/dl were given erythropoietin for three weeks preoperatively. The patients were entered into the study only when the preoperative haemoglobin was above 11g/dl. Premedication was with midazolam tablets 15mg on the night and on the morning before surgery. A large bore cannula, gauge 16 or 14 was inserted into a left arm vein. Anaesthesia was induced with a combination of fentanyl 1.5ug/kg, midazolam 0.04mg/kg and thiopentone 3mg/kg. Muscle relaxation was achieved with vecuronium 0.125mg/kg. Anaesthesia was maintained with nitrous oxide/oxygen and isoflurane. In 68 patients whose haemoglobin was less than 14g/dl one unit of blood (450mls) was removed from the right arm into citrate-phosphate-adenosine (CPD\textsuperscript{a}) blood bags. Two units of blood were removed in 6 patients whose preoperative haemoglobin was more than 14g/dl. This was replaced with ringer’s lactate or normal saline in volumes of 3ml per 1ml of blood and gelofusine or hydroxyl-ethyl starch (HES) in volumes of 1ml per 1ml of blood removed. The aim was to haemodilute to a haematocrit of approximately 30 to 31%. The haemoglobin and haematocrit were measured after the blood was taken.

During the bleeding the blood pressure was measured every two minutes; the electrocardiogram and oxygen saturation were monitored continuously using the Hellege automated monitor. Two surgeons of similar experience and who were treating the patients preoperatively performed the operations. The total blood lost was estimated based on the measurement of collection in the suction bottle and tubing, visual assessment of blood around the surgical site and the drapes. Patients were transfused the harvested blood as soon as haemostasis was achieved. The post-operative haemoglobin and haematocrit were measured 24 hours after transfusion of the autologous blood.

RESULTS
Seventy-seven (77) patients were initially enrolled but 74 completed the study. Three patients who developed haemoperitonium after surgery were excluded from the study. The average age of the patients was 41.49±8.2 years with a range of 24-57 years. The majority (40) of the patients were between the age ranges of 41 to 50 years (Table 1). Ten (13.3%) of the patients were Jehovah’s Witnesses and 21 (28.4%) had erythropoietin to augment their haemoglobin. Forty-two (57%) of the patients had total abdominal hysterectomy (TAH), 28 (38%) had myomectomy and 4 (5%) had both ap Phoenix and total abdominal hysterectomy (Table 1).

Table 1 Distribution of patients by age and type of surgery

| Age (year) | TAH | Myomectomy | TAH + Myomectomy | Apophagectomy | No. (%)
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>21-30</td>
<td>-</td>
<td>8</td>
<td>-</td>
<td>-</td>
<td>8(11)</td>
</tr>
<tr>
<td>31-40</td>
<td>2</td>
<td>16</td>
<td>18</td>
<td>24</td>
<td>24(32)</td>
</tr>
<tr>
<td>41-50</td>
<td>34</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>40(54)</td>
</tr>
<tr>
<td>51-60</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>11</td>
<td>8(11)</td>
</tr>
<tr>
<td>Total</td>
<td>42(57)</td>
<td>28(38)</td>
<td>4(5)</td>
<td>74(100)</td>
<td></td>
</tr>
</tbody>
</table>

The mean preoperative haemoglobin was 12.7±1.0g/dl with a mean haematocrit of 37.8±4.0%. Fifty-four (73%) of the patients had haemoglobin between 11.0g/dl and 13.0g/dl. Fifty percent of the patients had haematocrit between 37% and 40%. After normovolaemic haemodilution the mean haemoglobin dropped to 10.6±0.8g/dl and the mean haematocrit to 32.2±2.9%. The lowest haemoglobin was 9.2g/dl with a haematocrit of 26.7%. The changes in the haemoglobin are shown in Tables 2 and 3.

Table 2 Preoperative haemoglobin

<table>
<thead>
<tr>
<th>Haemoglobin range g/dl</th>
<th>Preoperative Hb No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.0-12.0</td>
<td>35(47.3)</td>
</tr>
<tr>
<td>12.1-13.0</td>
<td>19(25.7)</td>
</tr>
<tr>
<td>13.1-14.06</td>
<td>14(18.9)</td>
</tr>
<tr>
<td>14.0-15.0</td>
<td>6(8.1)</td>
</tr>
</tbody>
</table>

*Mean ± SD = 12.74±0.14g/dl

Table 3 Post-haemodilution and post-transfusion haemoglobins

<table>
<thead>
<tr>
<th>Haemoglobin range g/dl</th>
<th>Post-haemodilution Hb No. (%)</th>
<th>Post-transfusion Hb No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1-10.0</td>
<td>20(27.0)</td>
<td>20(27.0)</td>
</tr>
<tr>
<td>10.1-11.0</td>
<td>36(48.6)</td>
<td>28(37.8)</td>
</tr>
<tr>
<td>11.0-12.0</td>
<td>15(20.3)</td>
<td>17(23.0)</td>
</tr>
<tr>
<td>12.0-13.0</td>
<td>3(4.1)</td>
<td>9(12.2)</td>
</tr>
</tbody>
</table>

**Mean ± SD = 10.6±0.8g/dl
***Mean ± SD = 10.7±1.0g/dl
The average blood loss was 841±321 ml with a range of 350ml-1500ml. Twenty-five patients (34%) lost blood in excess of a 1000ml. Ten (13.5%) of the patients had blood losses between 1250ml and 1500ml (Table 4) and this was mainly in patients with previous gynaecological surgery and in those who had the aponeurotomy and hysterectomy.

Table 4 Estimated blood loss during surgery (mls)

<table>
<thead>
<tr>
<th>Blood lost (mls)</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>251-500</td>
<td>11(15)</td>
</tr>
<tr>
<td>501-750</td>
<td>23(31)</td>
</tr>
<tr>
<td>751-1000</td>
<td>15(20)</td>
</tr>
<tr>
<td>1001-1250</td>
<td>15(20)</td>
</tr>
<tr>
<td>1250-1500</td>
<td>10(14)</td>
</tr>
</tbody>
</table>

*Mean±SD=840.4±321 ml

There were no abnormal ECG changes during the study.

DISCUSSION

ANH has been used successfully for many years for various kinds of surgery. However a meta-analysis by Bryson et al and Laubster et al have cast doubts about the efficacy of this procedure in preventing the transfusion of allogeneic blood. However ANH has been successfully used in surgery for Jehovah’s Witnesses for whom ANH was the only means of having surgery done. The increasing incidence of HIV/AIDS and Hepatitis as well as the problem of increasing cancer recurrence after allogeneic blood transfusion has given the impetus for alternatives to blood transfusion.

The mean age of the patients was above 40 years and this was the age above which most patients got uterine fibroids and needed to have a total abdominal hysterectomy. The younger patients (less than 40 years) had infertility associated with fibromyomata and therefore had myomectomy. Four (5%) of the patients had total abdominal hysterectomy and aponeurotomy, which resulted in more blood loss. Although there were no operations for gynaecological cancer in our study, it is important to stress that most oncologists prefer the use of autologous blood due to the immunomodulation and increased tumour recurrence that is associated with allogeneic blood transfusion.

Jehovah’s Witnesses (JW), who were ten in number (13.51%) of the patients, do not accept allogeneic blood transfusion but accept certain forms of autologous blood transfusion including ANH. This has been used extensively in the management of JW’s coming for surgery where extensive blood loss was expected. In such situations care was taken to have a continuous contact between the harvested blood and the patient’s circulation. EPO has been used in recent times to increase the haemoglobin and haematocrit thus making autologous blood transfusion possible and is acceptable to JW’s.

The mean starting haemoglobin of the patients were normal and most of those who had haematocrit above 40% had been given EPO as part of their preoperative management. The target haematocrit of 30 to 31% was not achieved in all patients as can be seen from the mean haematocrit of 32.16 ± 2.9%. In these patients, another unit of blood could probably have been harvested. Biboulet et al in their study showed that moderate haemodilution resulted in an increase in the cardiac output which increased oxygen delivery. Studies have questioned the cut off point of the haematocrit of 30% as the safest point of haemodilution. Rose and Croustofides in their study had no increased morbidity or mortality with haematocrit of 20-22%. Post-haemodilution haemoglobin as low as 4.0g/dl have been used during scoliosis surgery in children without any adverse effects. This may suggest that more severe haemodilution that previously reported may be clinically acceptable in young healthy patients during ANH and therefore in our study more autologous blood could have been withdrawn.

It must be stressed that is ANH, it is important to maintain the circulating blood volume, the cardiac output and the blood pressure. This was achieved by using available crystalloids and colloids like Gelofusine and HES to replace harvested blood. Workers have variously used gelatins, dextran, HES, albumin and colloids during ANH. Theoretically gelatins and HES affect the coagulation when given in large quantities. The patients did not receive large volumes of colloids and this was unlikely to have any significant effect on the coagulation of blood.

It has been stated that the haemodilution method of autologous blood transfusion is beneficial if the blood loss is more that a 1000mls. During our study however the mean blood loss was 841±321mls. However 25(33.8%) of the patients had bleeding in excess of a 1000mls and therefore had the most benefit from the ANH. The patients who bled a lot were patients with previous pelvic surgery with extensive adhesions and also patients who had a combination of total abdominal hysterectomy and aponeurotomy. The harvested blood was re-infused as soon as haemostasis was achieved and 26(35.2%) of the patients had post-
operative haemoglobin above 11g/dl. This indicated that a little over a third of the patients did not really need re-infusion of the harvested blood. With the consent of the patients and appropriate screening this blood could be added to the general hospital stock of blood, 48 hours after surgery when it was obvious that the patient would not need the harvested blood.

In conclusion ANH is safe and feasible during gynaecological surgery in situations where the potential blood loss is expected to be more than 1000ml. It provides warm, platelet and clotting factor rich blood readily available for use in theatre. The unused harvested blood could provide a source of blood for the hospital.

REFERENCE


IN VITRO SUSCEPTIBILITY OF PLASMODIUM FALCIPARUM ISOLATES TO CHLOROQUINE AND OTHER ANTIMALARIAL DRUGS IN GHANA

N. B. QUASHIE, D. OFORI-ADJEI, N. O. DUAH, AND K. KORAM
Centre for Tropical Clinical Pharmacology and Therapeutics, Accra and Noguchi Memorial Institute for Medical Research, Legon, Accra, Ghana.

SUMMARY
The in vitro susceptibilities of Plasmodium falciparum to chloroquine, mefloquine and quinine were investigated in three distinct eco-epidemiological zones in Ghana using a modification of the World Health Organisation (WHO) micro-test technique. In vitro drug-sensitivity-tests were based on the measurement of the effect of the drugs on the growth and development of malaria parasites. Parasites were cultured in the presence of a range of concentrations of antimalarial drugs for one life cycle or part thereof. Sensitivity was then assessed by measuring the quantity of radio-labelled hypoxantane incorporated into the parasites in drug containing wells compared to drug-free wells. The concentrations of the various drugs achieving 50% inhibition were determined. Of the 64 P. falciparum isolates tested, overall chloroquine resistance of 37.5% was observed. Though all the isolates were fully sensitive to mefloquine and quinine, four showed reduced sensitivity to quinine. The overall mean IC50 determined for these antimalarial drugs were 1.1 x 10^-6 mol/litre, 1.02 x 10^-6 mol/litre and 2.3 x 10^-6 mol/litre for chloroquine, mefloquine and quinine respectively. Findings from this study indicate increasing levels of P. falciparum resistance to chloroquine compared to levels that were seen about a decade ago in the country.

Keywords: Chloroquine, resistance, susceptibility, antimalarial drug, in vitro test

INTRODUCTION
Plasmodium falciparum malaria has become a global menace infecting a significant number of people worldwide. In Ghana, the disease accounts for up to 40% of all outpatient attendance and remains one of the leading causes of mortality and morbidity especially among children. It follows climatic and ecological patterns in the country and occurs all year round with increase in incidence during the wet season.

Chemotherapy is the mainstay of malaria control in Ghana with chloroquine as the first line antimalarial drug. In recent times, however, there has been the emergence in the country of strains of P. falciparum resistant to chloroquine. Since the first report of chloroquine resistance in Ghana by Nsueyue and her colleagues, others have reported increasing chloroquine resistance in various studies across the country. The issue of chloroquine resistance in Ghana has not only complicated the treatment and prevention of the disease but has also threatened its use as the first choice antimalarial drug. Should the level of resistance become significantly high, there will be the need to replace it. Such an action must be justified with field-based evidence showing significant reduction in susceptibility of the parasites to chloroquine in the country.

The in vitro assay is based on culturing P. falciparum isolates in the presence of a range of concentrations of antimalarial drug for one life cycle or part thereof. The effect of antimalarial drugs is generally characterised by the inhibition of parasite growth and, consequently their multiplication. In this study inhibition of the incorporation of tritium-labelled hypoxantane (a nucleic acid precursor) by the parasite served as the indicator of antimalarial activity.

Generally, the in vitro method allows for almost complete exclusion of host-related factors, such as drug failure or host immunity and it also provides a more objective insight into inherent drug sensitivity than do the in vivo test. However it must be stressed that results from the in vitro tests complement the outcome of patient’s clinical response to antimalarial drug.
This study was carried out as part of a health facility based chloroquine efficacy study undertaken in Ghana with the aim of gathering data for informed, evidence based decision on recommendations for drug treatment of uncomplicated malaria.

MATERIALS AND METHODS

Study Area

Three study sites were selected from 6 existing sentinel sites being used for the monitoring of treatment efficacy in the country. These represent 3 eco-epidemiological zones in the country; namely the forest, the middle semi deciduous forest and the northern savannah. The sites were Tarkwa, Hofoe and Navrongo. Tarkwa is a gold mining town in the forest zone of the western region and it is considered an urban setting with easy access to antimalarial drugs. Due to the method of mining in the town, there are numerous open trenches containing stagnant water, which serve as breeding grounds for mosquitoes throughout the year. Malaria transmission in this area is therefore perennial with a slight increase during the main rainy seasons in April-July and September-November. Hofoe lies in the middle belt of the country with semi-deciduous forest vegetation. It is an urban community where malaria is hyperendemic. Malaria transmission in this area is perennial with peaks occurring after the major rains in June. Navrongo is classified as a rural area, lying in the guinea savannah zone in the upper east region of Ghana with a dominant population of peasant farmers. The area receives all of its rains between May and September. The rest of the year is dry. However, due to the large water reservoir in the town meant to provide water for irrigation, mosquito breeding occurs throughout the year. Malaria is thus hyper-endemic with the peak occurring between June and November.

Study Population

Children aged 6-59 months presenting to hospitals in the selected areas with fever or history of fever were screened for inclusion into the study. Inclusion and exclusion criteria for the study were in line with WHO protocol for the assessment of therapeutic efficacy in areas of high transmission (WHO, 1996)\(^5\). Briefly all patients had mono-infection of \textit{P. falciparum} with densities ranging from 2,000 to 100,000 asexual parasites per microlitre of blood with no other cause for their fever. Patients with signs and symptoms of severe and complicated malaria were excluded from the studies. A history of recent intake of antimalarial drugs was not an exclusion criterion. The study was thoroughly explained to the parents/guardian of potential children and given the chance to ask questions. Children were only enrolled after parents or guardians had signed the informed consent form (approved by the Noguchi Memorial Institute for Medical Research IRB) for the study.

Drug Treatment

Patients were treated with 25mg chloroquine per kilogram body-weight orally over a three-day period in line with the WHO standardised 14 days test of therapeutic efficacy \textit{in vivo}. Children were followed up for fourteen days with examination of blood films for malaria parasites on days 1, 2, 3, 7 and 14 respectively. Guardians of patients were advised to report to the clinical should there be persistence of symptoms or any danger sign of malaria at any time during the follow up period. Patients’ response to treatment were classified in accordance with WHO criteria\(^6\).

\textbf{In Vitro Test}

An \textit{in vitro} assessment of the susceptibilities of \textit{P. falciparum} isolates was performed using a modification of the WHO micro-technique\(^6\). The modification involves the use of inhibition of radio-labelled hypoxanthine incorporation by parasite to demonstrate drug effect. Prior to treatment, in vitro venous blood was collected from each patients and processed by standard methods used to remove the leukocytes, platelets and any antimalarial drugs in the plasma\(^6\). The red blood cells were diluted with complete RPMI 1640 (Sigma, USA) parasite-growing medium supplemented with 25mM HEPES, 25mM NaHCO\(_3\) and 10% normal human serum.

The culture was carried out in a 96-well microtitre plate pre-dosed with various concentrations of the antimalarial drugs (namely, chloroquine, mefloquine and quinine). The antimalarial drugs used for plate coating were supplied by WRAIR Inventory Laboratory, USA. Fifty microliters of blood-media mixture were dispensed into each well containing an appropriate concentration of drug. The concentration per well of drugs ranged between 1 and 64 pmol (0.2 - 12.8 mmol/L blood) for chloroquine, 2 and 128 pmol (0.4 - 25.6 mmol/L blood) for mefloquine and 4 to 256 pmol (0.8 - 51.2 mmol/L blood) for quinine. Plates were incubated at 37°C in a candle jar placed in an incubator. One uCi of \(^3\)H-hypoxanthine (supplied by NEN, Boston, USA) was added to each well after 18 hours and the culture incubated for an additional 24 hours.

At the end of the culture period, the plates were frozen to terminate the assay and later thawed to lyse the erythrocytes. The contents of each well was then harvested onto a glass fibre paper using
the Filtermate 196 cell harvester (Canberra Company, USA). The filters were dried and incorporation of \(^3\)H-hypoxanthine by the parasites measured with a Matrix scintillation counter (Canberra Company, USA).

**Assessment of Drug Susceptibility**

The quantity of \(^3\)H-Hypoxanthine incorporated into the parasites in drug containing wells compared to drug-free wells was used as a measure of parasite growth.

The concentrations of the various drugs achieving 50% (IC\(_{50}\)) inhibition were determined from a regression analysis of log-dose/response curve. The IC\(_{50}\) was defined as the drug concentration corresponding to 50% uptake of \(^3\)H-Hypoxanthine measured in the drug-free control well. Resistance was considered present when there was the evidence of parasite growth in wells containing chloroquine, quinine or melquoino at concentrations of 8 pmol (1.6 x 10\(^{-6}\) mol/L blood), 256 pmol (51.2 x 10\(^{-6}\) mol/L blood) and 64 pmol (12.8 x 10\(^{-6}\)) or more respectively.

**RESULTS**

A total of 64 out of 71 (90.1%) *P. falciparum* isolates from the three sites were successfully cultured. The results showed an overall, 37.5% *P. falciparum* resistance to chloroquine (Table 2).

**Table 1 Overall response in vitro of *P. falciparum* isolates from three sites in Ghana to chloroquine, melquoino and quinine**

<table>
<thead>
<tr>
<th>Drug conc. (Pmol/well)</th>
<th>No. of isolates with complete inhibition (%)</th>
<th>Percentage inhibition (average)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cq no=6</td>
<td>Mef no=48</td>
</tr>
<tr>
<td>1</td>
<td>0(0)</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>2(3.1)</td>
<td>0(0)</td>
</tr>
<tr>
<td>4</td>
<td>17(26.6)</td>
<td>5(10.4)</td>
</tr>
<tr>
<td>8</td>
<td>*40(82.5)</td>
<td>23(47.9)</td>
</tr>
<tr>
<td>16</td>
<td>43(86.2)</td>
<td>39(81.2)</td>
</tr>
<tr>
<td>32</td>
<td>52(81.2)</td>
<td>48(100)</td>
</tr>
<tr>
<td>64</td>
<td>68(92.2)</td>
<td>*48(100)</td>
</tr>
<tr>
<td>128</td>
<td>-</td>
<td>48(100)</td>
</tr>
<tr>
<td>256</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Cq=chloroquine; Mef=melquoino; Quin=quinine

*Concentration for which schizont growth is indicative of resistance

Chloroquine resistance were found to be 47.6%, 36.4% and 31.3% in Navrongo, Tarkwa and Hoheoe respectively and the IC\(_{50}\) values for chloroquine determined in these areas were; 1.75 x 10\(^{6}\), 0.61 x 10\(^{6}\) and 0.83 x 10\(^{6}\) respectively (Table 3). None of the isolates showed resistance to melquoino and quinine, though there was a slight reduction sensitivity to quinine observed in 4 of the isolates.

**Table 2 Summary of resistance to antimalarial drugs (%)**

<table>
<thead>
<tr>
<th>Site</th>
<th>Chloroquine</th>
<th>Melquino</th>
<th>Quinine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoheoe</td>
<td>31.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Navrongo</td>
<td>47.6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tarkwa</td>
<td>36.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Overall</td>
<td>37.5</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 3 Inhibition concentration by regression analysis for 50% inhibition**

<table>
<thead>
<tr>
<th>Site</th>
<th>Chloroquine IC(_{50}) (mol/litre)</th>
<th>Melquino IC(_{50}) (mol/litre)</th>
<th>Quinine IC(_{50}) (mol/litre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navrongo</td>
<td>1.75 x 10(^{6})</td>
<td>0.78 x 10(^{6})</td>
<td>3.05 x 10(^{6})</td>
</tr>
<tr>
<td>Tarkwa</td>
<td>0.61 x 10(^{6})</td>
<td>0.88 x 10(^{6})</td>
<td>1.53 x 10(^{6})</td>
</tr>
<tr>
<td>Hoheoe</td>
<td>0.83 x 10(^{6})</td>
<td>1.36 x 10(^{6})</td>
<td>2.46 x 10(^{6})</td>
</tr>
<tr>
<td>Overall</td>
<td>1.1 x 10(^{6})</td>
<td>1.02 x 10(^{6})</td>
<td>2.3 x 10(^{6})</td>
</tr>
</tbody>
</table>

The overall mean IC\(_{50}\) calculated for the antimalarial drugs were 1.1 x 10\(^{6}\) mol/litre, 1.02 x 10\(^{6}\) mol/litre and 2.3 x 10\(^{6}\) mol/litre for chloroquine, melquino and quinine respectively. The concentra-
Even at a concentration of 4.8x10^-6, which is thrice the threshold for chloroquine resistance in vitro, there was evidence of schizont maturation in 12(16.9%) of the isolates indicating the presence of strains of *P. falciparum* that are highly resistant to chloroquine.

**DISCUSSION**

It is evident from observations made in this study that *P. falciparum* isolates from different parts of Ghana have become resistant to the first line antimalarial drug, chloroquine. The study showed an overall chloroquine resistance of 37.5%.

An interesting and important observation made in this study is the higher chloroquine resistance found in isolates in Navrongo, a rural setting which we expect to have the least rate of resistance. This situation contrasts earlier findings in Ghana which showed an increase in drug resistance from the rural to urban areas. The assumption is that the emergence and spread of chloroquine resistance is precipitated by drug pressure which is more common in the urban areas where medical facilities are concentrated and where there is greater accessibility and more frequent use of chloroquine and other antimalarial drugs.

A possible reason for the observed increased in chloroquine resistance even in the rural areas could be the recently introduced home based treatment for malaria under the Roll Back Malaria program in the country. The intensive advert in the media might have led to an upsurge in the use of chloroquine with a consequent increase in parasite resistance to the drug due to drug pressure.

The level of chloroquine resistance observed in this study compares well with results from the in vivo study done concurrently which showed treatment failure rate of about 15-30% in the country (Koram *et al* - unpublished). Previous reports had shown 45% chloroquine resistance in vivo in the country.

Resistance of *P. falciparum* to chloroquine is common in most malaria endemic countries of Africa especially in eastern Africa. Thus Malawi and Kenya in 1993 and 1996 respectively changed their recommendation for first-line treatment of uncomplicated malaria from chloroquine to sulfadoxine/pyrimethamine, and Botswana and South Africa revised their treatment guidelines in 1997.

Evidence of a reduced susceptibility of *P. falciparum* to chloroquine obtained in this study as well as that from in vivo treatment outcome is strong enough to form the basis for a review of the national antimalarial drug treatment policy in Ghana.

This study demonstrates the absence of strains of *P. falciparum* resistant to quinine in the three study sites (overall IC50 was 2.3 x 10^-6 mol/litre). This should be a welcome piece of news for the health authorities in Ghana. This is because quinine remains the drug of choice for the treatment of severe and complicated malaria in the country. Hence the presence of parasites resistant to quinine would have been of great concern to the Nation Malaria Control Program. However, the observed delay in susceptibility of 4 of the isolates to quinine calls for a closer monitoring of this drug.

All the isolates tested were sensitive to mefloquine with an overall IC50 of 1.02x10^-6 mol/litre. This finding contrasts report of cross-resistance with chloroquine observed in Tanzania but agrees with observation of full mefloquine sensitivity in an area of Brazil with a high degree and frequency of chloroquine resistance.

This study further confirms the usefulness of the in vitro technique to establish the susceptibility of malaria parasites to antimalarial drugs.

In conclusion, this study reveals the presence in the Ghana of *P. falciparum* isolates, which are highly resistant to chloroquine.

**ACKNOWLEDGEMENT**

The study received financial support from WHO/MIM-TDR., Project ID 980034. We are most grateful to Ben Abaku, J. Fenteng, C. Attiogbe, C. Opoku-Ampomah, S. Osei and L. Boafo of the Epidemiology Unit, Noguchi Memorial Institute for Medical Research. Assistance received from the hospitals in Hohoe, Tarkwa and Navrongo is very much appreciated.

**REFERENCE**


HAEMOGLOBIN LEVELS OF WELL PRE-SCHOOL CHILDREN IN BIBIANI, GHANA

Department of Medicine, Komfo Anokye Teaching Hospital, P.O. Box 1934, Kumasi, Ghana and
Department of Community Health, School of Medical Sciences, KNUST, Kumasi, Ghana.

SUMMARY
The significant contribution of anaemia to childhood morbidity and mortality in developing countries calls for a critical and regular assessment of the situation for appropriate control measures.

This study was carried out to determine the haemoglobin level in 200 pre-school children in Bibiani, and the effect of sickle cell disease, malnutrition and malaria, on it.

One millilitre of venous blood was drawn from each child for haematological investigations, sickle cell status and malaria parasite status. A structured questionnaire was used to collect information on their nutritional status and the socio-demographic characteristics of the household the children belonged.

The mean haemoglobin (Hb) level was 9.8 (1.6)g/dl. Seventy-one per cent of the children were found to be anaemic (Hb< 11.0g/dl). Almost half (42.0%) of the anaemic children had microcytic anaemia, indicating iron deficiency anaemia. Prevalence of malaria parasites in the blood was 18.0%, while, sickle cell disease and malnutrition (stunting) prevalence were 2.0%, and 19.0%, respectively.

Anaemia and stunting ($\chi^2=30.1$), as well as anaemia and malaria parasitaemia ($\chi^2=12.4$), were significantly associated (p<0.05). The children were thus found to be mostly anaemic (iron deficiency anaemia) even before they got sick. Malnutrition (stunting) and malaria parasitaemia contribute significantly (p<0.05) to this situation. Iron supplementation, or improvement in childcare practices and subsequently in dietary iron intake, prevention of helminthic infestation through regular de-worming, malaria chemoprophylaxis for children with sickle cell disease, and the use of insecticide treated nets are recommended.

Keywords: Anaemia, haemoglobin, malaria parasitaemia,

INTRODUCTION
Anaemia is a pathophysiological state in which an individual's blood haemoglobin is below the normal range for the person's age and sex. It is a serious public health problem in Sub-Saharan Africa, where it contributes significantly to morbidity and mortality among children under 5 years of age.

The World Health Organization estimates that about two billion people are anaemic globally; children and women are most at risk. According to the Ghana Demographic Health Survey Report (1998), about 83.5% of children under 5 years of age in Ghana are anaemic. At the Bibiani Government Hospital, about 49.0% of paediatric admissions received blood transfusion in 2001.

Malaria plays a major role in childhood anaemia and causes about 1 million deaths per year in African children. Due to the destruction of red blood cells by the malaria parasites, concurrent parasitaemia is significantly associated with low mean haemoglobin in children.

Severe malarial anaemia which often requires blood transfusion is associated with a high mortality. Bojang et al have indicated that 65.0% of children admitted for blood transfusion died before the transfusion was given, and in those who received transfusion, 15.0% died after discharge within two months of transfusion. Blood transfusion itself poses the risk of transmission of transfusion-acquired infections such as HIV/AIDS. In order to minimize such risks, the rate of paediatric blood transfusion needs to be reduced. This can be done by assessing the haemoglobin levels of well children and instituting

*Author for correspondence
effective prevention methods if they are found to be low.

This study was therefore carried out to assess the prevalence of anaemia in pre-school children in Bibiani, and how this is influenced by sickle cell disease, malnutrition and malaria.

MATERIALS AND METHODS
The study type was cross-sectional and analytical. Two hundred (200) pre-school children were selected from the local schools, using multi-stage sampling methods, involving simple and systematic random sampling for the pupils from the schools.

Parental consent was given for the participation of the pupils in the study. After this, one millilitre of venous blood was drawn from each child for all the haematological investigations. Information related to the socio-demographic characteristics of the households to which the children belonged, were obtained using a pre-tested structured questionnaire administered to the mothers.

The blood samples were drawn into EDTA tubes for haematological analyses. Haemoglobin determination was by the cyanmethaemoglobin method\textsuperscript{12}. Thick blood films were prepared to determine the presence of malaria parasites by microscopy. Data on weight, height and exact age of the children were determined and transformed into nutritional status indexes (Weight-for-age, Weight-for-height, and Height-for-age), using Epi Info 2000 software. The children were classified into Normal (Z$>$2SD), moderately (-3SD$<$Z$<$-2SD) and severely (Z$<$-3SD) malnourished, using Z-score.

The data were analyzed using EPI Info 2000. Chi-square test of association at a significant level of 5\% was also performed. The results are presented as mean(SD).

RESULTS
Socio-demographic characteristics of the children and their mothers
The male to female ratio of the study population was 52.0\% to 48.0\%. The mean age of the children was 30.9 (8.3) months, whilst that of their mothers was 28.4 (9.7) years, ranging from 16 to 43 years. Almost a third (32.0\%) of the mothers were in the modal class of 25 to 29 years, whilst 35\% were teenagers. Farming (27.0\%) and trading (25.0\%) were the predominant occupations of the mothers.

Seventeen percent (17.0\%) of the mothers had educational level above secondary education, 42.0\% had up to junior secondary and 51.0\% had no formal education.

Health Status of the Children
Fourteen percent (14.0\%) and 48.0\% respectively, had febrile illness 3 months and 1 month preceding the study. Mothers had given anti-malaria medication in all cases.

None of the children was severely wasted or underweight, but 9.0\% were severely stunted. Moderate stunting (10.0\%), wasting (8.5\%), and underweight (2.0\%) were observed among them.

Seventy-one percent (71.0\%) of the children were anaemic (Hb $<$ 11.0 g/dl). The mean haemoglobin level of the children was 9.8 (3.6) g/dl.

Table 1 Distribution of haemoglobin level (g/dl) of well pre-school children in Bibiani, Ghana, 2001. (N=200)

<table>
<thead>
<tr>
<th>Haemoglobin (Hb) level (g/dl)</th>
<th>Number (N=200)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0 - 6.9</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>7.0 - 8.9</td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td>9.0 - 10.9</td>
<td>70</td>
<td>35</td>
</tr>
<tr>
<td>11.0 - 12.9</td>
<td>52</td>
<td>26</td>
</tr>
<tr>
<td>13.0 - 14.9</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>200</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Forty-two percent (42.0\%) of the anaemic children had microcytic anaemia (Mean Corpuscular Volume (MCV) less than 78 femtolitres), whilst 10.0\% had the macrocytic type (MCV $>$ 85 femtolitres). Forty-eight percent (48.0\%) had normocytic anaemia (MCV between 78 and 85 femtolitres). Twenty percent (20.0\%) of the anaemic children had the hypochromic type (Mean Corpuscular Haemoglobin (MCH) less than 24 picograms). All those who had hypochromic anaemia also had microcytic anaemia, implying that 20.0\% had microcytic and hypochromic anaemia, 22.0\% had only microcytic anaemia.

An assessment of the 'sickling' status of the children revealed the following: 77.0\% had Haemoglobin AA, while 14.0\% had AS, 7.0\% AC and 2.0\% were SC. There was no haemoglobin SS. Those with haemoglobin SC had mild anaemia (9.0 - 10.9) g/dl (Table 2).
Table 2 Distribution of mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH) by the anaemia status of children (<5 years old) in Bibiani sub-district, Ghana (2001) (N=200).

<table>
<thead>
<tr>
<th>Haematological index</th>
<th>Number</th>
<th>Anaemic % of total</th>
<th>% of anaemic</th>
<th>Normal Number</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCV (fl):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;78</td>
<td>60</td>
<td>30</td>
<td>42</td>
<td>32</td>
<td>16</td>
</tr>
<tr>
<td>78-85</td>
<td>68</td>
<td>34</td>
<td>48</td>
<td>22</td>
<td>11</td>
</tr>
<tr>
<td>&gt;85</td>
<td>14</td>
<td>7</td>
<td>10</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>MCH (pg):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;24</td>
<td>28</td>
<td>14</td>
<td>20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&gt;=24</td>
<td>114</td>
<td>57</td>
<td>80</td>
<td>58</td>
<td>29</td>
</tr>
</tbody>
</table>

Malaria parasitaemia was present in 18.0% of the children, and 89.0% of these were anaemic, while 11.0% had normal haemoglobin values.

Relationship between Anaemia, and nutritional status and malaria parasitaemia

The relationship between anaemia and nutritional status, as well as malaria parasitaemia is shown in Tables 3. A chi-square test of association indicated that there is a significant association (p<0.05) between anaemia and malnutrition, as well as between anaemia and malaria parasitaemia.

Table 3 Distribution of Anaemia status by malarial parasitaemia and nutritional status of Pre-school children at Bibiani, Ghana. (N=200)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absent</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. (%)</td>
<td>No. (%)</td>
<td>No. (%)</td>
<td>No. (%)</td>
<td>No. (%)</td>
</tr>
<tr>
<td>Malaria parasite Present</td>
<td>4 (2.0)</td>
<td>10 (5.0)</td>
<td>18 (9.0)</td>
<td>4 (2.0)</td>
<td>36</td>
</tr>
<tr>
<td>Malaria parasite Absent</td>
<td>54 (27.0)</td>
<td>60 (30.0)</td>
<td>42 (21.0)</td>
<td>8 (4.0)</td>
<td>164</td>
</tr>
<tr>
<td>Normal Growth</td>
<td>57 (28.5)</td>
<td>59 (29.5)</td>
<td>41 (20.5)</td>
<td>5 (2.5)</td>
<td>162</td>
</tr>
<tr>
<td>Stunted Growth</td>
<td>1 (0.5)</td>
<td>11 (5.5)</td>
<td>19 (9.5)</td>
<td>7 (3.5)</td>
<td>38</td>
</tr>
</tbody>
</table>

DISCUSSION

Socio-demographic characteristics of the children and their mothers

With as much as 51.0% of the mothers without any formal education, and 42.0% with education not exceeding Junior Secondary School level, it is not surprising that the mothers were predominantly farmers (27.0%) and petty traders (25.0%). By the nature of their work these mothers are likely to spend little time to do "Active feeding", the strategy recommended to mothers and caregivers to ensure that the child's desires and nutritional requirements are met, hence the children are at risk of nutrients deficiency. In a sub-urban community like Bibiani, the underlying poverty resulting from the socio-economic situation of the mothers is likely to exacerbate the nutritional deficiencies, with the accompanying health risks.

Health Status of the Children

In a malaria endemic zone, the observation that almost a half (48.0%) of the children experienced a febrile illness within a period of less than one month before the study, whilst 14.0% had suffered the same fate about three months ago is likely to be true.

The study reveals a significant proportion (almost 30%) of children under 5 with some abnormality in their nutritional status; 9.0% severely stunted, and a few moderately stunted (10.0%), wasted (8.5%), and underweight (2.0%). Though the wasting prevalence was close to the national figure of 9.5%, the prevalence of stunting in the area was lower than the national rate of 25.9%. This is indeed encouraging, since though not really what one would call 'good' nutritional status in a community, it is much better than the country's average.

Anaemia prevalence of 71.0% among the children was rather high. This suggests that conditions that are likely to further reduce the haemoglobin levels,
such as worm infestation, severe malaria and inadequate intake of nutrients should be prevented in the children. Regular physical examination is necessary in such a population to initiate treatment when needed. Nevertheless, this figure is lower than the national prevalence rate of 83.5%², probably, because the study subjects were supposedly healthy, while the national survey might have involved the entire population, including those who were clinically sick. Since iron deficiency and malaria have been found among others, to be associated with anaemia¹⁴, the endemic nature of these conditions in the area may account for the high prevalence of anaemia.

Our results of 42.0% of the anaemic children with MCV value of less than 78 femtolitres, and 20.0% with both microcytic and hypochromic anaemia, suggests iron deficiency anaemia. This finding could be compared with that of Tanzania in which iron deficiency was found to account for 30.0% of all cases of severe anaemia among infants¹⁴. Though the possibility of thalassaemia contributing to the microcytic hypochromic anaemia cannot be ruled out, its contribution is established to be more significant in the Mediterranean and South-East Asian countries¹⁵ and probably insignificant in the study area where the prevalence of Sickled cell disease (2.0%) among the children is as low as in the Ashanti region of Ghana ⁶. However, the fact that all the 2.0% who had sickle cell disease were moderately anaemic suggests that the condition is a key factor influencing the anaemia status of an individual. The conspicuous absence of Hb SS cannot be explained but the small number studied could be a factor.

Influence of malnutrition and malaria on anaemia
The study established a significant association (p<0.05) between anaemia and either malnutrition or malaria parasitaemia (Table 2), thus confirming the assertions by, WHO³, McElroy et al⁵, and Menendez et al³ linking anaemia to malnutrition and malaria. Wardlaw⁵, also affirms the ability of iron deficiency anaemia to interfere with longitudinal growth, weight gain, and behavioural development, resulting in reduced mental and motor development.

CONCLUSION AND RECOMMENDATION
Our results indicate that the majority (71.0%) of children in the study were anaemic even before they get sick, clinically.

Microcytic anaemia, suggestive of iron deficiency anaemia was high, representing 42% of the anaemic children. Microcytic hypochromic anaemia affected 20.0% of the children.

Malnutrition (stunting) and malaria parasitaemia were found to be significantly (p<0.05) associated with anaemia among the children.

Iron supplementation or improvement in childcare practices and subsequently in dietary iron intake, prevention of helminthic infestation through regular de-worming and the use of insecticide treated nets are recommended for children under five years in the Bibiani District.

ACKNOWLEDGEMENTS
We are very grateful to the Staff of Bibiani Government Hospital, and the parents of the children studied for their support, understanding and cooperation. We also acknowledge with gratitude, the support of Mr. C. Opoku Okrah, Haematology Department, KATH, Kumasi, and Dr. Hakan Ekwall, Karolinska Hospital, Stockholm, Sweden.

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USE OF MIDAZOLAM FOR CONSCIOUS SEDATION IN UPPER GASTROINTESTINAL ENDOSCOPY

E. ANITEYE, H. ADU-FUL, N. ADU-ARYEE, D. KOTEI, Y. ADU-GYAMFI.
Departments of Anaesthesia and Surgery, Korle-Bu Teaching Hospital, Accra, Ghana.

SUMMARY

The effectiveness, dosage regimen and amnesic properties of midazolam were studied in 77 patients who presented for upper gastrointestinal endoscopy at the Korle-Bu Teaching Hospital. Patients were given an initial dose of 0.02-0.04mg/kg of midazolam and top-up doses 0.0075-0.015mg/kg. The total doses of midazolam given for adequate sedation were 2.5mg, 3.5mg, 4.5mg, in 19%, 35% and 45% of patients respectively. The average dose of midazolam used was 0.067 ± 0.011mg/Kg. Ninety percent (90%) of the patients were awake but drowsy during the procedure, 6% were awake and anxious and 4% were asleep but responsive. Ninety-four percent (94%) of the patients had Ramsey sedation scale levels 2 to 4. Ninety-five percent (95%) of the patients had complete or partial amnesia of the procedure. Endoscopy conditions was fair to excellent in 88.3% and poor in 11.7% of the patients. Oxygen saturation during the procedure was maintained at normal limits (>92%) without oxygen supplementation.

It is concluded that midazolam in moderate doses is a safe and effective drug for conscious sedation in upper gastrointestinal endoscopy.

Keywords: Midazolam, sedation, endoscopy, amnesia.

INTRODUCTION

There has been an increase in the use of conscious sedation for invasive and non-invasive diagnostic and radiological procedures, including upper gastrointestinal endoscopy, at the Korle-Bu Teaching Hospital. Endoscopic procedures may be distressing to patients and compliance may be improved if these procedures are done under sedation. Although diazepam was the drug of choice for outpatient endoscopy for many years, because of its good sedative and amnesic properties, it was often painful to inject, caused thrombophlebitis and sedation could be prolonged because of active metabolites.

Midazolam, an imidazo-benzodiazepine was introduced for sedation during endoscopy at the Korle-Bu Teaching Hospital two years ago. It is watersoluble, has rapid onset and recovery, excellent anxiolytic, hypnotic and amnesic effects. Its water solubility reduces pain at the site of injection and the short elimination half-life of 3.0 hours (half-life of diazepam is 90 hours), makes it ideal for the short duration of endoscopy. Amnesia is considered to be more frequent with midazolam than diazepam.

This study was done to assess the effectiveness of midazolam for upper gastrointestinal endoscopy in the local population.

METHODS

After informed consent, patients between the ages of 12-72 years scheduled for upper gastrointestinal endoscopy, from the 1st January 2000 to 31st December 2001 were included in the study. Excluded were patients with severe cardiorespiratory disease, pregnant women or patients below 12 years. All patients had an intravenous line inserted for the administration of the sedation before commencement of the procedure. The upper airway was anaesthetized with 10% lignocaine spray.

An initial dose of 0.04mg/Kg of midazolam was injected slowly by the nurse for patients below 60 years and 0.02mg/kg for patients over 60 years. Ninety seconds was allowed for the drug to take effect before the introduction of the scope. Supplemental bolus doses of 0.015mg/kg for patients below 60 years and 0.0075mg/kg for patients above 60 years were injected if sedation was found to be inadequate. The same two endoscopists performed the examination.
The nurse and the anaesthetist monitored the respiratory and heart rates, blood pressure and the oxygen saturation during the procedure. The degree of sedation was assessed using Ramsay sedation scale: 1= awake, anxious and agitated or restless, 2=awake and calm, 3=drowsy but obeys commands, 4=asleep but responds to commands, 5=asleep but responds sluggishly to a glabellar tap or auditory stimulus and 6=asleep and unresponsive. Conditions for endoscopy was also assessed as excellent, good, fair or poor.

One hour after endoscopy the patients were questioned as to the recall of the procedure and this was classified as no recall, partial recall or complete recall. The data was quantitatively analyzed by calculating the mean and the standard deviation for selected variables using the Microsoft Excel 2000 data analysis tool pack of the program.

RESULTS
The demographic data of the patients are presented in Table 1. The mean age was 43.1 ± 14.3 years with a range of 12-72 years. This included two 12 year-old boys who were endoscoped for duodenal ulceration. Forty-eight (62%) of the patients were males and 29 (38%) were females. The mean weight was 60.0 ± 10.8 kg (range, 40-86kg).

Table 1 Age of patients

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-20</td>
<td>2 (2.6)</td>
</tr>
<tr>
<td>21-30</td>
<td>10 (13.0)</td>
</tr>
<tr>
<td>31-40</td>
<td>17 (22.0)</td>
</tr>
<tr>
<td>41-50</td>
<td>25 (32.5)</td>
</tr>
<tr>
<td>51-60</td>
<td>12 (15.6)</td>
</tr>
<tr>
<td>61-70</td>
<td>19 (11.7)</td>
</tr>
<tr>
<td>71-80</td>
<td>2 (2.6)</td>
</tr>
</tbody>
</table>

Midazolam requirements were 4.5mg, 3.5mg and 2.5mg in 35 (45.5%), 27 (35%) and 15 (19.5%) of the patients respectively (Table 2). The average dose of midazolam used was 3.8 ± 0.6mg (0.7mg ± 0.1mg/kg).

The results show that 5 (6.4%) of the patients were not sedated, Ramsay scale of level 1, 29 (37.6%) had a scale of level 2, 40 (52.0%) had a scale of level 3 and 3 (3.9%) had a sedation scale of level 4 (Table 2). Conditions for endoscopy were excellent in 12 (15.6%), good in 30 (38.9%), fair in 26 (33.8%) and poor in 9 (11.7%) of the patients (Table 3).

Complete amnesia was observed in 66 (85.7%) of the patients, 8 (10.4%) had partial recall and 3 (3.9%) had total recall of the events during the endoscopy (Table 3). Fifty-nine (76.6%) of the patients with complete amnesia had fair to excellent conditions for endoscopy.

DISCUSSION
Upper gastrointestinal endoscopy is usually performed as day cases and can be performed without sedation. However most patients find the procedure unpleasant and this causes a lot of anxiety in repeat endoscopies1. Sedation is therefore necessary for most patients. The expanding need of sedation for endoscopy and other diagnostic procedures prompted many medical committees to set up guidelines for the safe administration of sedatives in non-traditional settings. However sedation is being used in Ghana in paediatric and adult patients without any guidelines. Various sedative agents have been used for conscious sedation including diazepam, ketamine and propofol. These may have significant side-effects making them...
unsuitable for non-anesthetists. Midazolam has largely replaced diazepam as the drug of choice for non-anesthetists in conscious sedation.

The average dose of midazolam used was $0.067 \pm 0.011$ mg/kg, which is not different from doses used in previous studies in which recovery was equally rapid. A lower dose of approximately half the average dose ($0.033$ mg/kg) was used for the patients above 60 years old and this finding was similar to the study of Christe et al where the dose used was $0.03$ mg/kg.

The majority of the patients, that is 93.7% had Ramsey sedation scale between levels 2 and 4 which indicates that they had the ideal level of sedation that allowed them to co-operate with the endoscopists. Deeper levels of sedation that is Ramsey scale level 5 to 6, usually leads to a loss of the protective reflexes and cardio respiratory depression. The patients with a sedation scale of level 1 may have been given sub-optimal doses of the midazolam. The endoscopists involved in the study had previously used conscious sedation during endoscopy using patient co-operation as the endpoint of top-up doses. There was also no monitoring of the patients sedation score and therefore the risk of deep-sedation was always present.

The complete amnesia observed in 85.7% of the patients was much higher than was observed in previous studies where a range of 75.9% to 84.0% was quoted. The high level of amnesia observed is ideal for repeat endoscopies, as patients do not remember the unpleasant aspects of the procedure. The endoscopists in the study were satisfied with 88.3% of the endoscopies and this is attributed to the high level of patient co-operation. This high satisfaction with the endoscopy conditions with midazolam sedation has been confirmed in a recent study done in India by Abraham et al.

There were no adverse sequelae and there was cardio-respiratory stability. Addition of opiates to sedative drugs during conscious sedation is known to produce desaturation and hypotension in certain patients. Excessive drowsiness observed in 3 (3.9%) of the patients did not need reversal with flumazenil, a benzodiazepine reversal agent. Most anaesthetic associations have developed guidelines to help provide safe sedation during clinical procedures and this includes the use of monitoring equipment and the provision of an emergency trolley for resuscitation. Unfortunately the endoscopy unit where this study was done does not have any functioning monitoring equipment or an emergency trolley.

CONCLUSION

Midazolam is a safe, effective benzodiazepine that can be used by gastroenterologists for conscious sedation. It also provides favorable conditions for the endoscopist and the high level of amnesia makes repeat endoscopies more tolerable for the patients. The use of top-up titration mode of administration makes its use predictable. The basic monitoring equipment must be provided to make conscious sedation safe for patients. There is a pressing need to educate non-anesthetists on the technique of conscious sedation to reduce the risks of cardio-respiratory depression and possible aspiration of gastric contents.

REFERENCE:

10. Chin NM, Tai HY, Chin MK. Intravenous sedation for upper gastrointestinal endoscopy;


OBESITY AND SYSTEMIC HYPERTENSION IN ACCRA COMMUNITIES

A.I.O. ESCALONA, MERIAM SARFO AND LUCY KUDUA
Diagnostic Department, National Cardiothoracic Centre, Korle Bu Teaching Hospital, Accra.

SUMMARY
The study was carried out to determine the prevalence of obesity associated with systemic hypertension in four communities in Accra. A total of 598 persons, of whom 257 were male and 341 female aged 15 years and above were examined. Their blood pressure, weight, and height were measured; and from weight and height calculated the body mass index.

The results show that 22.6% were overweight (BMI 25-29kg/m²) and 17.2% were obese (BMI >30kg/m²). Overweight/obesity increased with age peaking at age 55-64 years and then falling. Obesity was about twice as common in women than men. The prevalence of hypertension (BP >140/90 mmHg) was 26.8%. There was a positive relationship between body mass and hypertension. In the study population the prevalence of hypertension was similar in males and females.

Keywords: Body mass, hypertension.

INTRODUCTION
The World Health Organisation has declared obesity as a global epidemic. In Europe more than half of the adult population is overweight or obese, and in the United States, the report suggests that approximately one-third of persons 20 years of age and above fall into this category. The prevalence of obesity also has increased in developing countries.

Obesity may be defined as an excess body fat content. All methods of measuring the fat content in living subjects are indirect. Body Mass Index (the body weight in kilograms divided by the square of the height in metres) is the preferred way of calculating obesity in clinical practice.

Obesity occurs when the calories intake exceeds the energy requirements of the body both for physical activity and for growth. The increased prevalence of obesity has been attributed to genetic factors, sedentary lifestyle and readily available palatable, high-fat foods.

Sometimes cultural beliefs equate success with obesity. In groups which great emphasis is placed on food, there is a tendency to overeat. In some societies fat men are respected and fat women considered beautiful.

Overweight is associated with an increased rate of mortality at all ages. This is primarily due to cardiovascular disease, hypertension, diabetes mellitus, gall bladder disease, and certain forms of cancer, for instance, endometrial cancer and postmenopausal breast cancer in women, prostate cancer in men, and colorectal cancer in both men and women.

In addition obesity significantly impairs the quality of life. Many obese individuals suffer pain and have restricted mobility because of mechanical disabilities. They experience low self-esteem, depression, emotional distress and other psychological problems because of social prejudices and discrimination.

On the other hand, the economic costs associated with obesity are substantial. These include both the direct cost of health care, and indirect cost associated with low productivity, caused by illness and disability.

Our experience in the hospital and the community shows that obesity is common in Ghanaians, and this is associated with other risk factors essential to the genesis of hypertension. Moreover we have noted certain tolerance and acceptance of obesity that may be attributed to the cultural and social patterns. Thirty years before our study Haddi had noted a high prevalence of obesity in medical
out patients of the Korle Bu Teaching Hospital (KBTH); the prevalence of obesity was higher in hypertensives than normotensives.

Under the terms of a technical assistance agreement between the Governments of Ghana and Cuba, a Cuban Health Brigade team undertakes clinical assignments in Ghana for periods of 2 years at a time. Each year the team holds a health week where those physicians are located and they pick on a theme for the purpose. During the 2-year duty tour of October 2000 – September 2002, a health week was held with Hypertension as the theme. The objective of this communication is to report on the study to determine the prevalence rates of hypertension and obesity in various communities in Greater Accra Region. Previous community studies had been in the Administrative Centre of Accra (Victoriaborg and Christianburg) and a suburb Mamprobi. Our study widened the scope of the spread of the population of Accra.

METHODOLOGY
The Population
Six communities, urban and semi urban in Accra, were randomly chosen. There was no census of the population taken but information was relayed to the communities of each locality through an identifiable traditional leader, concerning the impending exercise. Each day the survey field team moved from one location to the other, working between 0900 hours – 1500 hours. The blood pressures were taken by State Registered Nurses who had been trained in blood pressure (BP) measurement using standard methods. These nurses normally take the BP of the 60-80 patients a day, attending the cardiac and hypertension clinic of the National Cardiothoracic Centre in Accra. They also took the heights and the weights of the subjects.

Hypertension was defined as a BP of more than 140/90mmHg or a patient on anti-hypertensive therapy.

Overweight was defined as a BMI>25kg/m² with sub-classification: Pre Obese BMI 25.0-29.9kg/m² and Obesity BMI >30.0kg/m².

The statistical method used was the z-score for comparing two percentages.

RESULTS
Distribution of population x location x sex
There were 598 persons aged 15 years and above, consisting of 257 males (43%) and 341 females (57%). The communities studied were Teshie 58, 9.7%; Sakaman 124, 20.7%; Awoshie 118, 19.7%;

Oynase 97, 16.2%; Dansoman 73, 12.2% and Mamprobi 128, 21.4%.

Distribution of categories of body mass index and prevalence of hypertension. Table 1.
The prevalence of hypertension thus increased significantly with body mass from 20.5% at BMI 18.5-24.9kg/m² (normal), to 42.7% at > 30kg/m² (obesity).

<table>
<thead>
<tr>
<th>Body mass index</th>
<th>No. subjects</th>
<th>Percentage of selected population</th>
<th>Prevalence of hypertension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>23</td>
<td>3.8</td>
<td>1.75</td>
</tr>
<tr>
<td>&lt;18.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>337</td>
<td>56.4</td>
<td>20.5</td>
</tr>
<tr>
<td>18.5-24.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>135</td>
<td>22.6</td>
<td>37.8</td>
</tr>
<tr>
<td>25-29.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td>103</td>
<td>17.2</td>
<td>42.7</td>
</tr>
<tr>
<td>≥30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prevalence of hypertension, overweight and obesity x sex. Table 2
There was not much significant difference between males and females with respect to hypertension in the population, p>0.5; Overweight was commoner in females than males but the difference was not statistically significant. Obesity was thrice as common in females than in males, the difference was highly significant, p<0.001.

Prevalence of hypertension and overweight was equal in both sexes. However obesity was highly prevalent among females.

Prevalence of overweight and obesity in age groups. Table 3
Overall prevalence of overweight was 22.6% and of obesity 17.2%.

Thus there is a positive relationship between increasing age and the prevalence of overweight and obesity, though the prevalence of overweight peaked at 45-54 years whilst that of obesity peaked a decade later only to drop again after the age of 64 years.
Table 2 Prevalence of hypertension, overweight and obesity among males and females

<table>
<thead>
<tr>
<th></th>
<th>Males N=257</th>
<th>Females N=341</th>
<th>Total N=598</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;140/90mmHg</td>
<td>27.6%</td>
<td>26.1%</td>
<td>26.8%</td>
<td>&lt;0.5NS</td>
</tr>
<tr>
<td>Overweight (BMI 25.0-29.9kg/m²)</td>
<td>20.2%</td>
<td>24.3%</td>
<td>22.6%</td>
<td>&lt;0.3&lt;0.3&gt;</td>
</tr>
<tr>
<td>Obesity (BMI&gt;30kg/m²)</td>
<td>7.9%</td>
<td>24.3%</td>
<td>17.2%</td>
<td>&lt;0.001HS</td>
</tr>
</tbody>
</table>

NS=Not significant, HS=Highly significant

Table 3 Prevalence of overweight and obesity in age groups males and females together

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Overweight</th>
<th>Obesity</th>
<th>Overweight/obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-34</td>
<td>135%</td>
<td>103%</td>
<td>238%</td>
</tr>
<tr>
<td>35-44</td>
<td>22.3%</td>
<td>16.8%</td>
<td>31.2%</td>
</tr>
<tr>
<td>45-54</td>
<td>30.3%</td>
<td>20.5%</td>
<td>50.8%</td>
</tr>
<tr>
<td>55-64</td>
<td>20.8%</td>
<td>31.3%</td>
<td>51.1%</td>
</tr>
<tr>
<td>65+</td>
<td>21.4%</td>
<td>21.4%</td>
<td>42.8%</td>
</tr>
<tr>
<td>Total</td>
<td>22.6%</td>
<td>17.2%</td>
<td>39.8%</td>
</tr>
</tbody>
</table>

DISCUSSION

The communities were randomly selected without any knowledge as to the behaviour of blood pressure and the prevalence rates of hypertension in those communities. It is conceded, however, that without knowledge of the denominator population, almost certainly, we cannot be positive about the representativeness of the sample with respect to the study population as a whole.

Obesity as defined was noted in 17.2% of our study population as compared to 6.2% by Nube et al 5 and 5.7% and 7.4% amongst Civil Servants and Mampobri residents respectively 6,9. The Ghananian rates of obesity of 5.7-17.2% compare with 18.5% amongst citizens of the United Kingdom and 24.7% amongst the citizens of the United States of America 4.

The finding of the higher prevalence rates of overweight/obesity in females more than males, and the rising prevalence of body mass in both sexes with age are phenomena noted of other societies 10,11.

Hypertension

The prevalence of hypertension defined as a BP more than 140/90mmHg was noted in 26.8% of subjects of the communities. About that same time, a community study of Greater Accra, involving different communities from the current study, by Amoah, noted a rate of 28% in 4733 subjects 12. Earlier in 1975, Pobee had found amongst Mamprobi residents a rate of 25% in his 4703 subjects 13. The prevalence rate of 26.8% in our communities compared with 26.6% noted in Kpando in the Volta Region and 32% in Zebilla in the Upper East Region 14. Thus, with the caution indicated at the beginning of this discussion in mind, our study confirms the high prevalence rates of hypertension already noted in the Greater Accra Region. Previous studies reported above were about the Western and Eastern sub districts of Accra and at the very least, we have added other sub districts of Greater Accra Region.

Overweight/obesity and hypertension

That overweight/obesity is a risk factor for systemic hypertension is well documented in many societies, that we can only echo the saying attributed to Pickering, one of the giants in the field of hypertensionology: "The positive correlation (between body mass and blood pressure) has been so often as to leave room for no doubt" 15. Indeed this relationship was first noted of Northern Americans by Terry in 1923 16. Our finding of the positive relationship between body mass and hypertension in the community has confirmed Haddock's observation of patients attending the Korle Bu Teaching Hospital.

CONCLUSION

Our study shows that overweight/obesity is common in Ghana and that it rises with increasing age till the age of 65 years; and that overweight/obesity tended to be more common in females.

There was a high prevalence of hypertension in both sexes. There was a higher prevalence of hypertension in both sexes in the overweight/obesity than the normal weight persons in a ratio of 2:1. Thus obesity is a risk factor for hypertension.

REFERENCE


STATUS OF TRAUMA CARE IN GHANA

R.E. QUANSAH, C. MOCK and F.A. ABANTANGA
Department of Surgery, School of Medical Sciences, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana and Department of Surgery and Epidemiology, University of Washington, Seattle, WA, USA

SUMMARY
A survey of trauma capabilities was undertaken in Ghana. This evaluated the availability of expertise, supplies, equipment and clinical services at a range of health facilities, including 4PHC clinics, 8 district hospitals and 2 regional hospitals. The World Health Organisation (WHO) Essential Trauma Care Guidelines were used as a standard to assess the availability of certain critical resources. Low levels of availability of such critical resources and related treatment capabilities were identified, including airway management, chest tube insertion, blood transfusion and fluid resuscitation for patients in shock, wound toileting and orthopaedic care. Most of the deficiencies were low cost items. Improvements should be possible through organization and administration, with minimal increase in cost. The WHO’s Essential trauma Care Guidelines may offer a way in which to achieve such strengthened organization and planning for trauma services.

Keywords: Essential trauma care, health facility, Primary Health Care.

INTRODUCTION
Trauma is an increasingly significant cause of death and disability in Ghana as well as in most other African countries. In addition to improving road safety and other injury prevention efforts, the status of treatment of injured patients must be considered. It is well known that the facilities for care of injured patients are limited. There have been some efforts to evaluate and improve on the injury treatment situation in Ghana. There has also been a concerted international effort to increase and strengthen capabilities for trauma care globally. This has been carried out as a collaborative effort of the International Society of Surgery and the World Health Organization (WHO). This has been referred to as the Essential Trauma Care programme. This project has attempted to blend the two perspectives:

- International health work, including such efforts as the expanded programme on immunization, the essential drug list, the global TB programme and the safe motherhood initiative.
- Trauma system efforts that have been enacted in many individual countries, thus far, primarily developed countries.

The essential trauma care programme has been developing basic recommendations for what should be in place for trauma treatment in the spectrum of health facilities found around the world. This includes elements of human resources (training and staffing), physical resources (infrastructure, equipment, and supplies) and administrative mechanisms. It has been suggested that the template being developed by the WHO and the International Society of Surgery (ISS) could help to serve as model for the development of trauma services in countries around the world. In this regard, preliminary analysis of a random sample of health facilities in Ghana was undertaken to assess how well they met the WHO/ISS recommended essential trauma care model guidelines.

METHODS
Visits to randomly selected health facilities of varying levels were undertaken in the Ashanti, Brong Ahafo and Eastern regions of Ghana. A separate questionnaire was developed for each level (Health Care Centre, District Hospital or Regional Hospital). Interviews were conducted with doctors or other health workers who had first contact and/or primary responsibility for trauma patients on their arrival to that facility. These were usually junior doctors or nurses. In some cases, they may have been the ones providing all initial and subsequent definitive care. In some cases, they may have been providing only the initial care prior to contacting more senior doctors at the hospital or prior to referring the patient onward. Interviews utilized the standardised questionnaires and took approximately one hour to conduct at each site. In

*Author for correspondence
addition to those capabilities mentioned, the interviewer asked each hospital for available documentation on the numbers and types of trauma patients which that hospital was treating. All interviews were conducted by one interviewer (Dr. Robert Quansah).

RESULTS
Table 1 gives details of the levels of the health facilities and their geographic sites in the survey.

Table 1 Facilities visited

<table>
<thead>
<tr>
<th>Region</th>
<th>Regional hospitals</th>
<th>District hospitals</th>
<th>Primary health care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashanti</td>
<td>Asoro Manso</td>
<td>Kaseli</td>
<td>Mampong</td>
</tr>
<tr>
<td></td>
<td>Ejura</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mamprong</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ofinso</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nkenkenso</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brong-Ahafo</td>
<td>Sunnyani</td>
<td>Attehbu</td>
<td>Abobu</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kintampo</td>
<td>Amanet</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastern</td>
<td>Koforidua</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tables 2 through 4 indicate the compliance of each level of health facility with the essential trauma care guidelines. No hospital or health facility of any level was able to provide documentation on number of type of trauma patient on admission.

Table 2 facilities for care of the injured at regional hospitals

<table>
<thead>
<tr>
<th>Documentation of trauma cases</th>
<th>Sunnyani</th>
<th>Koforidua</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV fluids for emergency resuscitation</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Splinting of fractures</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>POP application</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Pressure bandaging on emergency basis</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Wound toileting on emergency basis</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Internal fixation</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>External fixation</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Advanced airway management (e.g. intubation) on emergency basis</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chest tube insertion on emergency basis</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Regional hospitals (Table 2) generally has sufficient capabilities for initial fluid resuscitation, as well as for initial management of fractures including splinting and pressure bandaging. There were, however, limited capabilities for prompt wound toileting. Likewise, there was no capability for internal or external fixation. Finally, these hospitals did not have chest tubes or under-water seal drainage bottles available for the care of trauma patients. Likewise, they did not have capabilities for advanced airway management on an emergency basis such as endotracheal intubation. Such capabilities may have been available on a more elective basis in the operative theatres, but were not available in the casualty wards.

The results of the evaluation of district hospitals are shown Table 3. It should be mentioned that two of these district hospitals were upper level facilities that functioned a bit more like regional hospitals rather than true district hospitals. This included Mampong and Techiman. These two hospitals routinely had better facilities for the care of injured patients than did the other hospitals. The capabilities for fluid and blood resuscitation were very limited at all hospitals except the two larger ones (Techiman and Mampong). Most hospitals did have capabilities for blood transfusions. These were usually arranged on the spot with capabilities of only providing one, or at most, two units of blood. Capabilities for splinting of fractures were available but very limited and felt to be inadequate. Capabilities for POP application were present at the two larger hospitals. Most of the smaller ones did not have this and, likewise, did not have X-rays facilities. Capabilities for wound toileting were very limited. Simple airway management was felt to be present but of questionable quality especially on an emergency basis. Oral airways and oxygen were usually available in the theatre, but not on an emergency basis in the casualty ward. There was no ready access to suction. Chest tubes were felt to be available on an urgent but not truly emergent basis in Techiman and Mampong. They were not available at tall in the other hospitals.

Evaluation of capabilities of the primary health care (PHC) facilities is shown in Table 4. Trauma cases were indeed brought to these facilities, but then referred promptly on to hospitals. These referrals were usually performed without even minimal first aid being provided. Specific capabilities are outlined in the table. It should be mentioned that intravenous fluids were indeed available at some of these facilities, but were usually reserved for use with obstetric patients or for administration of medications. They were not used for resuscitation of trauma patients. There were no splinting capabilities for fractures. Materials for pressure bandaging may have indeed been available but were not routinely used even to stop active bleed-
Table 3 Facilities for care of the injured at district hospitals

<table>
<thead>
<tr>
<th></th>
<th>Asoro</th>
<th>Manso</th>
<th>Ejura</th>
<th>Mampong</th>
<th>Offino</th>
<th>Nkenkenso</th>
<th>Atebubu</th>
<th>Kintampo</th>
<th>Techiman</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documentation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>IV fluid for</td>
<td>Limited</td>
<td>Limited</td>
<td>+</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
</tr>
<tr>
<td>emergency</td>
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<td></td>
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<td></td>
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<td>resuscitation</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>Limited</td>
<td>Limited</td>
<td>+</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
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<tr>
<td>Splinting of</td>
<td>Limited</td>
<td>Limited</td>
<td>+</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
</tr>
<tr>
<td>fractures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>POP application</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>Pressure bandaging</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Wound toiletting</td>
<td>Limited</td>
<td>Limited</td>
<td>+</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
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<tr>
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Table 4 Facilities for care of the injured at primary health care (PHC) clinics

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<td>Pressure bandaging</td>
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<td>BP measurements</td>
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<tr>
<td>Simple airway</td>
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*Not for trauma cases, e.g., IV fluids and BP measurement used for some cases, such as obstetrics, but not for trauma cases.

In all cases they listed difficulties with personnel, training, equipment and supplies. They also indicated that there were no clear regulations on what should be in place at their facilities for the care of injured patients. This lack of regulation lead some doctors, especially those at regional hospitals, to be afraid to perform procedures out of fear of complications. Likewise, at the primary health care centres, the staff felt there was no policy towards trauma. Their main tasks and training were felt to be for maternal-child health and outpatient curative services, but not trauma care, even the provision of basic first aid.

DISCUSSION

Trauma is well known as a major source of death and disability in developed countries. Its importance in developing countries is often not fully appreciated, and as such solutions to the growing problem of trauma in developing countries have not been well addressed. Such solutions need to address the prevention and all aspects of trauma care including pre-hospital and hospital based care.
Although improvements in prevention and pre-hospital care are of great importance, cost effective ways to improve upon hospital-based care must also be considered. Improvements in training for trauma care in the emergency room setting and ensuring the available resources are used more effectively have been identified as possible priorities. It must be noted that, any improvement must fit within the tight financial constraints of developing countries.

The study methodology was limited by the fact that, only few facilities at each level could be visited within the time frame of the study. In this regard, facilities in only three of Ghana’s ten regions were evaluated. Moreover, the visits were only 1 hour in length and hence only around 10 of the more than 200 Essential Trauma Care criteria could be assessed. However, some of the most critical ones were assessed. Despite these limitations, we feel that the data do allow us to draw some meaningful conclusions regarding the status of trauma care facilities in Ghana.

Overall, this study found low compliance with the basic elements laid out in the Essential Trauma Care guidelines developed by the WHO/ISS. There has been no, or at best, minimal progress since a similar pilot study was conducted on the capabilities of hospitals along major roadways in Ghana. The study demonstrated minimal training of doctors and nurses for care of trauma patients even in hospitals located along the major roadways, all of which had high trauma volumes. That study also demonstrated a dearth of emergency equipment including chest tubes and airway equipment. The current survey demonstrated virtually no change in the past three years.

Almost all of the items that were shown to be lacking are not expensive. Their absence cannot be attributed to cost alone. It is likely that their presence and proper use could be improved through organization and planning, with limited increases in cost. It is likely that many lives could have been saved by improved attention to such details.

CONCLUSIONS
Trauma care in Ghana could be strengthened by employing the WHO/ISS Essential Trauma Care Guidelines. Clearly stated, reasonable, feasible, and low cost standards need to be set at the range of health facilities in Ghana. This includes capabilities for trauma treatment at primary health care centres, small district hospitals, larger district hospitals (especially those located along major roadways), and regional hospitals. After creation of these standards, an implementation plan needs to be developed as to ways in which compliance with the standards can be promoted. This might include plans for optimizing training for doctors and nurses, plans for assuring supplies and equipment, and plans for instituting basic medical audit programmes.

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SMALL INTESTINAL MUCORMYCOSIS: A CASE REPORT

J.C.B. DAKUBO, H. AKOTO, MABEL ABOAH, R. KUMODJI and S.B. NAAEDER
Departments of Surgery and Pathology, University of Ghana Medical School, P.O. Box 4236, Accra.

INTRODUCTION
Mucormycosis is a rare but serious fungal infection that rapidly attacks and usually kills its untreated victims. It is caused by the large, non-septate, branching and saprophytic fungus of the genera mucorales.

Gastrointestinal Mucormycosis is rare with the gastroduodenal form the most commonly reported followed by that of the colon. Involvement of the small intestine is very rare with only two reports of the ileal disease found in the literature. Antemortem diagnosis has been stressed as important for effective treatment and given the rarity of the small intestinal disease a high index of suspicion, based on sound knowledge of the macroscopic features of the diseased bowel, is mandatory at surgery to enable early diagnosis and effective treatment.

A case of small intestinal mucormycosis diagnosed postmortem in a thirteen-year-old boy is presented and the literature reviewed.

CASE REPORT
A thirteen-year-old boy was admitted to the general surgery department of the Korle-Bu Teaching Hospital on 26th July 2003 complaining of mild abdominal pain and vomiting for four days. The abdominal pain was constant and located in the lower abdomen. The pain became generalized and severe with associated distension, constipation and fever three days prior to presentation. These symptoms were preceded by a week’s history of headache, palpitations, fever, chills and dry cough for which reason he was treated for malaria elsewhere. He appeared to have improved on this management but his condition deteriorated three days prior to presentation. He was neither a known diabetic nor a sickle cell anaemia patient and was not on any regular medication before the onset of the symptoms. He was febrile on examination, with severe dehydration. He was neither anaemic nor jaundiced. Besides a tachypnoea of 30/min, the respiratory system was unremarkable. A regular pulse of good volume at 100/min and a blood pressure of 110/60mmHg were recorded. The abdomen was distended with generalized tenderness, rebound tenderness and guarding. Bowel sounds were absent. The rectum was empty with smooth mucosa.

A diagnosis of peritonitis secondary to typhoid perforation was made and the patient prepared for surgery. His haemogram was; Haemoglobin-12.6g/dl, WBC-7.1 × 10^9/L (Neutrophils-63%, Lymphocytes-37%). The serum sodium was 143mmol/L, the potassium - 4.1mmol/L, urea - 18.1mmol/L, creatinine - 151umol/L, total protein-58g/L and albumin-29g/L. The HIV screening test was negative.

A Foley’s urethral catheter was passed and the urine output monitored. He was resuscitated with fluids given intravenously (Normal saline and Ringers Lactate), antibiotics (Metronidazole and Ciprofloxacin), and analgesics (Pethidine). Laparotomy was done ten hours after adequate resuscitation.

A 1.5cm wide ileal perforation at 9cm from the ileocaecal junction and between the mesenteric and antimesenteric borders of the ileum was found. A few ileocaecal mesenteric lymph nodes were enlarged. The Peyer’s patches were not inflamed. A segment of the bowel with the perforation was resected with 3cm margin and an end-to-end, double layer, inverting anastomosis done with chromic 2/0 suture.

He recovered from the surgery and was started on supplementary oral fluids on the fifth post operative day. There was a discharge of faecal matter from the wound on the 8th day and he developed peritonitis on the 10th day for which reason a relaparotomy was done the same day.
The findings at operation were:
1. Two areas of segmental necrosis of the ileum. The distal segment was 10cm long and extended to the ileoceleal junction. The second was 10cm proximal to the distal necrosed segment and was 6cm long. The necrosis extended into the adjoining mesentery.

2. There were six other isolated perforations; five involving the ileum and one the jejunum. The largest was 6cm and the smallest 3cm wide.

A right hemicolectomy was done with ileotransverse anastomosis. The perforated segment of jejunum was resected and an end-to-end anastomosis performed.

A diagnosis of enteritis necroticans (Pig-bel) was suspected at this second laparotomy based on the necrotizing nature of the lesions. The patient died twenty-four hours after surgery from severe sepsis causing multiple organ dysfunction.

Trichuris trichura were found in the contents of the resected bowel. Cultures of ileocecal exudates were not done. A microscopic examination of histological sections of the resected specimen stained with haematoxylin and eosin and accentuated with a Grocott stain revealed extensive areas of infarcted bowel and the adjoining mesentery as well as the large, thin-walled, nonseptate, branching fungal hyphae invading the bowel wall and showing a predilection for vessels as shown in Figures 2 and 3. The diagnosis of mucormycosis was thus made postmortem.

**DISCUSSION**

Mucormycosis is a relatively uncommon, frequently fatal, opportunistic fungal infection of the genera *mucorales*. Species pathogenic to man in this genera include: *Rhizopus, Absidia, Mortierella* and *Mucor*.

They are saprophytic and ubiquitous, thriving on dead and decaying organic matter including bread.

These fungi have little intrinsic pathogenicity in normal host but can cause serious infections in those immunocompromised by age, drug therapy, malnutrition or underlying disease. Not infrequently an underlying predisposition is not demonstrable in affected individuals, and fatal cases of invasive infection not associated with obvious systemic disease have been reported.

Classical pathological forms of mucormycosis include rhinocerebral, pulmonary, skin and soft tissue, gastrointestinal and disseminated disease. The gastrointestinal form is uncommon and most reports have come from Southern Africa. It has
been reported sporadically in America, Europe and Asia. The gastroduodenal disease, which frequently complicates chronic peptic ulcer, is the commonest followed by that of the colon. Small intestinal disease is extremely rare with two reports of the ileal disease made in the literature.

Local abnormalities of the gastrointestinal tract have been emphasized as predisposing to the disease in the gut. Peptic ulcer disease, amoebic colitis, post-traumatic peritonitis, gastroenteritis, typhoid enteritis, pellagra and Kwashiorkor are the local gut abnormalities described. The case being reported had Trichuris trichura in his gut and was malnourished (with a serum total protein of 59g/L and albumin of 29g/L) which could be the predisposing factors to the fulminating disease noted.

The pathogenesis of gastrointestinal mucormycosis is unclear, however, ingested spores can germinate and invade the mucosa through a chronic peptic ulcer or ulceration in the gastrointestinal mucosa in the course of debilitating illness. Gastrointestinal haemorrhage, obstruction or perforation (as was noted in the case presented) with dissemination of the infection may then occur.

While mucormycosis should be regarded as a serious and potentially life-threatening condition, it presents with a spectrum of severity and occasionally assumes an indolent and less aggressive course. When gastrointestinal mucormycosis presents as invasive fungal infection the prognosis is extremely poor.

With the invasive disease the gross appearance of the lesion on the gut is characteristic and at laparotomy should aid diagnosis. The characteristics include:

1. The size of the lesion from the serosal aspect is much larger than would be expected in the usual ulcer from peptic, typhoid or amoebic ulceration.
2. There is extreme hardness of the surrounding tissue.
3. There is a characteristic black appearance of the serosa.
4. There is a zone of hyperaemia between the black area and the normal bowel wall.

5. Seen from the inside, the obvious feature of the ulcer is the amount of black necrotic tissue as opposed to the white slough of peptic or typhoid ulcers.

If perforation occurs, as is frequently so in intestinal disease, these feature may be missed.

Diagnosis of gastrointestinal mucormycosis is difficult, but this is more so with the intestinal type. With improvement in diagnostic techniques ante-mortem diagnosis (an essential for effective treatment) is becoming possible. Cultures of exudates and aspirates from affected bowel have persistently yielded no growth; growths have however been achieved from cultures with tissue biopsy.

Histology of resection specimen occasioned by intestinal obstruction or perforation gives the diagnosis in most cases. Tissue invasion by the hyphae of mucormycosis must be seen microscopically to establish the diagnosis, but tissue culture is required to identify the fungal species involved.

A serological assay based on immunodiffusion for fungal antibodies holds promise for early diagnosis. Preliminary studies with this test indicate that it is specific for mucormycosis but cross-reaction occurred among the species in the genera. It demonstrated a sensitivity of 73% with a high negative predictive value.

Intravenous Amphotericin B is the mainstay of treatment in a daily dose of at least 0.8-1.0mg/kg. Surgical debridement (resection) to remove all infected material is a necessary adjunct as the presence of necrotic tissue prevents distribution of the drug to infected tissue.

Given the high mortality of the disease, attention should turn towards prevention since a source of infection could be removed if clustering of infection is recognized to come from a common source, e.g., contaminated ventilation system in hospital, or surgical dressing material. The development of other preventive measures depends on detailed knowledge of the role of the factors predisposing to mucormycosis. In the gastrointestinal disease attention should focus on the unifying factor in the myriads of factors that predispose to fungal infiltration and invasion.
REFERENCES


A CASE OF AMELIA: WHAT ARE THE IMPLICATIONS?

J.D. SEFFAH, K.A. AMPOFO, E.K. SROFENYOH AND I.O. KORENTENG
Departments of Obstetric and Gynaecology, University of Ghana Medical School and Korle Bu Teaching Hospital, Accra, Ghana.

SUMMARY
A case of Amelia (a skeletal dysplasia with failure of formation of all four limbs) is presented. The patient, aged 36, has had a previous normal baby. The index pregnancy was supervised at a polyclinic. An ultrasound examination was done to confirm the pregnancy at 11 weeks. She was referred to the Korle Bu Teaching Hospital at 42 weeks of gestation. She had a successful induction of labour and delivered a live 1.95kg male infant with no limbs. The neonatologist detected no other abnormalities. The Social Welfare department adopted him as the very depressed parents rejected him.

We advocate routine obstetric scan at 18-20 weeks gestation to detect anomalies. Apart from effective counselling, both medical and social support services should be improved for adequate and appropriate management of congenital malformations.

Keywords: Amelia, ultrasonography, management, implications

INTRODUCTION
Skeletal dysplasias are a heterogeneous group of disorders that affect the development of chondroosseous tissues and result in abnormalities in the size and shape of different segments of the skeleton.

Limb buds first appear during the third week of gestation with the upper limb buds appearing a few days before the lower limb buds. Failure of formation of the limb primordia during early embryogenesis may be secondary to vascular, mechanical or teratogenic exposure.

The aetiology may be genetic and a Mendelian pattern of inheritance has been described. The common factor underlying all these agents may be hypoperfusion of specific areas of the embryo due to vascular disruptions. The incidence is known to be 2.4 in 10,000 births globally but the incidence in Ghana is not known.

This is the first reported case of Amelia in the Ghanaian literature and this paper seeks to highlight its occurrence and the pragmatic measures for early detection.

CASE REPORT
A 36-year-old lady, para 1, was referred to the Korle Bu Teaching Hospital (KBTH) at 42 weeks gestation because she was post-date. She had been a regular attendant at the Mamprobi Polyclinic. She had had an early ultrasound to date the pregnancy at 11 weeks gestation.

Her booking haemoglobin was 11.0g%, and the sickling test was negative. Her glucose-6-phosphate dehydrogenase (G6PD) status was normal. Her blood group was A Rhesus positive. The venereal disease research laboratory (VDRL) test for syphilis was non-reactive. Her urinanalysis was normal. The fasting blood sugar (FBS) and 2-hour postprandial blood sugar level (2HPP) were within normal ranges. She had an uneventful pregnancy labour and delivery four years earlier. The child (a boy) was alive and healthy and with no congenital abnormality.

Although an asthmatic, she never had an attack throughout the pregnancy. She had no family history of diabetes, sickle cell disease, asthma, hypertension or congenital abnormalities.

She was a seamstress who was married to a driver. Both did not smoke or drink alcohol. She was prescribed routine antenatal medications of fersolate, folic acid, and weekly daraprim. She took a “lot of tea and salt for bouts of fever”.

Author for correspondence
The patient was admitted at the maternity ward of the KBTH. Her general condition was satisfactory. She was not pale or jaundiced. She had no peripheral lymphadenopathy. The thyroid gland and the breast appeared normal. She was normotensive and her chest was clinically clear.

Apart from the gravid uterus, no abnormality was detected in the abdomen. The symphysio-fundal height (SFH) was 36cm and the fetus was presenting with the vertex. The fetal heart rate was normal at 136 beats per minute. A pelvic examination showed a Bishop score of 6 (denoting the response of the cervix to induction). After counselling her about the need to induce labour at 42 weeks as well as possible complications such as ruptured uterus and foetal death, she agreed to induction of labour, which was performed, with intravaginal application of 50 microgram misoprostol. Her labour was monitored with the partograph. There was no fetal distress and the induction to delivery interval was approximately 4 hours 15 minutes. The main findings at birth were:

- Live 1.95kg male infant with no limbs. There was a small appendage on the left shoulder. There was no cardio pulmonary distress. The neonatologist examined the baby further but detected no other gross anomaly.
- The placenta weighed 550g, and was delivered by controlled cord traction.
- 3 vessels were seen in the umbilical cord.
- Estimated blood loss was 400mls.
- The external genitalia were well developed with 2 testes in the scrotum.

The parents were very depressed and rejected the baby. After a week of admission at the maternity ward, the Social Welfare Department adopted the baby.

**DISCUSSION**

Amelia is the complete absence of the skeletal parts of the upper or lower limbs with no bony structure distal to the defect. Total amelia affects all four limbs. This unfortunate malformation generally is a random event, but is occasionally seen in specific syndromes associated with other congenital anomalies.

Multiple organ system defects have been associated with amelia, or limb reduction abnormalities including cardiovascular, gastrointestinal, urogenital, skeletal, neural, tube, and respiratory anomalies.

Amelia is a rare finding and it is associated with medical, social and ethical implications. Some questions to be answered therefore were:

- Shouldn't the diagnosis have been made antenatally?
- What could have been the aetiology?
- What should have been the antenatal management?
- What should have been the subsequent management after birth?

At 36 years of age, the patient should have benefited from prenatal diagnosis employing maternal alpha-feto proteins and obstetric ultrasonography. She had an early scan at 11 weeks gestation, which confirmed intrauterine pregnancy and excluded any pelvic pathology. She should have however, had another ultrasound examination at about 18 to 20 weeks of pregnancy because examination at this gestation should be able to pick up any gross anomaly such as anencephaly, achondroplasia, hydrocephalus, amelia, phocomelia. That the patient had only one sonographic examination at 11 weeks shows that the useful technology is not being used adequately and efficiently. Sonography has also a value in the mother's autonomy. Because of its pictorial nature, it affords the ease of disclosure by the physician to the patient adequate information about the fetus and its management; it simplifies the information on the fetus; and therefore further generates voluntary decision by her to authorize or refuse a clinical management. Sonography further helps in humanizing care, by making antenatal supervision pleasant.

There is no literature support that “tea and salt” combination is useful in treating febrile diseases. Such self-administration with concoctions should not be tolerated in pregnancy because one must be wary of teratogens, which may not be as well documented as thalidomide or warfarin.

The differential diagnosis of amelia include phocomelia in which extremities resemble those of seal since the intervening arms and legs are absent; the Robert's syndrome (phocomelia with facial clefting defects or hypoplastic nasal alae); and the Crebe's syndrome (autosomal recessive condition, described in the inbred Indian tribes of Brazil, characterized by marked hypomelia of upper and lower limbs, increasing in severity from proximal to distal segments — in contrast to Robert’s syndrome, the lower limbs are more affected that the upper extremities).

Although the teratogenic potential of thalidomide has been well documented, the spontaneous occurrence of amelia and limb reduction defects in the general population is rare. Most cases have no specific aetiology, but some are seen in association
with genetically transmitted disorders such as Robert’s syndrome.

The current case, which had no limbs at all, could have developed as a result of spontaneous mutation. If the diagnosis had been made antenatally by ultrasound scan at 18-20 weeks, the patient would have had the best option of management. After counselling she could have had a termination of pregnancy, which is legal in this circumstance. She could have decided to carry on with the pregnancy and delivery. Neither could have resulted in such serious emotional outbursts; depression and rejection.

Prenatal diagnosis including ultrasound examinations around 18-20 weeks of pregnancy to exclude gross fetal anomalies should be encouraged in all obstetric practice. Pregnant women should always be educated to avoid unproven medications including herbal concoctions, which may be injurious to the development of the fetus.

ACKNOWLEDGEMENT
The authors wish to acknowledge contributions of Dr. C.F. Peterson, Ms Mary Dadzie, Principal Nursing Officer and all staff of the Maternity 5 and Neonatal Intensive Care Unit, Korle Bu Teaching Hospital, who contributed to the management of this patient.

REFERENCE


REVIEWERS FOR 2004

The Editorial Committee would like to thank all those who gave generously their time and expertise in reviewing papers for the Ghana Medical Journal in 2004. We apologize to any reviewer whose name has been inadvertently left out from the list.

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FELLOWSHIP & SPECIAL COMMENDATION AWARDS PRESENTED AT THE 2004 ANNUAL GENERAL CONFERENCE AT CAPE COAST

FELLOWSHIPS

DR. EDWARD NWINYOUR GYADER
Edward Gyader, you were born at Nandom in the Upper West Region and attended Tamale Secondary School. You qualified as a doctor at the University of Bologna and later as surgeon at the University of Padova between 1966 and 1977. You returned home in 1978 and was appointed Senior Medical Officer in the Ministry of Health and posted to Jirapa Hospital as Medical Superintendent and Surgeon in Charge. You have spent all of your professional practice since, in Jirapa and Wa, with a short spell in Burkina Faso. In fact on many occasions you have been left as the only doctor and surgeon in the Wa Regional Hospital and sometimes in the entire Upper West Region.

Your contribution to the health sector during this period includes holding administrative positions in the hospitals you worked in as well as practicing as a surgeon. You also served on the Central Council of the Ghana Red Cross Society, chaired the Upper West Regional Consultative Council; was the Presiding member of the Lawra District Assembly (1989 – 1992) and member of the 1991/2 Consultative Assembly which drafted the current constitution of Ghana.

You served on the Executive Council of the Association from 1997-2001 and as the Upper West Divisional Chairman from 1995-2003. During this eight year period you gave of your time, experience and wisdom to the advancement of the Association. From 1995 to 2000 you also served on the Medical and Dental Council.

You are a sportsman adept in hockey, lawn tennis, athletics and hunting. Your interest in sports is confirmed by your chairmanship and vice chairmanship of the Wa Lawn Tennis Association and the Wa Hunters Association respectively. You also have political inclinations and presently you are the Regional Chairman of the People’s National Convention (PNC).

For your dedicated service to the health sector you received the Meritorious Regional Award for the Upper West Region in 2003 and the Director-General’s Special Award in 2004.

Edward Gyader, surgeon and medical administrator; Council salutes you and confers on you this day its highest honour of Fellow of the Ghana Medical Association, with its rights, privileges and responsibilities, in recognition of your dedicated service to your profession, Association and country.

DR. JAMES BOAKYE FORDJOUR
Born at Asuweyi-Techoinan in the Brong Ahafo Region you gained admission to the University of Ghana Medical School after your secondary education at Prempeh College in Kumasi. You graduated from the Medical school in 1979 and did your house job at the Korle Bu Teaching Hospital. In 1980 you were transferred to your home region – Brong Ahafo and have since then spent all of your professional life working in various hospitals at various positions in the region. You are today one of the longest serving medical practitioners in the region.

In your professional career you have served as the Superintendent of the Sunyani Regional Hospital on three separate occasions and in charge of Obstetrics and Gynaecology at the hospital. You have also helped train several young doctors in Obstetrics and Gynaecology your chosen area of clinical interest.

You have served the Brong Ahafo division of the Association well especially in your capacity as Treasurer during which period you mobilized resources to improve the financial standing of the division. You have been a resource person for continuing medical education activities in the Association at both divisional and national levels. You also host a weekly radio programme on health and related issues which has high patronage earning you the great compliment “People’s Doctor”.

The Council of the Ghana Medical Association today draws attention and commends you for your invaluable service to your country, the region of
your birth and your Association by presenting to you this Special Commendation Award.

PROFESSOR AGYEMAN BADU AKOSA
Born on Christmas day, you attended Prempeh College and proceeded to the University of Ghana Medical School and graduated in 1979. After your house jobs, you worked as a Demonstrator in Pathology for two years before leaving for the United Kingdom for further studies in Pathology at the Royal Postgraduate Medical College in 1982. You obtained your membership of the Royal College of Pathologists in 1988. You returned home in 1995 as an Associate Professor of Pathology at the University of Ghana Medical School. You were promoted Full Professor in 1997. You have kept abreast with your discipline of dermatopathology through publications and attendance at meetings.

Your involvement in medical politics dates back to your student days at the medical school where you were the President of the Medical Students Association. During that time you brought together medical and pharmacy students. You had a taste of the military when you were drilled by soldiers during the invasion of Korle Bu compound in the heat of Union Government and the Professional Bodies Association. You later became the Secretary of the Junior Doctors' Association.

On your return home from the UK you became the Chairman of the Greater Accra division of the Association and in 1999 stormed the AGM at Ho to be elected the President of the Association. Your contribution to the improvement of the lot of medical and other health personnel are numerous and include winning the “battle” for the Ridge Hospital, introduction of Additional Duty Hours Allowance, institution of Annual Lectures series, acquisition of land and cars for doctors. Your support for the Association continued after your presidency; you continue to serve on committees and participate actively in Association affairs. As Director-General of the Ghana Health Service you provide support, both financial and material for the Association’s activities.

You have published in scientific journals but even more is your articulation of medical issues of public health importance in the lay press covering topics like the brain drain, water and the economy. You continue to march towards achieving “Imagine Ghana Free of malnutrition” and a Ghana free of the hazards of tobacco.

Your alma mater, Prempeh College has benefited from the innovations you have introduced as President of the Old Students’ Association.

Professor Agyeman Badu Akosa, pathologist, medical administrator and wellness advocate your dynamic leadership is recognized and Council has decided to award you its highest honour of Fellow of the Ghana Medical Association. Accept this honour and with it all its rights, privileges and responsibilities.

PROFESSOR DAVID OFORI-ADJEI
You graduated in 1975 from the University of Ghana Medical School after attending Mfantsipim. Following postgraduate training in Ghana and Edinburgh, you returned home in 1982 and joined the University of Ghana Medical School as a lecturer in Medicine. You subsequently studied Clinical Pharmacology at the Karolinska Institute in Stockholm, Sweden. Since 1985 you have spent your academic and professional career in the service of Ghana.

You have contributed immensely to the development of Clinical Pharmacology in the University of Ghana Medical School and made the Centre for Tropical Clinical Pharmacology and Therapeutics well-known for its work on the promotion of rational use of medicines. You co-supervised the first two candidates to obtain the Fellowship of the West African College of Physicians by examination.

Your contribution to tropical diseases research and clinical pharmacology has resulted in many scientific publications and presentations at conferences. As the current Director of the Noguchi Memorial Institute for Medical Research your characteristic zeal in building research excellence is demonstrated in the changes occurring at the Institute, physically and scientifically.

You have been involved in the development of national treatment guidelines since the late 1980s. You helped found the International Network for the Rational Use of Drugs and in Ghana have drawn to this network a group of young physicians, pharmacists and social scientists who are all contributing to the advancement of the quality use of medicines. You have made your expertise available to international bodies like the World Health Organization as a member of a number of Expert Groups or Panel, and the United States Pharmaceutical Convention. Your contribution to malaria
control was recognized by the Ministry of Health in 1995 and you currently chair the National Coordinating Committee of the Roll Back Malaria Initiative. In 2004, Health Care Link, an NGO, also recognized your contribution to the health sector with an Award.

As the Editor-in-Chief of the Ghana Medical Journal you have worked with your team of editors to bring the journal back to life. You have also been able to source for funds to equip a secretariat for the journal. You have participated in several continuing professional development courses as a facilitator; and made presentations at the Associations Annual Conference. You represented the Association on the then Pharmacy Board and the Board of GIHOC Pharmaceuticals.

Professor David Ofari-Adjei, you have taught, done research and offered considerable service to your country, profession, the Association and the world at large. In recognition of these Council grants you its highest honour of Fellow of the Ghana Medical Association with all its rights, privileges and responsibilities.

**SPECIAL COMMENDATION**

**DR EDITH MAWUNYO ACKUAKU**

You graduated from the University of Ghana Medical School in 1983 and subsequently trained in Ophthalmology obtaining the Membership of the Royal College of Ophthalmologists and the Fellowship of the West African College of Surgeons.

Your contribution to the Ghana Medical Association dates back to the year after your graduation from Medical School with your regular attendance at divisional and the Annual General Meetings. You served as Assistant Honorary Secretary of the Association in 1998/99 and the Honorary Treasurer from 1999 to 2002. You have also served on several committees of the Association and represented the Association on many national committees. You are particularly noted for your contribution to the publication of the Association’s handbook on ethics and the guidelines for locum practice. You have also reviewed articles for publication in the Ghana Medical Journal.

In your chosen specialty of ophthalmology you have provided leadership as Honorary Secretary of the Ophthalmological Society of Ghana; and Honorary Secretary and subsequently Vice President of the Glaucoma Association of Ghana. You have also been active in the Society of Ghana Women Medical and Dental Practitioners.

As a lecturer in the Ghana Medical School and ophthalmologist at the Korle Bu Teaching Hospital you contributed to the development of manuals on eye care and promoted your interest in corneal diseases and Vitamin A deficiency. Presently, you are involved in improving eye care services in The Gambia and chair the National Eye Care Senior Management Team as well as the Corneal Ulcer Services Coordinating Body among other responsibilities.

The Council of the Ghana Medical Association acknowledges your contribution to the country, the Association and your professional specialty and presents to you this Special Commendation Award.
The joint 20th Triennial Consultation/Conference of the Commonwealth Medical Association and the 46th Annual General Conference of the Ghana Medical Association

THEME: “ACHIEVING MILLENNIUM DEVELOPMENT GOALS: MATERNAL MORTALITY, CHILD SURVIVAL, HIV/AIDS AND GENDER”

November 7-14, 2004. Elmina and Cape Coast

ADDRESS BY THE PRESIDENT, PROFESSOR YAW ADU-GYAMFI
AT THE OPENING CEREMONY ON NOVEMBER 10, 2004

On behalf of the Executive Council of the Ghana Medical Association and on my own behalf I warmly welcome H.E. the President of the Republic of Ghana, Mr. John Agyekum Kufuor, to the 20th Triennial Consultation/Conference of the Commonwealth Medical Association and the 46th Annual General Conference of the Ghana Medical Association. We are grateful to you, Your Excellency for your gracious acceptance of our invitation to be our Special Guest of Honour on this historic day, despite your busy schedule at this critical time of electioneering. This is the first time the Commonwealth Medical Association is holding its Consultation Conference in Ghana and the second time in Africa. We are privileged and honored that you are here with us.

We also welcome and thank you, Your Eminence, Cardinal Peter Appiah Turkson, for your prayers and presence. Hopefully, with your prayers the rays of heaven may shed their influence to guide us to enlightened deliberations and fruitful conclusions.

I also welcome the Central Regional Minister, Hon Mr. Isaac Edumadzie, and the Hon. Minister of Health, Dr. Kwaku Afriyie, to the function and particularly thank the Regional Minister for his enthusiasm and help in organizing this event in Cape Coast.

Nana Omanhene of Oguna and your retinue, I welcome and thank you for being here to lend colour and culture to the occasion.

I warmly welcome Dr. P. Krishna, President of the Commonwealth Medical Association, and the Presidents and Chairmen of Council of all the Constituent National Medical Associations from Bangladesh, Britain, India, Malaysia, Mauritius, Nigeria, South Africa and Uganda, who have made it to Ghana to attend this Consultation Conference. We thank the Council of CMA for bringing the Conference here which means that the next President of Common Medical Association will come from Ghana. I hope you will find our country congenial and enjoy our proverbial hospitality and decide to stay here forever after this week. I bid you most welcome.

A special welcome is extended to H.E Mr Alfred Salia Fawundu, Resident Director, UNDP, Ghana Office, who is our Guest Speaker for this Ceremony. I expect that we shall be treated to his usual provocative and helpful suggestions which are distinctly pro-Ghanaian. We thank you for all the help you have given the Association. I also recognize H.E Dr Melville George, WHO Representative in Ghana for his attendance and support for our Scientific Sessions.

Let me recognize and welcome all the representatives of our Sister Professional Associations who have honored our invitation.

I congratulate the Central Division of our Association and the Planning Committee for putting together such an impressive programme despite all the scares and uncertainties. Well done!

Your Excellency, Distinguished Ladies and Gentlemen, let me start my address by drawing your attention to the fact that health has been enshrined as a human right in the United Nation’s Charter. It has also been defined as “the state of complete physical, mental and social wellbeing and not
merely absence of disease”. In 1978 under the auspices of the United Nations, Health Experts met in Alma Ata, Tashkent, in the then Soviet Union, and declared that there would be “Health for all by the Year 2000”. Obviously this goal was not realized and there are considerable residual problems. These problems have been subsumed under the eight point declaration of the Millennium Development Goals which states that by the year 2015 most developing countries worldwide will have been able to:

- Reduce extreme poverty and hunger by 50%
- Achieve universal primary education
- Promote gender equality and empower women through equity in education
- Reduce child mortality
- Improve maternal health by reducing maternal mortality by 75%
- Combat HIV/AIDS, malaria and other diseases
- Ensure environmental sustainability and
- Develop global partnership for sustainable development.

Analysis of the eight point declaration I have just mentioned will indicate that all of them are health related and pose quite a challenge to all of us.

His Excellency Mr Kofi Annan, Secretary General of the United Nations and our Distinguished Com-patriot, had this to say about the Millennium Development Goals and I quote: “A world not advancing towards the Millennium Development Goals will not be a world at peace. And a world awash in violence and conflict will have little chance of achieving the goals. But if the common ground we used to stand on no longer seems solid we must seek new common ground for our collective efforts”. End of quote.

On the eve of the fifth milestone for global health, and in regard to our own deliberations during our scientific sessions, Mr Kofi Annan’s words have significant import for all the Commonwealth National Medical Associations including Ghana Medical Association. His words “changing the common ground” should challenge us, the national medical associations, to refocus on health, poverty and the millennium development goals and declare joint new initiatives aimed at facilitating our efforts through:

- Constant dialogue with our governments and other stakeholders on issues of Healthcare Financing and
- Accelerated human resource development and retention

The theme chosen for this historic joint conference: “Achieving Millennium Development Goals: Maternal Mortality, Child Survival, HIV/AIDS and Gender” reflects our concern that unless issues relating to health and gender are addressed with urgency and commitment the goals set out in the millennium declarations will not be achieved by the year 2015.

Your Excellency, Distinguished Ladies and Gentlemen the organizing committee chose our theme with care. We know that government has put some organizational infrastructure in place to take care of our concerns regarding maternal mortality, child survival, HIV/AIDS and gender issues. These are not nearly enough for sustainable economic development growth rates that will drastically improve our mortality statistics. The economic impact of sickness has not been seriously quantified. Unpublished interim result of an ongoing study suggests that malaria alone costs the nation more than 50 billion cedis a year!

We are confronted by adverse economic circumstances. But through adversity, we should find cooperation, and innovation. We should learn and take inspiration from each other. With enthusiasm, hard work and hope we can turn the adverse circumstances we face into opportunities for better health. Good health leads to more literacy, more equality of opportunity in political and economic matters and environmental improvements. When health improves all other aspects of life also improve. Health, gender and development form a triad; a triad that supports all developmental activities. For our country to forge ahead economically, these health and gender issues must be addressed with all seriousness. As the old adage goes the, "Health of the people is the wealth of the nation".

The children are the future leaders and managers of our economy, and the mothers must be alive and healthy to nurture them. Infant and under five mortality figures in Ghana have dropped in recent years from 83.8 and 147.8 per 1000 live births to 56.7 and 107.6 per 1000 live births respectively. Maternal mortality stands any where between 250 and 800 per 100,000 live births depending on where one is the country and whose figures are being scrutinized. Life expectancy has improved
from 54 to 57 years. HIV/AIDS has a prevalence rate of 3.6%. We stand to lose these modest gains with respect to these mortality figures if we do not eliminate the scourge of HIV/AIDS malaria and other diseases with high prevalence rates. We should strive towards elimination of HIV/AIDS and bringing these mortality figures to single digits.

Your Excellency, of significance and critical importance towards achieving these objectives is the severe shortage of adequately trained manpower, with the desired skill mix of all categories, in the Health Sector. Our Ministry of Health is not unaware of the many problems besetting the health care delivery system including the high rate of attrition among health professionals, particularly doctors and nurses. The root causes of the brain drain have been identified as:
- Low levels of remuneration
- Lack of avenues for career development and progression
- Poor job satisfaction and inadequacy of Healthcare Financing and
- Uncertainty regarding medium to long term financial security, housing and pension.

Housing constitutes one of the greatest problems leading to the exodus. A concerted effort to sort out this problem is in the offing and we are glad that public sector housing has found its way onto the campaign trail of Your Excellency. We are sure you will deliver on it as usual.

There have been numerous discussions on the other causes of the brain drain and solutions to some of these problems have been identified and courageously tackled by Government. Others have been the subject of protracted and fruitless negotiations which we hope will soon be concluded for mutual benefit and satisfaction.

The launching of the Ghana College of Physicians and Surgeons in December, 2003, was aimed at addressing the problem of career development and progression. The GMA takes pride in announcing that the setting up of the College was largely through its advocacy efforts dating back many years and the political will and courage of government. We commend the government and the past and present leadership of the Association who worked assiduously for the establishment of the College of Physicians and Surgeons. We can only hope that the College administration will be adequately resourced to deliver to expectation.

Healthcare financing has also been the source of major concern to the Ghana Medical Association, government and the general public and was the subject of major advocacy effort by the Association. The theme of our 3rd Annual Public Lecture in the year 2002 was “Healthcare Financing in Ghana”. We all know that until recently the Cash and Carry system was the main financial sustenance of the healthcare delivery system. This was a necessary evil as without it the steep decline in the health sector would not have been arrested. But while it halted the decline it also proved to be iniquitous in its administration in some respects. It became obvious that innovative forms of healthcare financing were required. Pilot projects were mounted by the previous government and the results showed the daunting and near impossible task of establishing and sustaining any solidarity based scheme of health care financing.

While recognizing the efforts of the previous government, we commend the present government for the political will, courage and imagination in passing the National Health Insurance bill into an Act and starting the process of its implementation. Emphasis here is on the word “process”. It will take many years of fine-tuning and refinement to optimize the implementation of the National Health Insurance Scheme and it needs all hands on deck. Let no patriotic and well-meaning Ghanaian try derail this process. Whatever the arguments are against aspects of the health insurance law it is an important beginning and any properly managed pre-paid scheme is better than the cash and carry system.

The National Health Insurance Scheme has a lot of implications for us the providers. In the face of scarcity of doctors, other healthcare professional and the anticipated demands that will be imposed by the scheme there are a few questions that we must ask ourselves and government. How will the unequal distribution of healthcare professionals in the country be addressed? How are we going to rise up to the excessive demands on our dedication with the expected increase in hospital attendance rate? The dynamics of our relationship with our clients/patients will change as we try to manage them with scarce resource allocation. Should we allow all these changes to affect the ethics of our profession? We face adverse circumstances and serious challenges to our traditions of ethics, caring and science. We can overcome these challenges if only we work with our patients and other stakeholders to topplle the barriers to quality health care and stay united as members of our profession.
While submitting that healthcare professionals must be adequately compensated for our dedication we, the providers, must be knowledgeable about what is expected of us regarding the efficient administration of the benefit package of the health insurance scheme. It is not the Ministry versus Ghana Health Service or the Ministry versus GMA. We all have to work towards a common purpose: success of the Scheme. We wish to commend the Ministry for funding a workshop to educate our members on the benefit package of National Health Insurance Scheme. We hope that was the first of a series of workshops aimed at facilitating the roll-out process of the scheme and minimizing wastage.

Your Excellency I posed these questions because the brain drain phenomenon has left us with about 1,600 doctors, including all categories of specialists, for our population of 20 million. This translates into doctor to population ratio ranging from 1:12000 to 1:66000, depending on where one is in the country. Let me further highlight the problem by quoting the number of doctors available to comparable populations such as Australia, Sweden, Sri Lanka and Malaysia. Australia has a population of 20 million like Ghana but has 55,000 doctors. Sweden has a population of 9 million, about half that of Ghana, and has 30,000 doctors. Sri Lanka with a population of 18 million has 11000 doctors. Malaysia got her independence about the same time as Ghana and now has 22 million people and 14,500 doctors. Yet all these countries are looking for thousands more doctors to support their healthcare delivery systems!! We need a minimum of 5000 to 6000 doctors to barely provide reasonable total coverage for Ghana. But we can boast of only 1,600 doctors! There is an urgent need to train and retain more doctors.

The Ghana Medical Association has been in negotiations with government on remunerations for doctors for the past 3 to 4 years. We have had occasion to appeal to Your Excellency on the slow pace of these negotiations. Your Excellency was very sympathetic and instructed that the relevant Ministries should bring matters to a speedy and satisfactory conclusion. We are still waiting for the Ministries of Manpower and Employment, Finance and Health to meet with us to conclude the current phase of negotiations to slow down the attrition rate amongst doctors and other health professionals.

Remuneration is not the only item of negotiation. Housing and Pension are issues to be addressed in further negotiations. In this regard the Association is drawing up a comprehensive document on our Conditions of Service for discussion with our ministry and other employers. Congratulations, Sir, on setting up the Presidential Commission on Pensions to look into the long term financial security of all workers including doctors. We made written and oral submissions which we hope will be captured in the report.

We know that the brain drain is a worldwide phenomenon and not the fault of any government. But the problem exists and must be dealt with. The Ghana Medical Association is prepared to work with government, our development partners and other stakeholders to deal with this seemingly insurmountable problem.

Your Excellency, we believe that with the usual courage and political will and imagination on the part of your government, and goodwill, flexibility and innovative approaches by our development partners, we can solve the brain drain problem.

Health has been declared as an essential service according to Act 651, the New Labour Law. The provision declaring health as an essential service and was initially not well understood by membership. But following a workshop that Association organized on the new Labour Law for our members, we now know what being declared an essential service entails. However, it is the hope of the Association that similar workshops will be organized in the regions for the education of the membership at large by our ministry. GMA will abide by the new law and its provisions. But we will request that, in line with what has been done for other Essential Services, Health Professionals should be taken out of the Ghana Universal Salary Scale as the provisions of the labour law are being implemented. And here let me congratulate you, Your Excellency, on behalf of the Association, on the appointment of the new Commission on Salaries and Wages. Perhaps this will be the appropriate time for the new Commission to take us out of the GUSS. GMA will make a formal submission to the Commission.

Let me assure members of the Association that the leadership of Ghana Medical Association will strive at all times to improve the lot of the Ghanaian doctor and for improvement in the health sector in general. Let us remain true to the objectives and aspirations of the association including seek-
ing after the wellbeing of our fellow citizens. Once again let me welcome our guests, especially the foreign delegates to our midst and to the historic towns of Cape Coast and Elmina. Feel at home and enjoy the Ghanaian hospitality!

Before I take my seat I would like to welcome Your Excellency, once again, and thank you for your gracious presence and also for your concern and intervention towards solving our land problems.

Your Excellency, Your Eminence, Members of the Council of State, Hon Ministers of State, Members of the Diplomatic Corps, Nananom, Distinguished Ladies and Gentlemen, Members of the Press, Colleagues, on behalf of the Executive Council of the Ghana Medical Association I wish you all well. May this joint conference be blessed and lead to meaningful, beneficial and practical conclusions. May God bless Ghana, the Commonwealth of Nations and all of us here present.
Guidelines for Contributors

Contributions to the Ghana Medical Journal should be in English and addressed to:
The Editor-in-Chief, Ghana Medical Journal, P. O. Box 1596, Accra, Ghana.

1.0 CATEGORIES OF ARTICLES
The journal will consider articles of the following categories for publication:

1.1 Original Article
Works publishable under this section include original work of suitable standard. Such work must be innovative or contribute further to well-established knowledge in a particular field. Articles on all the medical specialties including the basic sciences, paraclinical and clinical sciences will be accepted. Short or preliminary report on original works will be published under this section.

1.2 Special Articles
Review articles, articles on special medical events, clinical notes and clinical investigation will be accepted for publication under this section. Review articles should cite original works that lead to formulation of a concept, theory or hypothesis. Review articles that seek to draw attention to current medical practice must have ample support in the form of published observations by other authors as well as the author’s own findings.

1.3 Case Report
Extremely rare clinical syndromes or presentations will be accepted for publication under this section. Also a collection of cases highlighting particular trends or problems in clinical practice are acceptable. In both cases, contributors are advised to give ample evidence in support of their claims.

1.4 General Practice
This section which is an innovation, is reserved exclusively for articles by general practitioners. The idea is to encourage contributors who are in general practice to share their knowledge in general practice with the general readership. They are given a chance here to share their experiences in general medical practice especially in areas where one has improvised due to shortage of facilities such as in rural areas or where a particular approach to the management of clinical problems is quite different from the normal practice but gives satisfactory results. Occasional new trends in general medical practice will be published under this section.

1.5 Correspondence
Correspondence on articles published in the journal or letter to the editor shall be entertained. Such correspondence must reach the editor not more than 3 months after publication of an article. The correspondence may seek further clarification on a published article. In both cases the author(s) whose article has attracted correspondence from readers will be contacted for their comments and both comments and correspondence on published articles will be published together. Letters to the editor are welcome at all times.

Apart from correspondence and invited editorials, all submissions will be subjected to peer review.

2.0 LENGTH OF ARTICLES
The high cost of printing requires that articles are not unduly lengthy. They must be concise.

2.1 Original Article
Including text, figures, tables and references should occupy not more than the space for maximum of 6000 words including tables and illustrations. Short or preliminary reports should not exceed 1500 words.

2.2 Special Article
Review articles should not exceed 7000 words including tables and illustrations. Articles on special medical events should not exceed 1500 words or total space equivalent to 5 quarto pages, including figures, tables and references.

2.3 Case Report
Case reports should not exceed 2700 words including figures, tables and references.

2.4 General Practice
Articles under this section should not exceed 2000 words. No figures or tables will be published under this section. Articles meant to be published under general practice that have figures and tables will be
published under case reports or original articles in which case they must include references.

3.0 PREPARATION OF MANUSCRIPT
All papers should be typewritten on A4 paper, on one side only, in double spacing, with a left hand margin of 3.5cm and a right hand margin of at least 2cm.

3.1 Format
Original articles, including short reports, must have the following parts: Title, name(s) of author(s), address of author(s), running title, summary, keywords, introduction, materials/subjects and methods, data analysis/calculations, results, discussion, acknowledgements and references.

The title, name(s) of author(s), address(es) of author(s), address for correspondence and running title should be on a separate sheet.

Case reports and review articles or special articles on medical events need not comply with this format.

3.2 Title
The title of each article should not have more than 20 words, or 100 characters, and should express clearly, the aims of the articles.

3.3 Names of Authors, Academic Qualifications, Title.
The name of the principal author should appear first, followed by other authors. The name and address of the author for correspondence must be indicated on the page for author(s) name(s) and address(es). The name(s) and signature(s) of author(s) and co-author(s) should appear on the covering letter to the Editor-in-chief. The first 3 academic degrees and titles of all authors and co-authors must be indicated on the same page as for names and addresses.

3.4 Summary
The summary should contain not more than 200 words and must state the purpose of the study, basic procedures, main findings and principal conclusions. It should emphasize new and important aspects of the study or observations.

3.5 Keywords
These should include words that emphasize the theme or central point of the research. For instance in a paper on the seasonality of human reproduction in Ghana, the following keywords may be used if it is felt that they emphasis the objectives and significance of the research: delivery frequencies, conception, fertility behaviour, conception probability. However, keywords should as far as possible be selected from the Medical Subject Heading (MeSH) list of Index Medicus.

3.6 Running Title
Where the title of the article is lengthy, the running title may take a shortened form to reflect the main objectives of the paper. However no running title is required if the title is short, for instance, not exceeding four words. Example: Salt activities of Rat Brain Choline Acetylttransferase maybe shortened to Rat Brain Acetyltransferase, as the running title. The running title should not have more 5 words or 30 characters arranged one after the other. A hyphen is counted as one character.


Guidelines on tables and figures, units and abbreviations, are also to be seen in the above references. Two figures will be published free of charge. Subsequent figures will be published at a cost of 12 US dollars or equivalent for each extra figure.

3.7 References
The number of references should be kept to a minimum. They should be numbered consecutively as they occur in the text. Identify references in the text, tables and legends by Arabic numerals placed in superscript.

The title of journals should be abbreviated according to the style used in Index Medicus.

The title of journals and books in listed references should be in italics. The references should be listed in the order in which they appear in the text.

Reference should be based on the Uniform Requirements style (the Vancouver style).

4.0 ETHICS OF INVESTIGATIONS
Clinical studies are expected to conform to the Proposed International Guidelines for Biomedical Research involving Human Subjects issued by CIOMS, (Geneva 1982). Statements about ethical clearance, (if appropriate) and the obtaining of participants' informed consent should be included in the paper. Experimental animals must be properly
anaesthetized to avoid suffering and anaesthetic
procedure fully explained in the text. Authors who
do not comply with the said code of ethics both for
humans and animals will have their articles re-
jected.

4.1 Originality of Articles
Articles submitted to the Ghana Medical Journal
must not have been submitted for publication in
another journal. The laboratory or institute of origin
of research and the role of each author in the case
of multiple authorship, must be indicated. Original
articles must be accompanied by a written declara-
tion that the articles have not been submitted for
publication either in part or in full, in another jour-
nal.

4.2 Copyright
Articles published in the Ghana Medical Journal
may not be published elsewhere without the con-
sent of the publishers. Request for consent for re-
production of material published in the Ghana
Medical Journal should be addressed to the Editor-
in-chief. The publisher of this Journal reserves the
right of copyright of all articles published in the
Journal.

5.0 GENERAL INFORMATION
Three copies of papers should be submitted. Au-
thors are also encouraged to include a 3.5" IBM
compatible diskette containing the text and tables in
MS Word format, stating clearly which version of
the software has been used.

5.1 All correspondence should be addressed to the
Editor-in-chief, Ghana Medical Journal, P. O.
Box 1596, Accra, Ghana.

5.2 Articles are subject to Editorial revision to clar-
fy them. Articles that do not conform with the re-
quirements of this journal shall be returned to the
author(s) after a median period not exceeding 12
weeks from the date of receipt of the articles. Re-
turned articles may be accepted for publication if
they are modified to an acceptable form.

5.3 Authors shall receive one copy of the Journal in
which their articles is published. Reprints will be
sent upon request in which case authors must pay
for the cost of production and postage of the re-
prints in advance. Each reprint including postage
fee will cost 20US dollars or equivalent per page.

5.4 All payments must be made by crossed cheque
or bankers transfer to the Ghana Medical Associa-
tion.

5.5 Frequency of Publishing
The Ghana Medical Journal is published quarterly.
Subscription price is $200,000 per annum for local
subscribers and 100US dollars per annum for sub-
scribers living outside the country.