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# MANAGEMENT OF OCCUPATIONAL EXPOSURE TO THE HUMAN IMMUNODEFICIENCY VIRUSES

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**Abstract**
By the end of the year 2002, the World Health Organisation estimated that 42 million people have been infected with the Human Immunodeficiency Viruses (HIV). Though sexual transmission is the commonest mode of transmission, transmission to the health care personnel (HCP) who are exposed to blood and blood products remains an increasing risk. Because there is no cure or effective vaccine for HIV infection, optimal post-exposure care, including the administration of antiretroviral drugs to prevent HIV infection, remains a high priority for protecting health care personnel. Factors that should be considered in the choice of treatment for an exposed health care worker include the risk of HIV infection associated with the exposure, the expected benefit of antiretroviral treatment, the risks associated with the proposed treatment, and the probability that the infecting strains will be susceptible to the antiretroviral regimen used. U.S. public health guidelines recommend that a four-week regimen of two drugs be started as soon as possible after most cases of HIV exposure through percutaneous or mucosal routes. If the source person is found to be HIV-negative treatment should be discontinued. When the injury involves an increased risk of HIV transmission, the regimen should be expanded to include a third drug. Since post-exposure prophylaxis is not 100% effective, prevention strategies through safer practices, barrier precautions, safer needle devices, and other innovations, remain the best way to prevent occupational infection by HIV and other blood borne pathogens.

**Key Words:** HIV, occupational exposure, post-exposure prophylaxis

## Introduction

By the end of the year 2002, the World Health Organisation estimated that 42 million people have been infected with the Human Immunodeficiency Viruses (HIV). [1] In that year alone, 5 million new infections occurred, with 75% of these infections occurring in sub-Saharan Africa. [1] Though sexual transmission is the commonest mode of transmission, transmission to the health care personnel (HCP) who are exposed to blood and blood products remains an increasing risk more so in sub-Saharan Africa, where medical manpower and facilities are grossly inadequate and over stretched. Because there is no cure or effective vaccine for HIV infection, optimal post-exposure care, including the administration of antiretroviral drugs to prevent HIV infection, remains a high priority for protecting health care personnel.

## Strategies for management of occupational exposure to HIV

Factors that should be considered in the choice of treatment for an exposed health care worker include the risk of HIV infection associated with the exposure, the expected benefit of antiretroviral treatment, the risks associated with the proposed treatment, and the probability that the infecting strains will be susceptible to the antiretroviral regimen used.[2]

### *Risk for occupational transmission of HIV*

In prospective studies of HCP, the average risk of HIV transmission after a percutaneous exposure to HIV-infected blood has been estimated to be approximately 0.3% (95% confidence interval [CI] = 0.2%--0.5%) [3] and after a mucous membrane exposure, approximately 0.09% (95% CI = 0.006%--0.5%). [4] Injury with a hollow-bore needle is by far the commonest mode of infection. [2] Although episodes of HIV transmission after non-intact skin exposure have been documented, [5] the average risk for transmission by this route has not been precisely quantified but is estimated to be less than the risk for mucous membrane exposures. [6] The risk for transmission after exposure to fluids or tissues other than HIV-infected blood also has not been quantified but is probably considerably lower than for blood exposures .[7]

Epidemiologic and laboratory studies suggest that several factors might affect the risk of HIV transmission after an occupational exposure. In a retrospective case-control study of HCP who had

percutaneous exposure to HIV, the risk for HIV infection was found to be increased with exposure to a larger quantity of blood from the source person as indicated by a) a device visibly contaminated with the patient's blood, b) a procedure that involved a needle being placed directly in a vein or artery, or c) a deep injury. [8] The risk also was increased for exposure to blood from source persons with terminal illness, possibly reflecting either the higher titer of HIV in blood late in the course of AIDS or other factors (e.g., the presence of syncytia-inducing strains of HIV). A laboratory study that demonstrated that more blood is transferred by deeper injuries and hollow-bore needles lends further support for the observed variation in risk related to blood quantity. [9]

A patient whose blood or other potentially infectious body fluid is involved in an occupational exposure should be evaluated to determine the likelihood of HIV infection, in accordance with relevant regulations and local policies. The interval between the onset of viremia and the detection of HIV antibody, with the use of current enzyme immunoassays for HIV, is a few days at most. [10] Hence, if the result of a reliable HIV test in the source patient is negative, the risk of transmission is assumed to be zero, unless the patient has risk factors for infection and the clinical findings are compatible with acute HIV infection (e.g., fever, pharyngitis, rash, lymphadenopathy, and malaise). [11]

***Benefits of chemoprophylactic treatment***

Information about primary HIV infection indicates that systemic infection does not occur immediately, leaving a brief window of opportunity during which post-exposure antiretroviral intervention might modify or prevent viral replication. In a primate model of simian immunodeficiency virus (SIV) infection, infection of dendritic-like cells occurred at the site of inoculation during the first 24 hours following mucosal exposure to cell-free virus. Over the subsequent 24--48 hours, migration of these cells to regional lymph nodes occurred, and virus was detectable in the peripheral blood within 5 days .[12] Theoretically, initiation of antiretroviral PEP soon after exposure might prevent or inhibit systemic infection by limiting the proliferation of virus in the initial target cells or lymph nodes. [2] Data from clinical trials of prophylaxis against perinatal HIV transmission have consistently demonstrated that antiretroviral treatment can prevent HIV infection after exposure, even among neonates who are not treated until after birth. [13-18] The relevance of this clinical situation to occupational exposure is not known.

Although these data are encouraging, it is clear that, whatever benefit is afforded by post-exposure treatment, the protection is not absolute. Twenty-one cases of HIV infection have been reported in health care personnel in the United States and elsewhere, despite post-exposure antiretroviral treatment, which included two or more antiretroviral drugs in some cases. [2, 19, 20] A variety of factors may have contributed to the treatment failure, including an intrinsic lack of efficacy of prophylactic antiretroviral treatment and resistance to antiretroviral drugs. [10]

***Risks of prophylactic anti-retroviral therapy***

All antiretroviral agents are associated with adverse events, especially gastrointestinal symptoms. Data from the National Surveillance System for Health Care Workers and the HIV Post-exposure Prophylaxis Registry of the United States indicate that nearly 50 percent of health care personnel report adverse events while taking antiretroviral drugs prophylactically, and about one third stop taking the drugs as a result. [2, 21] Most of these symptoms are not serious and can be managed. Prophylactic regimens that include three drugs are more likely to result in adverse events and early discontinuation of treatment than are two-drug regimens. [21]

***Antiretroviral drug resistance***

Resistance to antiretroviral drugs is a growing problem for all patients especially so in sub-Saharan Africa where erratic supply of anti-retroviral drugs is a major concern. [1] In the health care setting resistance to antiretroviral drugs is most likely in patients with clinical progression of disease, increasing quantitative plasma HIV RNA titers, a decline in the CD4 T-lymphocyte count, or a combination of these findings. [22] Unfortunately, clinical data alone are not reliable in detecting resistance, and data from genotyping or phenotyping assays are rarely available in time to guide decisions about empirical post-exposure treatment. For this reason, two or more antiretroviral drugs are usually used for prophylaxis after occupational exposure. [2]

## Antiretroviral drugs for HIV post-exposure prophylaxis

U.S. public health guidelines recommend that a four-week regimen of two drugs be started as soon as possible after most cases of HIV exposure through percutaneous or mucosal routes. [2] If the source person is found to be HIV-negative treatment should be discontinued. Therapy is not indicated for contact between intact skin and blood or other body fluids contaminated by HIV. [11] When the injury involves an increased risk of HIV transmission (e.g., an injury caused by a large-bore needle, associated with a deep puncture, or caused by a device visibly contaminated with blood or a device in a patient's artery or vein), the regimen should be expanded to include a third drug. Indinavir or nelfinavir is recommended as a good option when a third drug is indicated. Efavirenz, a non-nucleoside analogue, and abacavir are also considered potentially useful drugs when an expanded regimen is indicated. Routine use of three drugs is not

recommended for all exposed persons, because adding a third drug increases the probability that adverse events will occur and that the four-week course of treatment will not be completed. [2,21] Table 1 lists the regimen used in HIV post-exposure prophylaxis, their dosages and side-effects while Table 2 summarizes the current recommendations for post-exposure prophylaxis according to the source person.

Table 1: Basic and expanded regimens of post-exposure prophylaxis against human immunodeficiency virus infection.[10]

| Regimen | Doses | Primary adverse effects |
|---|---|---|
| ***Basic*** | | |
| Zidovudine plus lamivudine† | 600mg of zidovudine daily in two or three divided doses; 150mg of lamivudine twice daily | Zidovudine: aneamia, neutropenia, nausea, headache, insomnia, muscle weakness and pain. Lamivudine: abdominal pain, nausea, diarrhoea, rash, pancreatitis. |
| Stavudine plus lamivudine | 40mg of Stavudine (30mg if body weight is <60kg) . twice daily. 150mg of lamivudine twice daily | Stavudine: Peripheral neuropathy, headache, diarrhoea, nausea, insomnia, anorexia, pancreatitis, elevated liver enzyme values, anaemia, neutropenia Lamivudine: as above |
| Didanosine plus Stavudine | 400mg of Didanosine daily, taken on an empty stomach if a buffered tablet is used, or 250mg daily if a delayed-release capsule is used. | Didanosine: Pancreatitis, lactic acidosis, neuropathy, diarrhoea, abdominal pain, nausea.Stavudine: as above. |
| ***Expanded (basic regimen plus one of the following)*** | | |
| Indinavir | 800mg every 8hr, taken on an empty stomach | Nausea, abdominal pain, nephrolithiasis, indirect hyperbilirubineamia. |
| Nelfinavir | 750mg three times daily, with a meal or snack, or 1250mg twice daily with a meal or snack. | Diarrhoea, nausea, abdominal pain, weakness, rash. |
| Efavirenz | 600mg daily, at bedtime | Rash (including Stevens-Johnson syndrome), insomnia, somnolence, dizziness, trouble concentrating, nightmares. |
| Abacavir‡ | 300mg twice daily | Nausea, diarrhoea, anorexia, abdominal pain, fatigue, headache, insomnia, hypersensitivity reactions. |

†Available as a combined formulation Combivir®, the recommended dose is one tablet twice daily.
‡ Available as a combined formulation with zidovudine and lamivudine (Trizivir®).

*Management of the exposed person and follow up*
The exposed person should receive immediate first aid and post-exposure counseling with emphasis on the minimal risks of infection, the need for immediate HIV testing and the available resources for post-exposure prophylaxis.

HIV testing of exposed persons is recommended as soon as possible after exposure (to establish that the infection was not already present) and periodically during the first six months after the exposure (to detect occupational transmission). Testing after six months is not usually indicated, but if the exposure posed an especially high risk or if the exposed worker needs further reassurance, additional testing may be helpful. An enzyme immunoassay for HIV antibody is the appropriate test for detecting new infections. [11] Laboratory monitoring, including a complete blood count and tests of renal and hepatic function, is

recommended at base line and at two weeks. The use of additional tests depends on the specific regimen acquired hepatitis C virus infection from the exposure be followed for 12 months, because anecdotal evidence indicates that they may be at risk for delayed HIV seroconversion. [2] All exposed persons, regardless used and the medical condition of the source patient. The guidelines also recommend that persons who have of the post-exposure treatment regimen, are advised to return for immediate evaluation if symptoms or signs that might be attributable to acute HIV infection appear.

Table 2: Recommendations for prophylaxis against human immunodeficiency virus (HIV) infection after percutaneous injury, according to the infection status of the source person.[10]

| Risk posed by exposure† | Infection status of source person‡ | | | | |
|---|---|---|---|---|---|
| Lower | ***HIV Positive, Class 1*** Basic 2-drug prophylaxis recommended | ***HIV Positive, Class 2*** Expanded (3-drug) prophylaxis recommended | ***Unknown Status*** Generally, prophylaxis not warranted, but basic 2-drug prophylaxis can be considered if source person has risk factors for infection§ | ***Unknown Source Person*** Generally, prophylaxis not warranted, but basic 2-drug can be considered in settings where exposure to HIV-infected is likely | ***HIV-Negative*** Prophylaxis not warranted |
| Higher | Expanded (3-drug) prophylaxis recommended | Expanded (3-drug) prophylaxis recommended | As above | As above | As above |

† Injuries caused by solid needles and superficial injuries pose a lower risk of infection, and those involving a large-bore hollow needle, a deep puncture, a device visibly contaminated with blood, or a needle used in a patient's artery or vein pose a higher risk of infection.
‡ A class 1 positive status is defined by asymptomatic HIV infection or a low viral load (e.g., <1500 RNA copies per milliliter); a class 2 positive status is defined by symptomatic HIV infection, the acuired immunodeficiency syndrome, acute seroconversion or a high viral load .
§ If the source person has risk factors for HIV Infection, prophylaxis is optional and should be based on an individualized decision made jointly by the exposed person and the treating physician. If prophylaxis is administered and the source person is subseuently determined to be HIV-negative, prophylaxis should be discontinued.

## Conclusion

Post-exposure prophylaxis for HCP exposed to HIV infection is not a trivial undertaking as antiretroviral drugs are associated with serious, and rarely life-threatening, adverse effects; an assessment of the risks of benefit and harm should be made in all cases. Management of the HCP exposed to HIV infection is a medical emergency. Where post-exposure prophylaxis is indicated, it should be instituted as soon as possible after exposure, preferably within hours. Since post-exposure prophylaxis is not 100% effective, prevention strategies through safer practices, barrier precautions, safer needle devices, and other innovations, remain the best way to prevent occupational infection by HIV and other blood borne pathogens.

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# CLEFT LIP AND PALATE IN NORTHERN NIGERIAN CHILDREN

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**Abstract**
*Background:* Cleft lip and palate are congenital abnormalities often seen and managed early in life in the developed world. The current approach to management is a multidisciplinary one. In this part of the world however, patients present at a later age and are managed by a single specialist.
*Methods:* A retrospective review of children with cleft lip and palate seen and managed over a 10- year period was done using data obtained from patients' case folders.
*Results:* Five hundred children were treated over the ten-year period. 56.8% of patients treated presented with cleft lip alone while 43.2% had both cleft lip and palate. More males than females presented with cleft lip alone while more females had both cleft lip and palate. 59.3% of the patients were less than one year of age. There was a positive family history of cleft lip and palate in 5.5% of patients. Malnutrition, anaemia, convulsion, ear infection, diarrhoea, malaria fever, upper respiratory tract infection and skin rashes were often seen in these patients at first visit. All patients were managed by maxillofacial surgeons and anaesthetists. There was no involvement of the orthopaedic and plastic surgeon, orthodontist or speech therapist in patients' management.
*Conclusion:* Though management of cleft lip and palate was successful within our limits, there is need to increase public awareness of the treatment possibilities available and to adopt a team approach to management in order to improve treatment outcome.

**Key words:** Cleft lip and palate, northern Nigeria

## Introduction

The maxillofacial unit of the Ahmadu Bello University Teaching Hospital, Kaduna, Nigeria is one of the major treatment centers for cleft lip and palates in northern Nigeria; an area with an estimated population of 65 million people.

Unlike in the developed countries where cleft lip and palate (CLP) are managed by a multi-disciplinary team, [1] CLP are managed in northern Nigeria mainly by the maxillofacial, paediatric and sometimes plastic surgeons in the Teaching Hospitals in Zaria, Kano, Jos and Maiduguri. As a result of non-involvement of all relevant healthcare specialists in patient management, the defects are sometimes closed leaving patients with residual speech, hearing or facial structural impairment.

## Materials and methods

Five hundred cases of CLP seen at the Maxillofacial Unit of Ahmadu Bello Teaching Hospital, Kaduna, over a period of ten years were studied. Patients seen at the clinic but not operated upon were excluded from the study.

Patient presenting at the time of operation with haemoglobin less than 10g/dl were either built up with haematinics or transfused with packed cells preoperatively. All patients were free from infections and in optimal physical condition before their surgery. Cleft lip was repaired usually at the age of 5 months and palate at 18 months if patient was seen early enough in the clinic.

## Results

Majority of the patients with cleft lip and palate were children below the age of one year (Figure 1). There was a preponderance of males over females in those that presented with both cleft lip and palate (M: F = 14:1). Among the patients who presented with cleft lip alone, 113 (48.9%) were females while 118(51.1%) were males (Table 1). There was a predominance of left sided cleft lip (245, 66.4%) over right-sided cleft lip (124, 33.6%). Among patients who presented with cleft palate, the defect commonly affected the soft and hard palate. Rarely were hard palate alone or the uvula alone affected (Table 2).

*Associated medical conditions*
At the time of presentation, most patients had other medical conditions like malnutrition, anaemia, convulsion, diarrhoea, ear infections (1.2%), malaria fever, skin rashes and other congenital abnormalities like hypertelorism (3.2%), micrognathia (0.8%) and microphthalmos (0.4%). The overall incidence of anaemia in this study was 46.6%. Anaemia was most commonly seen in patients with the AS genotype. One hundred and eleven (67.3%) of the 165 of patients in this group had haemoglobin levels less than 10g/dl. One hundred and eighty one (61.98%) of all patients below the age of two years had haemoglobin levels less than 10g/dl.

*Family history*
Twenty-seven (5.5%) patients had a positive family history of either cleft lip or cleft palate. In a particular family, three out of five children had cleft lip and palate.

*Drug history*
Eighty-five (17.3%) of mothers admitted to taking drugs not prescribed by specialists during pregnancy. The commonest drug taken was the antibiotic chloramphenicol for treatment of typhoid fever.

*Surgical treatment*
The cleft lips in this study were repaired under general anaesthesia using the Millard rotation – advancement approach while repair of cleft palates were done using the Veau-Ward II type of closure. In the three cases where lengthening was required, pharyngoplasty was done. All the cases received prophylactic antibiotics for five days post operatively. Feeding was via nasogastric tube for seven days. Sutures were removed seven days post- operatively.

*Complications*
One death resulting from laryngospasm was recorded in the series. Post-operative complications were mainly upper respiration tract infection (112, 22.3%), bronchopneumonia (51, 10.2%) and partial breakdown of the repaired cleft (28, 5.6%). The breakdown was due either to poor nursing care, lack of adequate anti biotic cover or excessive tension on the different types of flaps.

Figure 1: Age distribution of children with cleft lip and palate

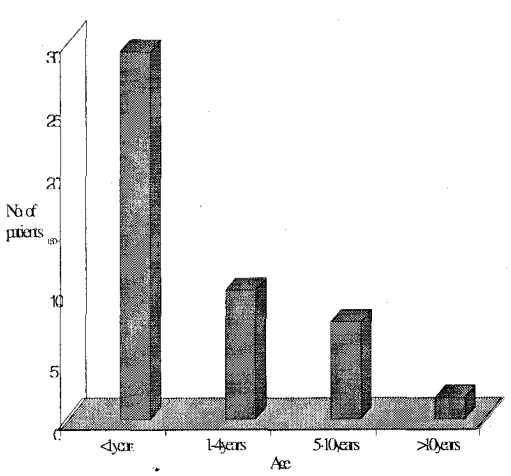


Table 1: Sex distribution of cleft lip and palate

| Type of cleft | M | F | Total (%) |
|---|---|---|---|
| Cleft lip alone | 118 (51.1) | 113(48.9) | 231 (100) |
| Cleft palate alone | 32 (57.1) | 24 (42.9) | 56 (100) |
| Both cleft lip and palate | 154 (59.0) | 107 (41.0) | 261 (100) |

Table 2: Extent of defect in cleft palate

| Extent of defect | No. (%) |
|---|---|
| Soft and hard palate only | 111 (44.2) |
| Soft palate only | 83 (33.1) |
| Soft palate, hard palate and uvula | 55 (21.9) |
| Hard palate only | 1 (0.4) |
| Uvula only | 1 (0.4) |
| Total | 251 (100) |

## Discussion

Cleft lip and cleft palate (CLP) are common cranio-facial congenital defects. It is said to occur in one in every seven hundred births. It is more common in Asians population [1,2] than in Africans. [8 - 10] Factors that have been implicated in the aetiology of clefts include, environmental factors, exposure to drugs, heredity and pre-natal nutrition. In developed societies, patients present for treatment very early in life. In this study, 84.3% of patients seen were below the age of 11years. In a similar study by Adekeye.[4] Only 36.4 % of patients presented below the age of 12 years. This indicates some improvement in age of presentation for treatment. This series confirmed the prevalence of left sided cleft lip as earlier reported. [4] There is an almost equal sex distribution between males and females in cleft lip presentation and a slightly higher female predilection for CLP. This is in agreement with earlier studies. [5-7]

Drug history was found to be significant in this study. Chloramphenicol widely used in Nigeria for the

treatment of typhoid fever was taken by many of the mothers during pregnancy for treatment of typhoid fever. This antibiotic has not been previously implicated in the aetiology of CLP. Further studies are required to determine the role of this antibiotic in the aetiology of CLP. Anti- convulsants and sedatives have been implicated in other report. [3, 8]

The anaemia noticed particularly among patients below two years of age could be as a result of feeding difficulties. Some mothers of CLP children lack proper understanding of appropriate feeding methods. As a result, the patients are usually underfed. Mothers were routinely referred to the Nutritionist for advice on proper feeding methods. Expectedly, patients with the AS genotype were more anaemic than those with genotype AA.

The positive family history of CLP observed in 5.5% patients lends credence to the implication of hereditary factors in the aetiology of CLP. In a particular family, three out of five children had cleft lip and palate.

Nwanze and Sowemimo, [9] and Datubo-Brown [10] suggest that the problems of managing CLP may derive from the fact that each tribe in Nigeria tends to have different religious and social taboos associated with CLP. Some believe that children with CLP are in contact with "evil spirits" while for some CLP is a punishment from the gods. This results in the child being ostracized by the family and society. The willingness to expend scarce financial resources on treating such children is often not there. The present study however suggests that in Northern Nigeria, the problems have to do with the serious lack of medical personnel, ignorance and poverty. It is a known fact that there is no single orthodontist in the whole region. A child with isolated cleft needs orthodontia. The need to realign the gum ridge and dental arches by the orthodontist to give the patient a better function cannot be over emphasized. After surgery for cleft lip and palate, the child needs the help of a speech therapist to learn to make new sounds. There are less than five speech therapists in the whole country and the facilities and equipment for speech production are inadequate. The fact that children with CLP may not be treated before the age of 10 years is an indication of the low level of health awareness and the pervasive poverty that still exists. All these difficulties have limited the management of CLP to just surgical intervention.

## Conclusion

Most children with CLP in northern Nigeria present late to hospital for treatment and are malnourished. There is need for awareness to be increased so that patients can present early. There is more importantly the need to promote personnel training in the management of CLP in the area. Training of relevant personnel will encourage a multidisciplinary approach to management and ensure optimal results.

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# COLOSTOMY COMPLICATIONS IN CHILDREN

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**Abstract**
*Background:* Colostomy is a common procedure in children and may be attended by significant morbidity.
*Method:* This is a retrospective study of morbidity and mortality associated with the formation and closure of colostomy in children between 1991 and 2001, at the Jos University Teaching Hospital (JUTH), Jos, Nigeria.
*Results:* There were 116 children with a median age of 3 weeks (range: one day 14 years). The male: female ratio was 2:1. The indications for colostomy were Hirschsprung's disease 68 (58.6%), anorectal malformations 44 (37.9%) and trauma to the rectum 4(3.5%). A total of 122 complications occurred in 62(53%) patients after colostomy formation. The commonest complication was excoriative dermatitis 46(74.2%), followed by prolapse 24(38.7%) and wound infection. Difference in complications between transverse and sigmoid colostomies was statistically significant ($P< 0.05$). One hundred and eight (93.1%) children had intraperitoneal closure of colostomy, 21 (19.4%) of who developed surgical site sepsis. The overall mortality was 16 (13.8%), exclusively from colostomy closure.
*Conclusion:* Colostomy-related procedures in children are associated with high morbidity and mortality in our environment. Improved health care delivery may improve the present outcome. Colostomy-related operations should not be relegated to minor importance.

**Key words**: Colostomy, complications, children

## Introduction

Colostomy is frequently employed in the management of children with congenital/acquired conditions of the colon or the ano-rectum. In developed countries, primary pull-through operations are increasingly performed to treat Hirschsprung's disease and anorectal malformations. [1] This is not so in many parts of Africa, and colostomy has continued to be a life-saving procedure in the management of these children. Since colostomy in children is usually done for the treatment of a non-malignant condition and is temporary, there is tendency to relegate colostomy-related procedures to minor importance. However, serious complications may result from the procedure. [2 - 8] This is a report of our experience with colostomy in children and aims to identify the problems associated with it in the environment. Preventive measures of the complications are presented.

## Patients and method

All the cases of colostomy performed in children at the Jos University Teaching Hospital (JUTH) between October, 1991and September 2001 were retrospectively reviewed. Data extracted from patients' case files, ward registers and operation notes were analysed for age, indications, types and sites of the colostomy and outcome, using the EPI Info and Excel software. The stoma-related complication rates were compared using the Chi-square. The level of significance was taken as $p<0.05$.

## Results

One hundred and twenty-eight colostomies were done, but adequate records were available in 116 patients. Seventy-eight were boys while 38 were girls, with a male-to-female ratio of 2.1. Their ages at colostomy formation ranged from 1 day to 14 years (median: 3 weeks). Figure 1 shows the age distribution of the children. Seventy-seven (66.4%) patients were aged one year or below. The modal age range was >28 days ≤ year.

*Indications for colostomy*
Colostomy was constructed for Hirschsprung's disease in 68 (58.6%) children, while anorectal malformation was the indication in 44 (37.9%). In 4 (3.5%) others colostomy was constructed to divert faeces from rectal injuries.

Figure 1: Age of 116 children who had colostomy

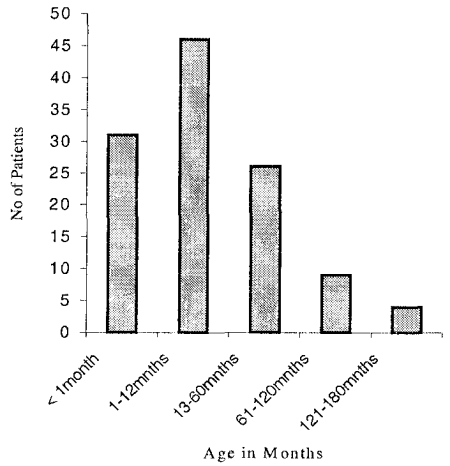


Table 1: Site and type of colostomy in 116 children

| Site | Loop (%) | Divided (%) | Total (%) |
|---|---|---|---|
| Transverse colon | 47(40.5) | 11(9.5) | 58(50.0) |
| Descending colon | 4(3.5) | 7(6.0) | 11(9.5) |
| Sigmoid colon | 7(6.0) | 40(34.5) | 47(40.5) |
| Total (%) | 58(50.0) | 58(50.0) | 116(100) |

Table 2: Complications in 62 children undergoing colostomy

| Complication | TC | | DC | | SC | |
|---|---|---|---|---|---|---|
| | L (%) | D (%) | L (%) | D (%) | L (%) | D (%) |
| | n=47 | n=11 | n=4 | n=7 | n=7 | n=40 |
| **Wound** | - | 3(27.3) | 1(25) | 2(28.6) | - | 2(5) |
| Bleeding+ | - | - | - | - | 3(42.9) | 1(2.5) |
| Bowel evisceration+ | | | | | | |
| Infection+ | 1(2.1) | 4(36.4) | - | 2(28.6) | - | 4(10.0) |
| **Stoma** | | | | | | |
| Oedema/obstruction+ | - | 3(27.3) | | 1(14.3) | - | 4(10.0) |
| Strangulation/necrosis+ | - | 1(9.1) | | 2(28.6) | - | 3(7.5) |
| Dermatitis | 17(36.2) | 9(81.) | | - | 3(42.9) | 5(2.5) |
| Prolapse | 12(25.5) | 4(36.4) | | - | 6(85.7) | 2(5.0) |
| Diarrhoea | 5(10.6) | 1(9.1) | | - | - | 2(5.0) |
| Stenosis | - | 1(9.1) | | - | - | 3(7.5) |
| Retraction | - | - | | - | - | 3(7.5) |
| Hernia | 1(2.1) | | | | 1(14.3) | - |

TC vs SC : $X^2$ = 8.39, P= 0.003868, $d^o$ = 1
+ Early complications (< 1 month).
Some children had more than one complication
All others = Late complications (>1 month post operative)
TC = Transverse colostomy, DC = descending colostomy, SC = Sigmoid colostomy, L = loop, D = Divided

*Sites/types of colostomy*

Table 1 shows the sites and the types of colostomy. In 58(50.0%) children, the colostomies were cited on the transverse colon. Forty-seven (40.5%) of the transverse colostomy were loop, while 11(9.5%) were divided. Forty-seven children had sigmoid colostomy, with 40(34.5%) divided and 7(6.0%) loop. The remaining 11(9.5%) patients had their colostomy on the descending colon, with 4(3.5%) loop and 7(6.0%) divided.

*Colostomy closure*

The duration of the colostomy before closure ranged from 3 to 9 months. Colostomy closure was preceded by routine colonic and rectal wash outs for at least 2 days. All the patients had intraperitoneal closure of the colostomy. The colostomies were closed in 108(93.1%) patients, while 8(6.9%) children were lost to follow-up before their colostomy closure could be effected.

*Complications*

Table 2 shows the distribution of the various complications following the colostomy formation. Sixty-two (53.0%) children had complications. Transverse colostomy (TC) had a total of 62 complications, while 14 and 42 complications occurred following the descending colostomy (DC) and sigmoid colostomy (SC), respectively. Wound-related complications occurred in 23(37.1%) children, which included bleeding, infection and wound dehiscence with bowel evisceration. Thirty-nine (62.9%) children had stoma-related complications, comprising escoriative dermatitis, bowel prolapse, stoma retraction, colostomy diarrhoea and parastomal hernia. Twenty-one (19.4%) of the patients who had colostomy closure, developed wound infections (divided sigmoid colostomy 37%, transverse loop colostomy 19%, divided descending colostomy 19%, divided transverse colostomy 10%, sigmoid loop colostomy 10%, loop descending colostomy 5%).

*Mortality*

The overall mortality rate after the formation of the colostomy was 13.8%(16) involving 10 neonates and 6 infants. Two of the neonates died on the operation table, while 8 died within 24 hours after the operation from overwhelming sepsis in 5 and fluid overload in 3. Two of the infants died from severe diarrhoea, 3 from sepsis and 1 from fluid overload.

## Discussion

Colostomy remains a life-saving procedure in the management of colonic and anorectal pathology in children, especially where late presentation and lack of necessary facilities preclude a primary repair. [1] Colostomy in the paediatric age group should be regarded as a major procedure that demands meticulous attention to details.

Indications for colostomy in children are invariably benign, unlike in adults. Hirschsprung's disease (HD) was the leading indication for colostomy in this study followed by anorectal malformations (ARM). This finding is similar to the reports from elsewhere. [5,8-10] Our preference has been for loop colostomy for Hirschsprung's disease, hence the predominance of this type of colostomy in the present series. The use of divided colostomy was largely reserved for ARM and injury to the rectum, where total faecal diversion was a necessity. On occasions, however, divided and loop colostomies were offered for HD and ARM, respectively. Citing the stoma in the right transverse colon spared the entire left colon for reconstruction, but the stoma-related problems were high in this series. A similar observation has been reported elsewhere. [3,4,11] Descending and sigmoid colon stomas were relatively trouble free, and yet left enough bowel length for reconstruction.

The pattern and the complication rate of 53% in this report compares favorably with previous reports. [3,4,11,12] Early complications included wound infection and skin excoriation, other early complications were invariably mechanical in nature, like wound dehiscence and bowel evisceration, stoma obstruction, strangulation and necrosis. All the 4 cases of bowel evisceration required urgent revision. The low incidence of revision surgery in the present series is similar to the report by Sowande, but contrasts with the 16.4 – 18.6% reported by other authors. [5-8] This low incidence implies that the commoner complications of colostomy do not necessarily require a revision operation. Bowel evisceration (and parastomal hernia) results either from failure to fix the colostomy to the fascia or from the breakdown in fixation of the colostomy. Proper fixation of the stoma to the fascia, using non-absorbable or delayed absorbable suture should avert this problem. To avoid excessive narrowing of the stoma, and hence stoma oedema and early obstruction/strangulation, an appropriately sized Hegar dilator or catheter should be inserted into the intestinal lumen at the time of colostomy formation. Early postoperative inspection of the mucosa at the stoma is imperative for early detection of stoma strangulation (blue-black discoloration) and necrosis. The late consequence of such strangulation includes stoma stricture and retraction.

In this study, complications were significantly less frequent in sigmoid loop colostomies when compared to transverse loop colostomies (41.9%vs 58.1%, $P< 0.05$). This finding is not different from other studies. [13] This difference relates to a lower incidence of skin complications in the sigmoid group. This observation may be due to the fact that most divided colostomies were sited in the sigmoid where faeces is more formed, with little or no skin contamination.

Excoriative dermatitis was the highest complication in this report as in others, [11,15,14] and occurred more in the colostomies cited in the transverse colon. It is possible that when the enzyme-rich liquid faeces of the right colon makes contact with the skin, the protein structures in the skin are digested resulting in the excoriation and inflammation of the skin result. To prevent this complication, colostomies should be sited on the left or sigmoid colon, whenever feasible. The application of colostomy bags to collect the faecal matter prevents the skin excoriation but, in our environment these appliances are either not readily available or are too costly. Instead cellophane bags are commonly applied as alternatives, with the faeces still leaking on the skin around the poorly fitted bag. Application of a non-adhesive oily solution (e.g. Vaseline) around the stoma to act as an interface between the faeces and the skin would prevent the skin excoriation. Where the excoriation had already occurred, applying zinc oxide paste was curative.

Colostomy prolapse was the second commonest complication, occurring in 24 (20.7%) children. This

is in concordance with other reports. [5-8] Prolapse was three times as common in loop as in divided colostomy. Previous authors reported a similar finding. [11,16] Intentionally narrowing the distal stoma in loop colostomy may prevent distal prolpase. [16] A flush colostomy, without bringing the whole transverse loop out beyond the skin level, [14] has been reported to have a similar preventive effect. None of the prolapse in this series required a revision surgery.

Colostomy diarrhoea occurred in 3 patients with transverse colostomy and 5 patients with sigmoid colostomy in our series. This finding is similar to the report by Sowande. [1] The diarrhoea was responsible for the death in 2 infants who also had Hirschsprung's disease.

Colostomy closure also requires diligence to technical details and postoperative care, though it is frequently an underrated procedure[5]. All our patients had the intraperitoneal closure, resecting the exteriorized colon with careful end-to-end anastomosis. Twenty-one (19.4%) of our patients developed surgical site sepsis after colostomy closure. This is quite low compared to other series. [1] Colostomy-related surgical site sepsis results from faecal contamination of the wound at surgery. Pre-operative preparation of the bowel and careful attention to technical details would prevent such contamination. Mollitt et al[5] had suggested that delayed primary closure would prevent such surgical site sepsis. No faecal fistula, anastomotic leaks and intestinal obstruction reported elsewhere [1, 3, 4] occurred in our study.

Sixteen (13.8%) of our patients died. This mortality rate is quite high compared to the reports from the developed countries. [5, 6, 8] Most of the deaths were related to fluid management, occurring in neonates and infants. This underscores the importance of diligence in the post-operative management of these patients.

Colostomy in children is associated with significant morbidity and mortality in our environment. Good outcome demands careful attention to technical details and good postoperative and stoma care. More frequent use of sigmoid (or left) colon (when feasible) should be encouraged as it appears to be associated with fewer complications. Colostomy operations should not be underrated or relegated to the lowest member of the team.

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# BREAST MASSES IN ZARIA, NIGERIA

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**Abstract**
*Background:* Breast masses are a common problem worldwide. There is usually an urgent need to differentiate benign from malignant masses.
*Method:* A retrospective study of 428 patients at Ahmadu Bello University Teaching Hospital, Zaria, Nigeria with breast masses in fourteen (14) years was carried out.
*Results:* There were 401 females and 27 males. There were three hundred and five (71.3%) benign lesions and 123 (28.7%) malignant lesions. One hundred and fifteen (26.9%)), 103 (24.%) and 65 (15.2%) of the masses were carcinoma, fibroadenoma and fibrocystic change respectively. Of the 123 malignant lesions, 115(93.5%) were primary breast carcinoma; of these six (5.2%) were in male patients. Eighty-five (73.9%) of the patients with carcinoma had advanced disease. The commonest histologic type was ductal carcinoma in 96 patients (83.5%). All the 305 patients with benign lesions had excisional biopsies. Majority of patients with carcinoma 104 (90.4%) had mastectomy, the other 11 patients had only biopsies. Eighty-nine females with carcinoma (72.4%) had, chemotherapy. Majority of the patients (91.1%) were seen once after discharge from hospital.
*Conclusion:* Benign breast lesions (Fibroadenoma and fibroadanesis) are the commonest cause of breast Masses in our environment, followed by carcinoma of the breast. Patients with breast cancer commonly present late, with advanced disease.

**Key words:** Breast, cancer, advanced diseases

## Introduction

Masses in the breast are common worldwide. [1-4] Evaluation of breast masses in young women continues to be a problem. [1] Despite the presence of mammography and fine needle aspiration cytology, excisional biopsy remains the gold standard for diagnosis. [1,5,6] The pattern of breast cancer in our environment is that of an advanced lesion in a patient presenting late to hospital, after all sorts of treatments have failed. [3-5] This is a report of our experience with diagnosis and treatment of breast masses in Zaria, Northern Nigeria.

## Patients and methods

In the period January 1988 to December 2001, 505 patients were managed for breast masses at the Ahmadu Bello University Teaching Hospital, Zaria, Northern Nigeria. The clinical, operative and histopathological records of the patients were retrieved and reviewed. The records of 428 patients were found adequate. All records of patients that presented to the Hospital in that period with masses in the breast were retrieved. Those excluded were patients whose records were incomplete for age, histological diagnosis, and those that refused surgery or died before surgery.

## Results

Of the 428 patients 401 were female and 27 males (F: M= 15:1). The mean age for females was 36.4 years, range 13-80 years while that of the males was 32.8 years and 18-70 years respectively. Breast masses accounted for 3.5% of the surgical load during the study period. Majority of the females patients were in the first four decades of life, while the males were in the third decade of life (Table 1). The average duration of symptoms before presentation was 10 months, range (2 weeks to 2.5 years). The number of patients with breast masses has generally decreased during the study period.

There were 305 benign lesion (71.3%) and 123 malignant lesion (28.7%) of the malignant lesion 115 (93.5%) were primary carcinoma of the breast, 2 (1.6%) secondary carcinoma, 4 (3.3%) lymphoma, and 2 (1.6%) malignant phylloides tumour. Of the 115 primary carcinoma, 6 were in men (5.2%) (Table 2). The most common lesions were carcinoma in 115,

fibroadenoma in 103, and fibrocystic change in 94 patients. Twenty-one patients had gynaemastia. One patient with carcinoma had stage I disease, 27 stages II, 34 stages III, 51 stages IV and in 2 patients the stages were not recorded. Majority of the patients, 85 (73.9%) presented with clinically advanced disease. The most common histological type was Invasive ductal carcinoma in 96 patients (83.5%) others were anaplastic, lobular, colloid and scirrhous carcinoma.

Two hundred and nine fine needle aspiration biopsies were done (FNAB), of these 188 were for benign and 21 were for malignant lesions. Of the 141 patients that had excisional biopsies of their lesions, 104 and 37 were for benign and malignant lesions respectively. Incisional biopsies were done on 78 patients, 13 and 65 for benign and malignant lesions respectively.

For treatment all the 305 patients with benign lesions had excisional biopsies in 284 (93.9%) and subcutaneous mastectomy in the other 21 (6.9%) patients. Majority of the patients with carcinoma, 104 (90.1%) had mastectomy, 26toilet, 35 simple and 43 modified radical, while the other 11 patients (6 males inclusive) had only biopsies of their lesions. Twenty other patients (17.4%) with carcinoma had bilateral oophorectomy in addition to mastectomy. All the female patients 109 (94.8%) with carcinoma had tamoxifen 20mg daily. Eighty-nine patients (77.4%) had cyclical combine chemotherapy with cyclophosphamide, methotrexate and 5- fluorouracil (C.M.F.) at 3-4 weekly intervals, mostly as adjuvant therapy. Radiotherapy was given to 12 (10.4%) patients, in 6 after mastectomy and the other 6 had biopsies only before radiotherapy.

Majority of the patients 390 (91.1%) were seen only once after discharge from hospital. A few patients (18) with carcinoma of the breast are still attending surgical outpatients clinic, the longest surviving patient is eight years post mastectomy and radiotherapy.

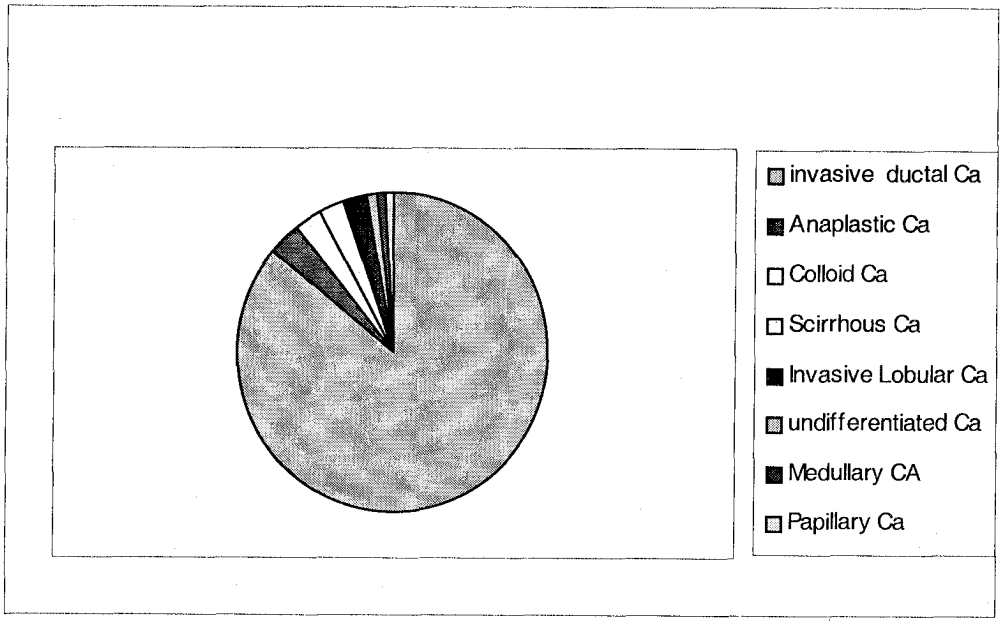
Table 1: Age and sex of 428 patients with breast masses

| Age | M<br>No. (%) | F<br>No. (%) | Total<br>No. (%) |
|---|---|---|---|
| 10-19 | 3 (0.7) | 93 (21.7) | 96 (22.4) |
| 20-29 | 13 (3.0) | 103 (24.1) | 116 (27.1) |
| 30-39 | 3 (0.7) | 89 (20.8) | 92 (21.5) |
| 40-49 | 2 (0.5) | 71 (16.6) | 73 (17.1) |
| 50-59 | 3 (0.7) | 28 (6.5) | 31 (7.3) |
| 60-69 | 2 (0.5) | 28 (6.5) | 31 (7.3) |
| 70-79 | 1 (0.2) | 6 (1.4) | 7 (1.6) |
| 80-89 | - | 1 (0.2) | 1 (0.2) |
| Total | 27 (6. 3) | 401 (93.7) | 428 (100) |

Table 2: Pathologic lesions of 428 patients

| Lesion | M<br>No. (%) | F<br>No. (%) | Total<br>No. (%) |
|---|---|---|---|
| Carcinoma | 6 | 109 (25. 5) | 115 (26. 9) |
| Fibroadenoma | - | 103 (24. 1) | 103 (24. 1) |
| Fibroadenosis | - | 94 (22. 0) | 94 (22) |
| Gynaecomastia | 21 | - | 21 (4. 9) |
| Non-specific chronic mastitis | - | 19 (4.2) | 19 (4. 2) |
| Suppurative mastitis | - | 16 (3. 6) | 16 (3. 6) |
| Tabular adenoma | - | 10 (2.4) | 10 (2.4) |
| Tabular adenoma | - | 8 (1.8) | 8 (1.8) |
| Lactating adenoma | - | 7 (1. 6) | 7 (1.6) |
| Schlerosing adenosis | - | 6 (1.4) | 6 (1.4) |
| Galactocoele | - | 5 (1.0) | 5 (1.0) |
| Phylloides tumour | - | 4 (0.9) | 4 (10.9) |
| Others | - | 20 (4.7) | 20 (4.7) |
| Total | 27 (6.3) | 401 (93.7) | 428 (100) |

Figure 1: Histology of 115 breast carcinomas




## Discussion

Benign lesions are by far the commonest cause of breast masses in this report, accounting for 305 of 428 (71.3%) but cancer of the breast is the single most common lesion. This is similar to reports in Northern Nigeria [5-7] and elsewhere. [1,2]

Breast diseases commonly present as masses in the breast and differentiation between benign and malignant lesions clinically is sometimes difficult.[6] Unfortunately clinical examination is the only non-invasive technique at the disposal of most surgeons in the assessment of breast masses in our country. [7] Although the number of breast masses showed a downward trend, this could be explained by the establishment of more tertiary health centres, and the frequent industrials actions in the hospital in recent years. Many tertiary health institutions lack facilities for mammography and fine needle aspiration cytology, (FNAC) and so surgical biopsies are performed for histological diagnosis.

Fibroadenoma, and fibroadenosis were the most common causes of benign lumps in our study. This finding is similar to the finding in other series, [1,8,9] but slightly at variance with the Kano report.[5] The patients with benign masses had excisional biopsies, and subcutaneous mastectomy inclusive. This is the practice in our centre, even after a preliminary FNAC result is available. [10] Although gynaecomastia contributed (4.9%) of the masses in our study, the prevalence was 12 percent as reported from Ibadan.[11] The other benign conditions in our study are those usually found in the breast as in other studies. [8,9]

Cancer of the breast is not uncommon in our environment. The true incidence in our country is yet to be determined, but various studies have reported incidences of 13.5%, 5.3% and 3.5%. [3,12,13] Our study showed that carcinoma of the breast is predominantly a female disease; other malignant conditions were non-Hodgkin's lymphoma, metastatic carcinoma and malignant phylloides tumour. This is similar to reports from America[8] and our country. [10,12,13] Majority of patients with carcinoma in our study, presented with advanced disease (73.9%). This appears to be a common finding in our country. [3,4,10,13,16.] The reasons for this pathetic, but avoidable problem include delay by peripheral health centres in referral, patronage to traditional healers, local herbalists and barbers by the patients, visit to prayer houses and self-medication. [3,14,15.] Carcinoma of the male breast is a rare lesion, only one patient out of 100 with cancer of the breast was male in the report from Lagos, [14] ' and this may account for the paucity of report in the literature. [17,18]. Invasive ductal carcinoma is the commonest histological type of breast cancer in our study. This is consistent with reports from many centers. [4,10,12,14,19,20] This tumour commonly metastasizes to the axillary lymphnodes and the prognosis is poor than that for the other types. [20.]

Patients present with early breast cancer in the developed world, [19] while patients in our centre and indeed our country commonly present late, with advance disease. [4,9,12,21,22.] This poses a challenge to management. Until about 2 years ago there was no facility for radiotherapy in our centre, and so majority of our patients were managed by surgery, chemotherapy and hormonal manipulation. [13,21]

Surgery was the main form of therapy for almost all the patients. Modified radical mastectomy was performed on those with early disease, while those presenting with advanced disease had simple, toilet mastectomy, or biopsy only, depending on the presentation. Chemotherapy with intravenous cyclophoshamide, methotrxate and 5- fluorouracil (CMF) is the regime used in our centre. This is repeated at 3-4 weekly intervals for 6 courses. This is administered either as adjuvant or neoadjuvant therapy and is similar to the report from Lagos. [14] We do not have facilities for oestrogen receptor assay in our centre like many centres in this country [3,14,21]. All our patients are given tamoxifen, once a histological diagnosis is established irrespective of menstrual status. [20,23] Now that there is a functioning radiotherapy unit in our centre, we expect most of our patients with cancer to benefit.

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# PRE-NATAL EFFECTS OF ETHANOL AND FOLIC ACID SUPPLEMENTS ON THE MINERALISATION OF BONES IN WISTAR RAT

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**Abstract**
*Background:* Alcohol consumption has long been implicated as capable of inducing folic acid deficiency, in particular at pregnancy; thus inflicting severe skeletal dysgenesis on the conceptuses particularly the mineralisation of the bones.
*Methods:* In the present study, 120 adult female Wistar rats were grouped into three: A, B and C. Group A received 0.79g/kg of 30% ethanol from day 1 to day 10 of gestation, group rats received same dosage of ethanol plus 0.14g/kg folic acid supplements for the same period, and group C served as the control. Bone calcium and phosphorus contents were assessed daily from day 12 to 21 in the conceptuses of the three groups; and also the detailed sequence of calcification in the foetal bones were simultaneously monitored with alizarin red S stains.
*Results:* Low mineral levels and a lag or delay in calcification of about 2 days were recorded in the ethanol rats compare with the folate supplement group; with respect to the control, reparative or 'catch-up' growth was displayed in the ethanol plus folate treated rats.
*Conclusion:* These observations attest to the toxic consequences of gestational ingestion of ethanol on bone, and the possible alleviating effects of folic acid supplementation.

**Key words:** Ethanol, folic acid, bone mineralisation, rat

## Introduction

Consumption of ethanol, particularly at pregnancy had long been associated with abnormal development of skeletal tissues of the resulting offsprings.[1, 2] Commencing the ingestion of ethanol at the onset of conception inflicts more consequences on the fetuses. One of the ways ethanol is thought to effects its toxicity is by the inhibition of folic acid uptake by the intestinal bacteria, and its metabolism in the liver. Folic acid is a well-known essential co-factor in the synthesis of purine and pyrimidine components of DNA and RNA, which are important in the formation of protein for normal development, growth and reparation of tissues. Folic acid deficiency is a common feature in pregnancy, being more severe in the alcoholics.[3-7]

Moreover, bones are the reservoir of calcium and phosphorus needed for the normal functioning of mineral deposition on the skeleton when needed. In young actively growing animals, bones are sensitive to changes in intake of calcium and phosphorus for instance in extreme deficiencies of either of them. This usually necessitates profound alteration in the state of mineralisation[8] Factors instigating a deficient absorption or utilization of the minerals particularly in the presence of adequate in take had been assessed with low retention of calcium in rickets[8, 9] Calcium is the main constituent of bone and more than 99% of the mineral in the body is concentrated in the skeleton. Adequate calcium and phosphorus is important for normal skeletal growth, health and integrity. In alcoholics, calcium along with other minerals deficiencies is part of the general malnutrition, resulting from impairment of its absorption. The effects of ethanol ingestion with the concurrent folic acid supplements at pregnancy on the mineralisation of bones of the conceptuses are investigated in this study, using the Wistar rat animal model.

## Materials and methods

One hundred and twenty adult nulli - parous Wistar rats weighing between 200g and 250g were procured from the animal holdings of the Faculty of Pharmaceutical Sciences, A.B.U., Zaria, for the experiment. They were kept in the animal holdings of Department of Human Anatomy and fed on rat pellets (Agro Feeds Ltd., Ibadan), with clean drinking water

provided ad - libitum. The animals were grouped into three: A, B and C with 40 rats in each group. The animals were subsequently caged in twos with one adult male rat for mating. Confirmation of pregnancy and commencement of gestation dating was done according to Asling methods.[10] The group A rats were intubated at a dose of 0.79g/kg of 30% v/v ethanol per day from day 1 to 10 of gestation (dosage calculated from the equivalent g/ml of ethanol). Group B rats were also intubated with the same dosage of ethanol plus 0.14g/kg of folic acid per day for the same period. This dosage of folic acid is equivalent of the recommended 5g/day at pregnancy in Nigeria. The group C rats serve as control.

*Assessment of bone calcification*

Four rats were sacrificed daily from each group by chloroform inhalation from day 12 to day 21; the abdominal wall opened up and the fetuses retrieved from each uterine horn; immediately fixed in 10% formalin and carefully inspected to detect any morphological distortion. The skin, soft tissues and viscera were dissected off to expose the skeleton and subsequently processed in alizarin red S stains according to the methods of Dix. [11] Calcification in the individual bone of the fetuses was monitored daily by the aid of the stereoscopic microscope.

*Bone mineral quantification*

From days 12 to 21 four rats were sacrificed daily from each group by chloroform inhalation; the abdominal wall opened up and the fetuses retrieved from each uterine horn and weighed. The skin, soft tissues and viscera were dissected off, and the weight of the exposed skeleton recorded. These were subsequently processed according to the methods of Sampson and co-workers [12] to assess the bone minerals and materials levels.

## Results

*Calcification*

Detailed daily recordings of the calcification are presented in Tables 1a, b and c. The control rats displayed normal, proximo - distal sequence of bone growth.

The ethanol plus folic acid supplements rats displayed an attempted 'catch-up' with the control rats in the period of calcification The ethanol treated rats exhibited delay in calcification, with lag time of about 2 days.

*Minerals*

The dry weight steadily increased with the foetal age from day 12 through the gestational period in all the groups but at relatively slower rates in the ethanol, and the folate supplement groups with respect to the control group, except on days 15 and 19 respectively when the weights closely match up with the control rats.

Table 1. First day of appearance of calcification in the bones of Wistar rat foetuses monitored from days 12 to 21 of gestation (foetuses n= 15/group/day): (a) *Skull bones*

| Bones | A (n=40) | B (n=40) | C (n=40) |
|---|---|---|---|
| Mandible | 14 | 13 | 13 |
| Maxilla | 17 | 16 | 15 |
| Frontal | 18 | 17 | 15 |
| Nasal | 17 | 16 | 16 |
| Temporal | 19 | 17 | 16 |
| Parietal | 18 | 17 | 16 |
| Occipital | 19 | 17 | 16 |

Table 1. First day of appearance of calcification in the bones of Wistar rat foetuses monitored from days 12 to 21 of gestation (foetuses n= 15/group/day): (b) *Axial bones*

| Bones | A (n=40) | B (n=40) | C (n=40) |
|---|---|---|---|
| Clavicle | 14 | 13 | 13 |
| Sternabrae | 18 | 17 | 16 |
| Ribs | 18 | 17 | 16 |
| Scapula | 20 | 18 | 18 |
| Vertebrae | | | |
| Cervical | 18 | 17 | 17 |
| Thoracic | 19 | 17 | 17 |
| Lumbar | 21 | 19 | 18 |
| Sacral | 21 | 20 | 19 |
| Caudal | 21 | 20 | 19 |

Table 1. First day of appearance of calcification in the bones of Wistar rat foetuses monitored from days 12 to 21 of gestation (foetuses n= 15/group/day): (c) *Appendicular bones*

| Bones | A (n=40 | B (n=40) | C (n=40) |
|---|---|---|---|
| Humerus | 18 | 17 | 16 |
| Ulna | 18 | 17 | 16 |
| Radius | 18 | 17 | 17 |
| Carpals | 19 | 17 | 17 |
| Meta-Carpals | 19 | 18 | 17 |
| Fore- Phalanges | 21 | 19 | 18 |
| Femur | 17 | 16 | 16 |
| Tibia | 18 | 16 | 16 |
| Fibula | 18 | 17 | 16 |
| Tarsal | 20 | 18 | 17 |
| Meta-Tarsal | 19 | 17 | 17 |
| Hind-Phalanges | 20 | 19 | 18 |
| Pelvis | 20 | 19 | 18 |
| Astragalus | 20 | 19 | 18 |

Fat-free weights were less in the ethanol group. Higher weights were recorded for the folate supplement and the control groups; the mean percentage fat-free weights were 25%, 35% and 38% respectively. Likewise, the mean percentage ash-weights calculated from the dry weights were 5%, 23% and 27% respectively (Table 2).

The bone calcium and phosphorous contents are expressed in mg/g, and this was low throughout the foetal age; likewise the phosphorous, the level apparently plateaued through the gestational days and was considerably less in the ethanol group than in the ethanol + folate and the control foetuses (Table 3).

Table 2. Analysis of bone size (mg/g, from day 12 – 21 of gestation) in the Wistar rats' foetuses in the ethanol, folate supplements and control groups

| Group | | Foetal age (days) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| Control | Dry-weight | 200 | 215 | 220 | 220 | 228 | 235 | 240 | 245 | 254 | 260 |
| | Fat-free | 185 | 201 | 206 | 195 | 200 | 201 | 210 | 212 | 216 | 220 |
| | Ash-weight | 85 | 89 | 90 | 93 | 96 | 110 | 109 | 100 | 115 | 120 |
| Ethanol + folate | Dry-weight | 210 | 210 | 215 | 218 | 220 | 230 | 240 | 240 | 248 | 250 |
| | Fat-free | 194 | 202 | 190 | 197 | 206 | 202 | 210 | 210 | 211 | 212 |
| | Ash-weight | 60 | 85 | 101 | 96 | 100 | 108 | 110 | 118 | 112 | 115 |
| Ethanol | Dry-weight | 205 | 212 | 208 | 220 | 216 | 218 | 228 | 226 | 194 | 236 |
| | Fat-free | 160 | 165 | 170 | 180 | 170 | 165 | 182 | 190 | 194 | 205 |
| | Ash-weight | 50 | 60 | 65 | 60 | 78 | 80 | 75 | 87 | 91 | 95 |

Table 3. Analysis of bone mineral values (mg/g, from day 12 – 21 of gestation) in the Wistar rats' foetuses in the ethanol, folate supplement and the control group

| Bone mineral | Foetal age (days) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| Control | | | | | | | | | | |
| Phosphorus | 8.92 | 9.00 | 8.46 | 9.24 | 9.42 | 9.24 | 9.29 | 9.22 | 9.55 | 4.10 |
| Calcium | 3.00 | 3.20 | 3.40 | 3.30 | 3.40 | 3.64 | 3.40 | 3.30 | 4.10 | 4.40 |
| Ethanol + folate | | | | | | | | | | |
| Phosphorus | 8.25 | 8.87 | 7.85 | 8.87 | 8.25 | 8.22 | 8.25 | 6.42 | 8.86 | 8.94 |
| Calcium | 2.10 | 2.30 | 2.50 | 2.20 | 2.00 | 3.00 | 2.70 | 2.80 | 2.50 | 3.00 |
| Ethanol | | | | | | | | | | |
| Phosphorus | 4.60 | 4.46 | 4.65 | 4.42 | 4.46 | 4.23 | 3.45 | 4.86 | 4.58 | 4.99 |
| Calcium | 3.40 | 4.50 | 4.42 | 4.50 | 5.67 | 4.82 | 4.92 | 4.86 | 5.00 | 5.30 |

## Discussion

The pattern of calcification in the control group is in agreement with those observed in earlier studies in rodents; [13, 14] the delay in calcification in the ethanol treated group could be attributable to the fascilitatory effect of ethanol on the calcification inhibitors. These are family of inorganic phosphates, phosphonates and diphosphonates, usually present in matrix of osteoid tissues undergoing calcification. They normally act to prevent calcium deposits from forming in soft tissues[15]. On the other hand, pyrophosphates enzymes are normally secreted in the vesicles; these usually destroy the inorganic inhibitors. Ethanol is thought of capable of suppressing these enzyme activities, thereby slowing down bone mineralisation [16 – 17]

Moreover, earlier reports indicated that alcohol consumption results in reduced osteoblast activity with consequent inhibition of the process of matrix synthesis. This leads to poor formation of bone protein (collagen); in addition, the possibility of ethanol - potentiation of folic acid deficiency could therefore explain the defects in the calcification seen in the present investigation.

Furthermore, the fact that the high demand for calcium and phosphorus to the manifold functions

in the organism recalls its important role and the effects of its deficiency in the feature of calcification of bones and in osteoporosis.[8, 18,19] An increase in the production of $Ca^{2+}$ x $PO4^{2-}$ to a point beyond the solubility product constant of calcium hydroxy - apatite (CaHPO4) is critical for deposition of the bone mineral and also determines the formation of a colloidal calcium phosphate in the plasma.

Deficiency in bone minerals usually account for a relatively short supply of stored calcium, high osteoblast and osteoclast activity, reflecting in maximum demand for stored calcium and a subsequent porous shaft[8] Unfortunately, there is no special storage mechanism for calcium and phosphorus to meet the needs of pregnancy and lactation in mammals because these organisms are able to adapt to low intake of calcium to some extent without demonstrable pathological changes; but in the face of high demand such as in calcification, inadequacy of minerals is manifested in poor skeletal health and integrity[9]

Malnutrition which usually accompany alcoholics contributes to hypocalcaemia and phosphate depletion, having its maximal impact on the skeleton particularly in early childhood of the resulting offspring; the low mineral levels and poor calcification in the experimental rats concur with the earlier studies.[12, 20] Earlier workers examined the chronic effects of ethanol consumption on 10-month old rats and similar decrements in bone density and mineralisation were observed. [21, 22]

The apparent compensatory growth in the folate supplement group rats could have probably improved perhaps with higher dosage of folate. The hypothesis that growth retardation of bone due to ethanol consumption is modified by impairment of folate uptake by the foetal tissues tested in this study is exhibited in the differential bone growth and mineralisation in the foetuses. The fact that there is a relative improvement in the foetal group receiving the same dosage of ethanol with folate supplementation substantiate this point of a possible rehabilitatory growth. Folate supplement was administered to alleviate the hypothetical ethanol - induced deficiencies.

The anomalies in bone mineralisation seen in the ethanol foetuses were not fully redressed before birth as indicated in the folate supplement group, and such pathology persists even to adulthood and usually manifests in cases like foetal alcohol syndrome; however, a higher dosage of folate supplementation in a future study may be necessary in order for a conclusive picture.

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# SEX IDENTIFICATION FROM THE SKULL OF THE HAUSA/FULANI IN NORTHERN NIGERIA

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**Abstract**
*Background:* The Hausa / Fulani is one of the major races in Nigeria, with scanty craniometrical records for sex identification, a useful resource in forensic study and anthropometry.
*Methods:* Craniometry of non-pathologic radiographs of the skull was done to evaluate the sexually dimorphic characteristics in the bones.
*Results:* Statistical analysis of the figures revealed significant higher dimensions in the male over the female in the parameters considered except in the nasal height and orbital bones; sex discrimination was also illustrated in the craniometrical indices except in the nasal bone. Possible factors responsible for these observations were discussed.
*Conclusion:* It is suggestive that the findings could possibly serve as indicator of sex identification in this race.

**Key words:** Hausa/Fulani, skull, sex identification, craniometry

## Introduction

Most times, particularly in forensic studies, one is confronted with the identification of sex of the individual from a skeletal remains. The skull appears to be the main reliable bone apart from the pelvis exhibiting sexually dimorphic features. [1] Other bones such as clavicle, calcaneous, radius and ulna had also been found useful in some cases, although there exist regional and racial variations in the skeleton. [2] Whereas preadolescent bones are almost useless in sex identification as they show little or no dimorphic features or dimension due to the fact that the secondary sexual characteristics do not develop safe for hormonal influence at puberty. [3, 4] Moreover, supposing one finds him / herself among this populace, the Hausa / Fulani, and has only the skull to assess sex from? It is on this basis the present work was designed, to assess dimorphism in the skull, adopting the craniometrical methods of El-Najjar and McWilliams. [5]

## Materials and methods

Three hundred and fifty plain radiographs of non-pathologic cases and known identity comprising 185 males and 165 females showing either frontal or lateral view, ageing between 25 and 50 years, obtained from the Radiology Unit of the Ahmadu Bello University Teaching Hospital, Zaria were used for the study. The radiographs were taken from anode – film distance of 100cm. They were placed on dust free illuminator and with the aid of veneer calipers the following dimensions were measured directly and recorded (Figures 1 and 2, Table 1); Cranial Length (Figure 1, A – B): The greatest antero-posterior diameter from glabella to the most posterior point in the mid-saggital plane on the occipital bone; Cranial Breadth: (Figure 2, F – G): the greatest horizontal or transverse diameter of the cranium taken at a point above the auditory meatus or the supramastoid crest; Nasal breadth (Figure 2, K – L): the maximum distance between the points of the intersection of the naso-frontal and the naso-maxillary sutures on the right and left sides; Nasal height (Figure 2, H – I): From the nasion to the lowest tip of the nasal spine on the lower border of the nasal aperture; Orbital height (Figure 2, M – N): the maximum distance between the upper and lower margin of the orbital cavity taken perpendicular to the orbital breadth; Orbital breadth (Figure 2, O – P): From the mid-point on the medial margin of the orbit to the mid-point on the lateral orbital margin; Facial height (Figure 2, H – J): the distance from nasion to the menton with the lower jaw in place and the teeth in apposition; Mandibular length (Figure 1, D – E): from the menton to a line perpendicular to the most posterior point on the condyle; Mandibular breadth (Figure 1, C – D): between the gonion and the uppermost point on the condyle.

The maximum and minimum values obtained were recorded as range and the mean values worked out for each parameter in both sexes. Student's t-test was used to compare the values and a P – value of 0.05 or less was considered to represent a statistically significant difference. Furthermore, the data were categorized into indices as follows according to El-Najjar and McWilliams; [5]

(i) Cranial index (CI): $= \max \frac{\text{A-B x 100}}{\text{max F-G}}$

(ii) Frontal Index (FI): $= \max \frac{\text{H-J x 100}}{\text{max O-P}}$

(iii) Orbital Index (OI): $= \max \frac{\text{O-P x 100}}{\text{max M-N}}$

(iv) Nasal Index (NI): $= \max \frac{\text{K-L x 100}}{\text{max H-I}}$

Figure 1: Lateral view of the skull

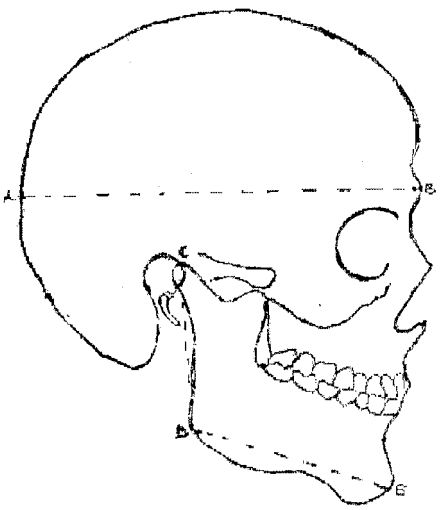
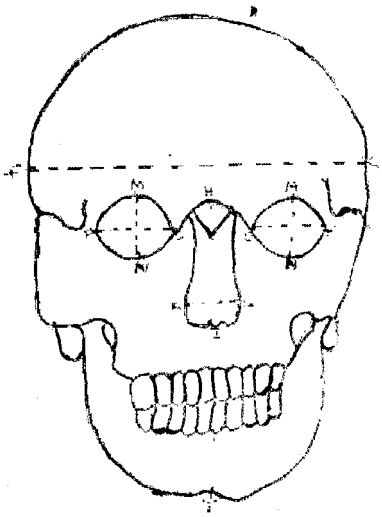


Figure 2: Frontal view of the skull



## Results

Table 1: The craniometrical measurements (mm) (males =185; females =165; No. of FV = 180, No. of LV N=170

| Dimension | Parameter | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CL | | CB | | NH | | NB | | OH | | OB | | FH | | MDL | | MDH | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Min | 186.00 | 67.00 | 145.00 | 51.00 | 44.40 | 40.05 | 30.30 | 33.05 | 33.40 | 34.50 | 35.00 | 37.05 | 106.05 | 106.05 | 86.05 | 80.42 | 67.23 | 65.08 |
| Max | 210.00 | 210.00 | 161.25 | 155.05 | 64.00 | 45.05 | 45.00 | 35.50 | 48.00 | 55.50 | 45.00 | 38.50 | 135.00 | 135.00 | 131.95 | 98.50 | 84.38 | 78.25 |
| Mean | 208.00 | 202.02 | 152.00 | 151.00 | 58.82 | 46.54 | 47.35 | 34.27 | 42.05 | 34.71 | 39.33 | 37.00 | 128.00 | 118.50 | 89.26 | 86.40 | 74.33 | 70.08 |
| SD | 2.40 | 2.35 | 3.06 | 2.05 | 2.64 | 2.07 | 2.08 | 1.95 | 3.44 | 3.06 | 3.22 | 3.16 | 3.86 | 2.86 | 2.56 | 1.65 | 2.74 | 2.74 |
| P value | N.S | | N.S | | <0.05 | | <0.05 | | <0.05 | | N.S | | <0.05 | | N.S | | N.S | |

FH = Facial Height; MDL = Mandibular Length; MDH = Mandibular Height
M = Male; F = Female; Max = maximum range; Min = minimum range
(Radiographs: FV = Frontal view of skull; LV = Lateral view of skull)

The craniometrical assessment clearly revealed higher dimensions in the male than female subjects in all the parameters except in the nasal height, orbital height and breadth. Statistically significant differences were recorded in the frontal, nasal and orbital bones, indicating that these bones exhibit more of the dimorphic features (Table 1). Distinctive higher figures were recorded particularly in subjects ageing between 30 and 45 years in the males. However, this was less distinct in the earlier ages and appears to decline in latter years. Moreover, the cranial indices recorded in this series could be categorized as follows after El-Najjar and McWilliams[5] (Table 2).

Table 2: The craniometrical indices

| Indices | Sex | Values | Categories |
|---|---|---|---|
| Cranial index | Male | 76.7 | Mesocranic |
| | Female | 73.8 | Dolichocranic |
| Orbital index | Male | 93.7 | Hypsiconch |
| | Female | 69.3 | Chamaeconch |
| Nasal index | Male | 72.0 | Hyperchamerrhine |
| | Female | 70.3 | Hyperchamerrhine |
| Facial index | Male Male | 97.0 | Hyperleptoprosopic |
| | Female | 87.7 | Mesoprosopic |

## Discussion

The implication of the skull in racial identification had been well documented. [6 - 8] More so, the usefulness of the bone in the assessment of sex had been receiving attention since Pendergrass [9] suggested some criteria such as the unusual thickness of the cranial bones such and the persistence of the metopic suture into adulthood in the females. El-Najjar and McWilliams [5] listed other features in the female skull such as the prominence of the brow ridges, sharpness of the orbital rims, height of the mandible, size of the mastoid process and the acuity of the gonial angle as some of the reliable parameters in sex identification; and from the present observation. However, subsequent to the work of Montague[10] who reported that the osteometric assessment of some cranial land marks are useful indicators of sex determination, the present work extends the findings of El-Najjar and McWilliams[5] in the Caucasians skull and appendicular skeleton in which almost all the dimensions considered in the bones recorded higher values in the male than in the female subjects. The indices further illustrate the sexually dimorphic features in the bones, safe the nasal in which both sexes fall into same category. This report also adds to the dossiers of existing evidence to substantiate the skull as a useful indicator of sex.

A possible explanation for this finding could probably be due to endocrine influence on post-natal growth of bones[4]. At preadolescent age, bone growth in both sexes is almost at the same rate and of equal dimension.[10 - 13] But with the onset of puberty in the female, the inhibitory effect of the oestrogen on the osteoblast activities at the growing end of the bone appears to retard the bone growth, hence, the lower dimensions recorded in this sex.[14, 15] On the other hand, the socio-cultural attitude of this race most times limits the female physical activity. Could that possibly restrict the skeletal growth in this sex as presently observed? It would rather be too hasty to be conclusive at this point; hence, this study is continuous on the long bones to assess the basis of the seemingly higher physiques of the male subjects in this race.

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# RISK FACTORS FOR VISUALLY DISABLING AGE-RELATED CATARACTS IN IBADAN

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**Abstract**
*Objective:* To assess the risk factors for visually disabling age related cataracts.
*Methods:* A hospital based case-control study carried out at the university College Hospital Ibadan between May 1996 and March 1997. Three hundred and eighty three cases were matched for age and sex with five hundred and ninety nine controls. Subjects aged 50 years and above were examined for visual disabling central lens opacities, which were graded on a scale of 0-3, through undilated pupil with direct ophthalmoscope set at +2.00 Diopters, and held 1/3 meter away. Grades 2a or more with visual acuity less than 6/18 only were selected as cases. Both cases and controls were examined and the risk for development of cataract determined.
*Results:* The analysis revealed a strong association between uncontrolled diabetes and cataracts (O.R 2.03, P < 0.021). A risk was seen to exist between visually disabling cataract and ultraviolet exposure (O.R 1.45; P <0.003), uncontrolled hypertension (O.R 1.3, p>0.05) and topical steroid use (O.R 1.57; p>0.05).
Exposure to alcohol was found to be protective (O.R 0.66; P < 0.05) while no risk was observed with severe diarrhoea (O.R 0.85; P >0.05) and heavy smoking (O.R 0.81; P > 0.05).
*Conclusion:* The study confirms an association between cataract and exposure to diabetes, ultraviolet irradiation, hypertension, corticosteroids, and cigarette smoking. There is therefore a need for introduction of intervention measures aimed at reducing exposure to these risk factors.

**Key words**: Age-related cataract, visually disabling cataract, cataract risk factors

## Introduction

Cataract or opacity of the crystalline lens is the commonest cause of blindness worldwide, accounting for over 40% of the world's 38 million blind population. [1] Most cases of cataract are said to be of unknown etiology. In a study done at the University College Hospital, Ibadan, [2] involving 567 cataract cases, over 80% were idiopathic and occurred in an otherwise healthy pre-senile and senile age group.

Cataract is not preventable at the present level of knowledge, but blindness from cataract can be cured through cataract extraction followed by adequate visual rehabilitation. Very few surgeries are however being done in many developing countries because of numerous socio-economic problems. [3,10] A large backlog of cases is therefore left un-operated. With dwindling resources there is no immediate hope in sight for improvement in the cataract surgical rates. Cataract has however been linked to multi-factorial etiology by a number of studies[4, 5] in Europe, India and America. Nutritional factors[6], ultraviolet ray exposure, [7] smoking, [8] alcohol, [8] systemic diseases such as diabetes and hypertension[6] as well as steroids have all been identified. No reported work has been done in the study environment to establish a role for any of these risk factors in the causation of cataract. This study was therefore carried out with the aim of examining the role played by some of these risk factors in the development of visually disabling age related cataract with the intention of making appropriate recommendations based on findings that may help in reducing the cataract incidence.

## Materials and methods

This study was conducted at the Eye Clinic of the University College Hospital Ibadan. A city located between latitudes 7.23 degrees North of the equator and longitude 3.56 degrees East of the Greenwich meridian. Ibadan is dominated by hills and

has relatively high temperatures throughout the year with an average annual maximum of $31^0$ Celsius and an average lowest of $23^0$ Celsius. An annual average rainfall of 48 inches (120cm) measured over a period of 40 years makes Ibadan atmosphere very dry compared to many places such as Bida, Illorin and Kaduna in the North and Forcados in the South. [11,27]

The study population consisted of mostly peasant farmers, petty traders, and retired civil servants from Ibadan and nearby towns.

*Examination procedure*

All patients aged 50 years and above attending the eye clinic during the study period had their consent taken after detailed explanation of the study, they were initially questioned and examined for eligibility, tested to assess visual acuity (using E-chart at 6 meter with or without pin hole). The red reflex of each eye was visualized through the un-dilated pupil with direct ophthalmoscope set at +2.00 Diopters and held at 1/3 meter from the patient's eye to examine for central lens opacity.

Central lens opacities that partially or wholly obscured the red reflex were identified and graded on a scale of 0-3 according to the method for rapid grading of cataract in epidemiological studies described by Merha and Menasian. [12] Only patients with visual disabling cataracts as confirmed by pinhole visual acuity worse than 6/18 and of grade 2a or worse (lens opacities obscuring more than 1/3 area of red reflex were chosen as cases.

Excluded were patients with ocular conditions such as uveitis, retinal detachment, glaucoma traumatic, congenital or developmental cataracts and other forms of secondary cataracts. Also excluded were cases of central corneal opacity, which would not allow adequate assessment of the cataract.

*Controls*

were defined as subjects with visual acuity of 6/18 or better who did not have central lens opacities and did not have ocular disease. They were screened from patients or relations who accompanied patients to the University College Hospital, Ibadan. Two controls matched for age and sex were selected per case less than 70 years of age.

For those over 70 years of age due to inadequate number of persons without cataracts at this age only one control was matched per case.

Selected cases and controls were then interviewed with same set of questionnaires in the eye clinic by one of the authors (COB). Cases had their pupils fully dilated with topical 1% tropicamide and 10% phenylephrine to enable slit lamp examination of the lens using oblique illumination with a narrow slit of 1mm and the light source directed from an angle of 45 degrees from the microscope, full, illumination and x10 magnification to allow classification into morphological types. [18]

Cases and controls had their blood pressures checked and urine tested for glucose. They were also examined for association with the following factors:

i. Diarrhoea: History of one or more episodes of severe life threatening diarrhoea severe enough to render patient seriously ill in bed for three days or hospital admission. This episode having occurred at least three months before visual impairment as a positive history.

ii. Ultraviolet Light Exposure: A positive history was considered to be occupational history of sunlight exposure all day long (6am - 6pm) unprotected with sun shades and brim hat every day except day of worship for at least one year i.e. 12 hours every day for 300 days.

iii. History of heavy smoking: Smoking equivalent of a pack of cigarette daily for five years, as positive history.

iv. History of heavy drinking: Drinking more than 4 units of alcohol per day (two bottles of beer) for at least five years as positive history.

v. Steroidal eye medications: Use of steroid eye drops regularly consistently every day for up to 12 months was regarded as positive history of steroid use.

vi. Hypertension: History of hypertension or use of anti-hypertensives for up to one year. Hypertension was confirmed by blood pressure readings of 160/90mmHg or more with the aneroid sphygmomanometer with patient sitting down.

vii. Diabetes: History of diabetes or use of drugs for diabetes for up to one year. Confirmation of diabetes was by a positive urinalysis of freshly voided urine tested with clinistix strips for sugar.

Statistical analysis was with Stat Pac Gold Application package. Odds ratio as estimates of relative risk were computed for factors to assess the risk of visually disabling cataracts. All statistical testing for significance was at 5% probability level.

## Results

Nine hundred and eighty two subjects (383 cases and 599 controls) were examined, interviewed and included in this study. A majority of the cases 268 (69.9%) were mixed cataracts. Others were cortical opacities 11(2.9%), nuclear cataracts 47(12.3%), and posterior sub-capsular cataracts 56(14.6%).

A majority of the cases were from the 60 - 74 year age group accounting for 65.3% of all cases. Majority of the controls were from the 60-74 years age

group accounting for 63%. The mean age for cases was 66.1 years and controls 63.0 years, (t-test=5.91, p.value 0.001).

Of all cases there were 216 males (56.4%) and 167 females (ratio 1.3: 1.0) of the control 334 (55.8%) were males and 265 females (ratio 1.3: 1.0). Sex chi-square was 0.02 and p.value 0.89. There was no significant difference in sex distribution of the study. The distribution of the occupations of the subjects for the study is shown in Table 1.

*Risk of Visually Disabling Cataract*

When the risk of visually disabling cataract was examined for UVR, heavy smoking, heavy drinking, diarrhoea, prolonged use of topical steroids, hypertension and diabetes, the results are shown in Tables 2.

i. U.V.R: There was an estimated 45% increased risk of developing visually disabling cataracts in unprotected UVR exposure. (O.R 1.45, C.I 1.10-1.90, P-0.003)
ii. Heavy Smoking: No risk was found with heavy smoking. (O.R O.81, C.I 0.46-1.42, P-0.25)
iii. Heavy Drinking: An association was found between heavy drinking and cataract, which was protective. (O.R 0.66, C.I 0.40-1.08, P<0.048).
iv. Diarrhoea: No risk was found with diarrhoea (O.R 0.85, C.I 0.54-1.34, P=0.26).
v. Topical Steroids: There was a 57% increased risk for visually disabling cataract with use of topical steroid but it was not statistically significant. (O.R 1.57, C.I 0.44-5.59, P>0.31).
vi. Hypertension: There was 33% increased risk for cataract with systemic hypertension, which was not statistically significant. (O.R 1.33, P=0.083).
vii. Diabetes: There was a doubling of the risk of cataracts in uncontrolled diabetes. (O.R 2.05, P=0.021).

*Risk of developing different morphological types of cataracts*

Examination of the risk for developing different morphological types of cataracts for each risk factor is as shown in Table 3.

i. U.V.R: There was an increased risk for all morphological types of cataracts except for cortical opacities. This risk was how ever statistically significant for mixed cataracts only.
ii. Diarrhoea: No risk was found with diarrhoea and all morphological forms of cataracts.
iii. Smoking: A marginal risk was found for cortical opacities but not statistically significant. No risk was found for other morphological types.
iv. Heavy drinking: There was an identified increased risk for cortical opacities but of no statistical significance.
v. Topical steroid: There was an identified increased risk for posterior subcapsular cataracts but not of statistical significance.
vi. Hypertension: There was increased risk for posterior subcapsular and mixed cataracts but not of statistical significance.
vii. Diabetes: The risk was tripled for P.S.C and doubled for mixed cataract but not statistical significant.

Table 1:Distribution of studied subjects by occupation

| Occupation | Case (%) | Control (%) | Total |
|---|---|---|---|
| Trading | 162 (42.3) | 294 (49.1) | 456 |
| Farming | 62 (16.2) | 72 (12.0) | 134 |
| Civil servant | 42 (10.9) | 70 (11.7) | 112 |
| Artisan | 14 (3.7) | 13 (2.2) | 27 |
| Driving | 10 (2.6) | 14 (2.3) | 24 |
| Mason | 6 (1.6) | 16 (2.7) | 22 |
| Armed forces | 6 (1.6) | 17 (2.8) | 23 |
| Security guard | 5 (1.3) | 4 (0.7) | 9 |
| Tailoring | 4 (1.0) | 11 (1.8) | 15 |
| Others | 72 (18.8) | 88 (14.4) | 160 |

Skilled=civil servants; semiskilled=artisans, drivers; unskilled= traders, farmers.
$X^2$=3.09, p=0.379.

Table 2:Risk factors for visually disabling cataracts

| Risk factor | Cases (%) | Control (%) | O R | 95% CI | p value |
|---|---|---|---|---|---|
| Diabetes | 23 (6.1) | 20 (3.4) | 2.5 | 1.06 – 3.98 | 0.021 |
| UVR | 175 (45.7) | 220 (36.8) | 1.45 | 1.10 – 1.90 | 0.003 |
| Hypertension | 86 (22.6) | 106 (18.0) | 1.33 | 0.95 – 1.85 | 0.083 |
| Topical steroid | 6 (1.6) | 1 (1.57) | 0.44 | 0.44 – 5.59 | 0.31 |
| Diarrhoea | 36 (9.4) | 65 (10.9) | 0.85 | 0.54 – 1.34 | 0.26 |
| Heavy smoking | 22 (5.7) | 42 (7.0) | 0.81 | 0.46 – 1.42 | 0.25 |
| Heavy drinking | 27 (7.9) | 62 (10.4) | 0.66 | 0.40 – 1.08 | 0.045 |

OR=Odds ratio; CI=Confidence interval.

Table 3: Risk for developing various morphological cataract types

| Risk factor | Cataract | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Cortical | | Nuclear | | PSC | | Mixed | |
| | OR | p value | OR | p value | OR | p value | OR | p value |
| UVR | 0.98 | 0.7 | 1.80 | 0.05 | 1.60 | 0.2 | 1.40 | 0.03 |
| Diabetes | 0.0 | 0.2 | 0.98 | 0.2 | 3.18 | 0.03 | 2.06 | 0.05 |
| Topical steroid | 0.0 | 0.2 | 0.0 | 0.2 | 1.8 | 0.2 | 1.88 | 0.2 |
| Hypertension | 0.0 | 0.2 | 1.07 | 0.2 | 1.37 | 0.2 | 1.45 | <0.05 |
| Heavy smoking | 1.36 | 0.5 | 0.30 | 0.3 | 0.77 | 0.2 | 0.93 | 0.2 |
| Diarrhoea | 0.83 | 0.9 | 0.78 | 0.8 | 0.82 | 0.8 | 0.93 | 0.8 |
| Heavy drinking | 1.92 | 0.2 | 0.38 | 0.2 | 0.49 | 0.2 | 0.70 | 0.2 |

## Discussion

This study identified an increased risk for visually disabling cataracts with unprotected daily exposure to UVR for at least one year. It was not possible to calculate the actual dose of UVR received by subjects in this study. An indirect estimate based on total daily sunlight hours of exposure was used as a measure of UVR exposures. It is a recognized indirect estimate as shown by previous studies. [13,25] A positive association between UVR and cataracts has been identified by previous studies. [6,7,13] The India-U.S case control study found a reduced risk for all types of cataracts and indices of larger amounts of lifetime cloud cover. The Chesapeake Bay study using estimate of annual ocular sunlight exposure from detailed occupational, hat and glasses use history with laboratory and field measurements of sunlight exposure found an increased risk for cortical cataracts with cumulative levels of UVR exposure. No risk was found for the other cataract types. The absence of risk with cortical cataract in this study may be due to the fact that some subjects with cortical opacities did not have visually disabling cataracts and were not selected as cases. A marginal increased risk for heavy smoking was found for cortical lens opacities but not at a statistically significant level, probably because of the few subjects with cortical opacities for statistical analysis. Previous studies[8, 15] have identified heavy smoking as a risk for cataract especially of the nuclear type. Absence of a strong risk (especially for nuclear cataracts) in this study may be related to misinformation by subjects or perhaps is a true reflection of the absence of heavy smoking practice amongst the studied population. Two case-control studies one in India [6] the other in the United States [17] did not find any significant association between smoking and cataract.

A reduced risk was found between heavy drinking and visually disabling cataracts but was increased for cortical opacities. The Oxfordshire[8] and Beaver Dam[17] studies found a positive association between heavy drinking and all types of cataracts. Other studies[18] have found a J-shaped relationship, with higher risks among total abstinence and heavy drinkers compared to occasional drinkers. The J-shaped relationship was said to have suggested a protective effect of light drinking or possible misclassification of none drinkers. Protective effect of drinking on cataract formation in this study may have been due to misclassification in view of the stringent definition of heavy drinking used.

No risk was identified for cataract with severe life threatening diarrhoea in the study environment. Most

of the respondents had suffered from some form of diarrhoea in the past but not in the magnitude of that mentioned in the Raipur India study. [26] Another study, which has found no risk with diarrhoea disease, is the India-U.S[6] case control study, which defined diarrhoea as that lasting one day or more.

Prolonged use of topical steroids had an increased risk for PSC and mixed cataracts but not at a statistically significant level. This may be related to the fewer number of positive responses to the question of steroid use. One basic problem identified was the difficulty with eliciting the history of steroid use. Most of the respondents did not know the names or types of ocular medications they had used in the past. Previous studies[18, 9,19] on prolonged use of large dose systemic steroids have identified a positive risk for cataract with steroids. There have also been reports of PSC with topical steroids. [20,21] There is however scarcity of literature on controlled clinical studies involving topical steroids and cataract.

Hypertension had a marginally increased risk for cataracts but not at a statistically significant level. Previous studies have also found hypertension as a significant risk for cataract. [6,22]

A case-control study by an urban health maintenance organisation [23] however did not find any risk between hypertension in those less than 60years and cataract. The results may have been affected by the relatively young age of the population studied since essential hypertension is predominantly a disease of the aged.

Diabetes was identified as a strong risk factor for cataract in this study, particularly of the PSC and mixed types. Analysis of pooled data from 2 Oxfordshire studies[24] also showed a strong positive association with R.R of 5.04. A number of the studies[8] on diabetes in the past have identified a positive association with cortical, posterior subcapsular and mixed cataracts. Lack of positive association with cortical opacities in this study may be related to the study methodology.

## Conclusion and recommendations

This study set out to identify risk factors associated with visually disabling cataracts in the study environment. Ultraviolet radiation, topical steroids, hypertension and diabetes were found to be significant risk factors for cataract. Drinking of alcohol was found to be protective. No significant risk was found for diarrhoea and smoking. Use of hospital subjects has introduced selection bias in this study, to eliminate this in future studies a less biased method of random selection of controls from the community would need to be used.

The largest group of people involved in this study consisted of traders and farmers accounting for 58.8% of all cases. They spend a large part of the day working outdoors unprotected from the ultraviolet radiation of sunlight. It is therefore recommended that the use of wide brimmed hat and sunshade be advocated for all outdoor workers to reduce the effective dose of UVR getting into their eyes. People also need to be educated on the side effects of topical steroid to prevent widespread abuse. For hypertension and diabetes it is recommended that people be encouraged to have regular check up to ensure early diagnosis.

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# AMOEBIC LIVER ABSCESS: A DIAGNOSTIC DILEMMA IN THE ELDERLY

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**Abstract**
A 63-year old man presented with a 2-year history of progressive abdominal swelling with non-specific symptoms and signs. He visited several hospitals, where no diagnosis could be made for about 2 years and all therapeutic options given were ineffective. The appearance of an elevated right hemi diaphragm on chest X-ray, a single well defined area of Sonolucency with a thin edged border on ultrasound and a positive amoebic precipitin led to a diagnosis of amoebic liver abscess. Radiological intervention through ultrasound guided aspiration combined with medical therapy using metronidazole, led to rapid recovery and near complete resolution. This case typifies a not very uncommon but atypical presentation of amoebic liver abscess seen in practice characterized by intra abdominal space occupying lesion with non-specific symptoms and signs. Effective use of imaging techniques should help in the diagnosis. Ultrasound guided aspiration combined with medical therapy is effective treatment.

**Key words:** Amoebic liver abscess, atypical presentation, imaging

## Introduction

About 10% of the world's population is chronically infected by Entamoeba hystolytica. [1] Majority of these people live in the tropics. Amoebic liver abscess is the commonest site of extra intestinal amoebiasis [2] and has been noted to account for 48% of all visceral abscesses. [3] It is a common problem in tropical countries. [4]

The typical patient with amoebic liver abscess presents with right upper quadrant pain, fever, intercostal tenderness with or without hepatomegaly and occasional pleuropulmonary signs. However, presentation may be atypical ranging from acute abdomen to chronic progressive abdominal swelling with or without pain. [5] These may occur many years after the colonic lesions have subsided. [6]

### *Case report*

A 63-year old man presented with a 2-year history of progressive abdominal swelling. The swelling started in the right hypochondrium but progressed to involve the whole abdomen. He had fever, jaundice and right upper quadrant abdominal pain 2 months before onset of swelling. He had no cardiovascular or respiratory symptoms and no leg swelling. He took some herbal medications and also visited several rural hospitals where he received prescriptions of various drugs. There was however no improvement in his symptoms.

Physical examination showed pallor and wasting. There was no jaundice, no intercostal tenderness, no fever (Temperature 36.8°C) no peripheral lymphadenopathy or oedema.

The abdomen was uniformly distended, tense and non-tender. There was a firm mass occupying the entire right hypochondrium, extending from under the rib cage, crossing the midline and extending to both lower quadrants and hypogastrium (Figure 1). There was no clearly defined edge. There was no demonstrable ascites. Rectal examination was normal.

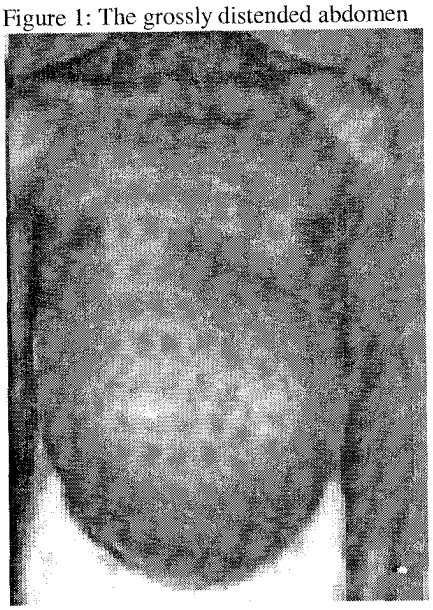
Urine and stool microscopy were normal. Full blood count showed normochromic, normocytic anaemia with haemoglobin concentration of 9gm/dl, white blood cell count was 7 x $10^9$/L (68% neutrophils, 30% lymphocytes and 2% eosinophils). Serum alkaline phosphatase was mildly elevated at 20 units/dl (King-Armstrong).

Chest X rays showed elevated right hemidiaphragm. Plain abdominal X ray showed uniform soft tissue opacity with few pockets of gas shadows in the left lateral and lower aspects. Abdominal ultrasound suggested a large liver abscess. Under ultrasound guide 20mls of reddish brown (anchovy paste) fluid was aspirated. Cytology showed only leucocytes, predominantly neutrophils.

Culture of the fluid was sterile. Amoebic precipitin test was positive.

Under ultrasound guide, repeated therapeutic aspirations were done using 19 gauge spinal needles with the patient detained and observed for 24 hours. This procedure was commenced 5 days after starting the patient on 800mg metronidazole orally, which was continued for 10 days. Aspirations were done on 4 sessions over a period of 6 weeks. A total of 5.2 litres of the fluid was aspirated. Recovery was uneventful and he was discharged home after 6 weeks, but was lost to follow-up.

Figure 1: The grossly distended abdomen



## Discussion

This case typifies a not very uncommon but atypical presentation of amoebic liver abscess seen in practice with a space occupying lesion in the Liver and non-specific symptoms and signs. Young patients with amoebic liver abscess are more likely to present in the acute phase with fever, right upper quadrant pain and point tenderness over the Liver, and also more likely to have pleuropulmonary involvement. [8] A majority of patients with amoebic liver abscess present in an acute (40%) or sub acute (50%) manner. Only 10% present in a chronic, difficult to diagnose manner. [9] Older patients from endemic areas are more likely to have atypical presentation, ranging from acute abdomen to chronic progressive abdominal swelling with or without pain. [5] These may occur many years after the colonic lesions have subsided. [6]

In Enugu, Nigeria 91% of patients with hepatic amoebiasis presented with hepatomegaly. [7] Persistent pyrexia without other symptoms or signs may be the only presentation especially in the elderly. [8] An unexplained fever or space-occupying lesion in the liver with non-specific symptoms and signs can be a diagnostic dilemma. Alcoholism, malnutrition, physical exhaustion and pregnancy are factors that upset the host parasite relationship and facilitate invasion of the Liver by the parasite. [10] Amoebic liver abscess is solitary and located in the right lobe of the liver in 70-80% of cases. [1, 10].

Routine laboratory investigations such as liver function tests, complete blood counts, stool and urine examinations may not be helpful in cases with atypical presentation. [8]. Serology using ELISA, indirect haemagglutination and immunodifusion may give up to 90% diagnostic yield. [1, 8] Unfortunately these are not available in most hospitals in tropical Africa. Amoebic trophozoites are difficult to demonstrate in the amoebic liver abscess fluid. [10]

Imaging techniques such as X-rays, ultra sound scan, and computed Tomograms are becoming more readily available. These make diagnosis easier and also provide improved therapeutic efficacy through radiological intervention by ultrasound or CT guided aspirations or catheter drainage.

While most hepatologists consider that medication alone is effective enough in treating amoebic liver abscess, medical treatment alone may not be entirely efficacious for complete resolution. Treatment failure has been reported in as many as 15-50% of cases treated with metronidazole and 6% with chloroquine – emetine. [11 - 13]

In a study of 51 patients with amoebic liver abscess [14], three different treatment approaches were compared, medical therapy with metronidazole alone, open surgical drainage and percentaneous drainage using ultrasound guide combined with metronidazole administration. Patients receiving combined ultrasound guided drainage and chemotherapy experienced faster and overall better clinical and radiological response associated with fever relapses and less residual scarring than either medical therapy alone or open surgical drainage combined with medical therapy.

The diagnosis of amoebic liver abscess in our environment could be difficult in the elderly because of atypical presentation and may cause preventable deaths. Appropriate use of X-rays, ultrasound and serology in evaluating unexplained fever and/or abdominal space occupying lesions will not only lead to early diagnosis but also provide an interventional tool in the management of amoebic liver abscess.

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# DIABETES MELLITUS COMPLICATING β-THALASSEMIA: A CASE REPORT

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**Abstract**
A case of beta-thalassemia major complicated by diabetes mellitus in a Fiji national is presented. The mechanisms involved in the pathogenesis of this complication are highlighted.

**Key words:** β-thalassemia, diabetes mellitus, iron overload.

## Introduction

β-thalassemia is the commonest inherited single gene disorder in man [1] and results from mutations of the β-globin genes leading to reduction, or complete prevention of the production of the β- chains of haemoglobin. The highest prevalence rates of this disorder have been noted in malaria endemic areas of Southeast Asia. In a community study involving 1800 individuals in Hong Kong for example, 3.4% of subjects were found to be carriers of β-thalassemia mutations. [2] About 200 mutations have been described in patients with β-thalassemia resulting into either absence of ($\beta^0$-thalassemia), or a reduction in β-chain synthesis ($\beta^+$-thalassemia). [3] Individuals who come to medical attention in the first year of life and are transfusion dependent for survival are clinically classified as having β-thalassemia major, while those who present later in life and seldom require transfusions are regarded as having β- thalassemia intermedia. [3] In β- thalassemia, iron absorption is abnormal leading to iron overload[4], which may be worsened by blood transfusion.[5]

Diabetes mellitus is a heterogeneous metabolic disorder characterized by chronic hyperglycaemia due to dynamic interactions between varying defects of insulin secretion and insulin action. [6] Although thalassemia is not in itself and endocrine disease, it may be complicated by diabetes mellitus in about 5% of adults with the condition. [7]

### *Case report*

A 23-year-old female was diagnosed to have beta-thalassemia major since the age of six months for which she was virtually transfusion dependent. To reduce transfusion requirements, she had splenectomy at the age of 8 years; with resultant reduction in transfusion requirements (from approximately two transfusions per month, to about once a month). She was maintained on folic acid 5 mg per day and intramuscular injections of Desferoxamine 500 mg daily for five days every month.

The patient had been doing fairly well until January 2000, when she presented with a three-day history of right-sided loin pain, fever, rigors and urinary frequency. Clinical examination revealed an acutely ill looking young lady, darker than average for her race and relatives. She was diaphoretic and pyrexic (temperature 38.8$^0$C) with sclera icterus and conjunctival pallor. There was right renal angle tenderness and hepatomegaly of 8 cm below the right costal margin. Cardio-respiratory examination revealed bilateral basal crepitations, raised jugular venous pressure, displaced cardiac apex, tachycardia, and an irregular heartbeat, which was confirmed to be atrial-fibrillation on electrocardiogram.

A chest radiograph confirmed cardiomegaly and para hilar haze consistent with pulmonary congestion, while abdominal ultrasound scan demonstrated multiple gallstones, there were however no evidence of intra-hepatic or extra-hepatic bile duct obstruction. Serum urea, creatinine, sodium and Potassium were within normal limits, while random blood glucose was elevated to 17.2 mmol/L, subsequent readings were persistently in excess of 11.1 mmol/L. Serum bilirubin was elevated at 243 micro-moles/L and 86 micro-moles/L for total and direct bilirubin respectively. Haemoglobin was 8.1 gm%, with a leucocyte count of 38.8 x $10^9$/L, 95% of which were neutrophils. Platelet count was however normal at 233 x 10 $^9$/L. Midstream urine revealed clumps of leucocytes and grew *E Coli* >$10^5$colony forming units per ml, sensitive to ampicillin, gentamicin

and cephalothin. Two sets of blood culture grew the same organism with same sensitivity pattern as the urinary isolate.

The patient had a two-week course of parenteral ampicillin and gentamicin and required 20 units of human insulin per day for the control of blood sugar. Heart failure was treated with digoxin, frusemide and captopril. She was discharged after 18 days of hospitalization on oral amoxycillin, anti-heart failure medications and insulin injections.

Following clinical improvement, she had further biochemical tests for iron metabolism and endocrinologic tests. Her serum ferritin was 5164 micrograms/L (normal 18-300 micrograms per litre) while transferrin saturation was 94.8%. Thyroid stimulating hormone and cortisol levels were normal at 1.73 micro-units per ml and 276 Pico moles per liter respectively.

After her from hospital, she had three other admissions for pneumonia and refractory heart failure respectively. She died of heart failure six months after the diagnosis of diabetes mellitus.

## Discussion

The ideal regimen to manage beta-thalassemia major should maintain hemoglobin levels above 10 grams percent and prevent iron overload by chelating agents. [5] An aggressive high transfusion program, typically requiring transfusion of 12 to 15 ml of packed cells per kilogram body weight every 3 to 4 weeks is what is usually required. This is concomitantly given along with desferoxamine at a dose of 40 to 50mg per kilogram body weight as a continuous intravenous infusion, or administered subcutaneously over 8 to 12 hours, for five to seven days a week. [3, 5] However, these regimens are expensive and virtually beyond the reach of many patients in developing countries. Consequently, less expensive and less effective regimens are often times employed in these areas. The result usually is progressive iron overload occurring basically through two mechanisms; increased absorption of iron from the gut due to bone marrow hyperplasia as a result of chronic anemia, and blood transfusions. [4, 6] Abnormal absorption of iron from the gastrointestinal tract contributes to increases in total body iron by 2 to 5 grams per year even in patients with thalassemia intermedia who do not receive transfusions. This burden is proportional to the degree of anemia and consequent bone marrow expansion. With blood transfusions, this burden are further increased by 200 to 250mg of elemental iron per unit of blood transfused. [5]

To reduce transfusion requirements, splenectomy was employed in this patient. In the tropics however this is usually not a light decision due to the high prevalence rate of infections. This along with diabetes mellitus could explain the severity of the infection she presented with.

Our patient had clinical and biochemical evidence of iron overload as evidenced by high serum ferritin and high transferrin saturation. Although serum ferritin is an acute phase reactant and therefore a less reliable measure of iron overload, while the hepatic iron index is a more sensitive index of iron overload, a transferrin saturation value of greater than 45 percent is highly suggestive of iron overload. [8] Our patient had a transferrin saturation of 94.8 percent and given the clinical picture of transfusions, cardiomegaly, atrial fibrillation, increased skin pigmentation and diabetes mellitus, the diagnosis of iron overload is not in doubt.

In thalassemia, diabetes mellitus results from iron overload in tissues, particularly the liver and the endocrine pancreas. Iron deposited in parenchymal tissues is known to cause substantial toxicity compared to iron deposited in the reticuloendothelial system. [5]

It is thought that as the total body iron burden increases, iron deposited in the liver causes liver dysfunction as a result of a direct toxic effect on the hepatocytes probably mediated through the medium of free radicals. [9] The resultant hyperinsulinaemia as a result of decreased hepatic extraction of insulin on a prolonged basis subsequently leads to pancreatic-beta cell exhaustion, low insulin levels and diabetes mellitus. [4, 7] This explanation is supported by a recent case control study among Finnish men in which a positive association was demonstrated between total iron stores and the incidence of type-2 diabetes mellitus. [10]

Furthermore, the pancreatic islets may also be directly affected by deposition of elemental iron, which is known to be a strong catalyst for free radical stress leading to free radical mediated injury to the beta cell. [9] However, although chelation therapy is known to prevent diabetes as a result of iron over load in thalassemia, once the complication is manifest, there is no evidence to suggest that the same therapy may reverse this complication. [11]

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# VISION 2020: THE RIGHT TO SIGHT - THE CONCEPT, THE PLAN

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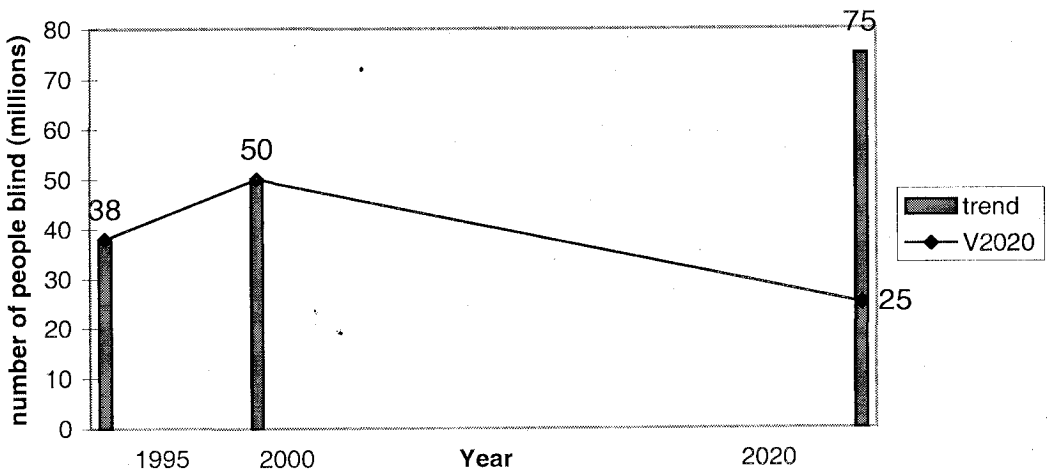
VISION 2020, coined from the American terminology for perfect vision, [1] is the World Health Organization's (WHO) caption for "The Right to Sight" - the Global Initiative for the Elimination of Avoidable Blindness. Founded in 1998 and launched in Geneva on 18th February 1999[2], it aims for the control of avoidable world blindness by the year 2020.

In 1995, there were an estimated 38 million people blind worldwide [3] with an increase of 1-2 million per year to 50 million people blind in 2000.[4] If this trend is to continue unabated, with the growing and ageing global population, it is projected that 75 million people will be blind worldwide by the year 2020 associated with loss in economic productivity of billions of dollars per year. [5] With the pooling of resources, increased advocacy and intensive implementation of carefully devised blindness control measures, targeting the communities most vulnerable to blindness, WHO in collaboration with member states, International Agency for Prevention of Blindness (IAPB) and other professional and non-governmental organisations (NGOs) believe that this alarming figure can be pared down to 25 million by the year 2020[4] (Figure 1) and continue to decline thereafter.

Figure 1: Estimated blindness worldwide




Blindness, as defined by WHO, is the best-corrected visual acuity (VA) of less than 3/60 or visual field less than 10 degrees from central fixation in the better eye. [6] This WHO definition of blindness, however, should be revisited since functional blindness is attained even before VA of 3/60 is reached, and 'presenting' vision rather than 'best-corrected' vision should become the standard definition. It is, perhaps, in view of this that country surveys vary in the interpretation of blindness, especially with uncorrected refractive error blindness.

Blindness is largely a disability of poor, [7,8] old

people [9] and it is avoidable in about 80% of cases most of who are in developing countries. [3] The major causes of blindness are cataract, refractive errors (RE), corneal blindness from trachoma and vitamin A deficiency (VAD), onchocerciasis, glaucoma and diabetic retinopathy (DR). These are either curable, or easily preventable with the appropriate treatment or treatable with some difficulty. Current knowledge and available technology have proven efficacy in the treatment/prevention of 75% of these conditions that are curable/preventable [1] (Table 1). Since the problem is solvable, these diseases are priority for V2020. Additionally, improvement in modern technology has reduced the cost of existing eye care services - for example, cataract surgery previously requiring 5 to 7 days hospitalisation, is now being done either as day-case or with 2 days' hospitalisation.

Table 1: Leading causes of blindness worldwide

| Outcome of intervention | Curable/Treatable (Vision restored) | Preventable | Treatable with difficulty (to slow the progression to blindness) | Further research required |
|---|---|---|---|---|
| Causes of Blindness | Cataract, Refractive errors | Trachoma, Onchocerciasis, Vitamin A deficiency | Glaucoma, Diabetic retinopathy | Uveitis, Retinitis pigmentosa, Age-related macular degeneration, Others |
| Contribution to global blindness | 60% | 15% | 15% | 10% |

The VISION 2020 plan – propped on 3 main components and through a concerted multiple partnership strategy - aims to enhance and intensify the existing measures and develop further means for *disease control* of the major causes of blindness, including childhood blindness, by the required skilful personnel trained through the *human resource development* (HRD) component of the programme. Additionally, ensuring the strengthening and equipping of the needed *infrastructure with appropriate technology*, and encouragement of *community participation* in order to urge people to take responsibility for their eye health as a group and ensure sustainability of eye care programmes. [10] These diseases are set as priority because the emphasis is on equity with problem solving that is good for a large population, at the shortest possible time and at the lowest cost. [9] The different diseases are tackled in different ways.

**Disease control**

Available information extrapolated from carefully conducted surveys of prevalence and causes of blindness [6,11-13] indicate that cataract, the whitening of the natural clear lens in the eye, is responsible for about 20 million blind worldwide [14] (about half of world blindness) mostly living in developing countries. It is a needless blindness. Vision is often restored by a straightforward skilful 30-minute operation using microsurgical techniques of removal of the opaque lens and replacing it with an artificial intraocular lens (IOL), which can be done even before blindness occurs. Cataract surgery, according to World Bank studies, is the most cost-effective and gratifying of all surgeries. [15] Economic advantages are seen in terms of return of patients to gainful employment, return of their young carers/guides back to school/jobs, and regaining of patients' socio-economic status. When large numbers are treated at the same time, there is the added advantage of adequate and cost-effective utilisation of resources (economics of scale). Thus, the strategy is geared towards creating demand and increasing the number of quality cataract surgeries with IOL implantation done per million population per year (cataract surgical rate, CSR) from the meagre 300 -1500 in developing countries [16] to at least 3000. [10] VISION 2020 will also address the issue of barriers to the uptake of cataract surgery which are noted to be largely linked to service providers, [17] especially the cost of the service. [18] Thus, free cataract surgery for the blind should be implemented in all regions. Most of these patients have long lost their economic productivity due to blindness and can ill-afford the cost of treatment. This will ensure that the cataract backlog is tackled and incident cases are immediately taken care of.

Refractive error (RE) was previously not recognised as a major blinding entity because previous blindness definition did not take into account the uncorrected presenting VA. Though data on

prevalence of blindness from RE are not readily available, [14,19] it now features in blindness data, with wide variations of 15 to 30% of various regional blindness; some of which are from inadequate refractive correction of aphakia after cataract surgery. It is believed to be the 2nd leading cause of *treatable* blindness worldwide. [19,20] Most of those affected, frequently unaware of their condition, have a presenting (uncorrected) VA <3/60. These patients can have functional vision restored with appropriate refraction and provision of spectacle lens correction. [20] It is a worthwhile venture requiring patience and skill. However, for a few of these patients, vision cannot be corrected with spectacles because of failure of normal visual maturation (amblyopia) associated with uncorrected refractive error since childhood, [21] or posterior ocular pathology in high myopia. Myopia, a significant cause of visual impairment, was found to be uncorrected in 2/3 of secondary school students. [22] School screening for RE is an integral part of V2020 control of RE.

Trachoma is a chronic infective blinding disease caused by the ocular serovar of the microorganism *Chlamydia trachomatis*. With an estimated 146 million people infected and 6 million blind worldwide, it is the leading cause of infectious blindness. The disease thrives in the shadow of poverty as it is (hyper) endemic in the poor communities of sub-Saharan Africa, [23 - 26] South-east Asia, East Mediterranean region [27] and the indigenous Australians. [28] These areas are characterised by inadequate water supply and poor environmental sanitary conditions. Children with the active disease, being the reservoirs of infection, have repeated ocular inflammation from cycles of infection transmitted by direct contact, by flies, fomites and fingers. Scarring of the upper eyelid causes distortion of the lid (cicatricial entropion) with in-turning of the eyelashes (trichiasis) rubbing on the dry vulnerable cornea leading to corneal injury and infection and corneal opacity as an end stage of the disease, years after the initial infection. [26] Trachoma is also notable for causing long 'ocular misery' years which has an effect on socialization and economic productivity of affected individuals. Facilitated by WHO, Global Elimination of Trachoma (GET 2020) and the International Trachoma Initiative (ITI) adopted the "SAFE" strategy, a comprehensive control strategy to eliminate trachoma and its blinding effects. [27] It entails Surgery for trichiasis, antibiotic treatment against the microorganism, facial cleanliness to improve personal hygiene and Environmental sanitary control measures to break the cycle of transmission. This strategy has been successfully implemented with a positive impact in some communities. [11] The challenge for VISION 2020 includes the mapping out of trachoma affected areas [29] and implementing this promising strategy for GET. And the challenge for the trachoma control strategy no doubt remains with the intersectoral collaboration with the education, community development and water and sanitation departments. This should be enhanced, as there have been questions about the SAFE strategy [27] as well as the need to provide the best available evidence for the impact of the environmental interventions on active trachoma. [30]

Onchocerciasis is caused by the nematode *Onchocerca volvolus* which is transmitted by the black fly -Simulium species- breeding along fast-flowing rivers. Responsible for at least 270,000 blind, [31] it causes irreversible blindness by affecting the optic nerve (optic atrophy), retina (chorioretinal atrophy) and the cornea (sclerosing keratitis). In some endemic areas, this river-blindness has forced farming communities to abandon their fertile river-side settlements for less arable lands. [32] Fortunately, control measures instituted have led to the reduction of blindness from onchocerciasis and protected those at risk of blindness. The implementation of onchocerciasis control programme (OCP), one of the most successful and cost-effective healthcare intervention programmes [31] and described as "the gold standard of partnership," [33] is done by intersectoral and multi-disciplinary collaboration involving all cadres of healthcare personnel especially at the community level. Initially targeted at vector control by aerial spraying of insecticide, it subsequently included the Community Directed Treatment with Ivermectin (CDTI) - a drug against the microfilaria (larvae or *baby worms* of *O. volvolus*), donated free to the patients in endemic areas. The CDTI, done by community directed distributors (CDD), has achieved coverage of about 60% of its ultimate treatment goal (UTG) of 59 million people. [33] The role of V2020 is to coordinate and enhance the ongoing programme together with the African Programme for Onchocerciasis Control (APOC) and Onchocerciasis Elimination Programme in the Americas (OEPA) in order to achieve the UTG with ivermectin, and zero incidence of blindness from onchocerciasis. [10] Through this community-based approach and functional integration of other primary healthcare activities, APOC has given the communities access to better healthcare overall. [34] Even with no doubt about the success of OCP/APOC, fears arise with the long-term sustainability and effectiveness of ivermectin in preventing visual acuity loss from onchocerciasis. [35] Thus, operational research and the search for drugs effective against the adult worm (macrofilaricide) should continue.

Blindness from vitamin A deficiency (VAD) - xerophthalmia - and its interplay with measles, malnutrition and use of traditional eye medicine (TEM) features as the major cause of childhood blindness. This burden is mainly in the developing countries of Africa and Asia, which constitute about 85% of world childhood blindness i.e. about 1.3 million blind children. When considering "blind-years" (the number blind times the years expected to live) childhood blindness is ranked 2nd to cataract as a

cause of visual disability. Its causes are associated with high mortality and are potentially avoidable. [21] Thus, the issue is addressed through child survival strategy - The Global Child Survival Program - geared towards a sustained elimination of VAD through encouraging measles immunisation with piggy-back vitamin A supplementation for children and nutrition education for mothers. [10] Longer-term measures explore the possibility of genetically modified food fortification with vitamin A being cultivated in these regions. [36] As blindness from VAD reduces through successful control programmes, congenital/developmental cataract emerges as a leading cause of childhood blindness. [37,38] In the medium- and high-income countries, retinopathy of prematurity (ROP) and cortical visual impairment are the more prominent causes. [39] Thus, prevention of childhood blindness from surgically avoidable and treatable causes such as congenital cataract, glaucoma and ROP is also another priority for V2020.[10] Cataract surgery in childhood poses a challenge - the postoperative management is taxing and the rate of postoperative complications is alarming. [38] As such, in addition to the earnest training of paediatric ophthalmic surgeons and their teams, expectations of outcome should be explained to the parents, giving a realistic measure of what can be delivered.

With the declining prevalence of blinding trachoma and a projected 6.7 million blind from glaucoma in 2000, available information indicate that glaucoma is emerging as the 2nd leading cause of blindness worldwide. [6] However, glaucoma surveys have varied widely and it has been difficult to provide standardised tools to adequately measure its impact as a visual disability. [40] Few blindness prevalence surveys include visual field-testing, with the likelihood of missing glaucoma cases where field loss often occur before acuity loss. It is generally perceived as a disease difficult to diagnose and treat before profound visual loss occurs. Nevertheless, together with diabetic retinopathy (DR) and age-related macular degeneration (ARMD), they are emerging as significant public health issues in countries that are not burdened with the V2020 priority diseases. [4,9] They are issues for further research. The V2020 strategy is to ensure. regular examination of individuals at risk, develop effective screening methods and promote awareness on visual loss. Additionally for DR, educate on diabetic metabolic control and provide retinal laser treatment. [10]

Though not given as much attention as the major blinding diseases, other blinding conditions such as leprosy, diseases of the retina, optic atrophy, uveitis and trauma are within the scope of V2020 as it is modelled to coordinate comprehensive eye care through existing health and eye care services. [10] Despite data indicating that trauma is the most important cause of monocular visual loss and the cause of blindness in about 500,000 people in 1992[41] and more recent estimates in 1.5 million people, [6] V2020 fails to recognise it as a priority condition requiring specific attention for control. It is avoidable and requires enforcing preventive measures through legislation; training of personnel and equipping of hospitals to manage severe ocular wounds.

**Human Resource Development**

For efficient service delivery, purposeful and adequate training of all cadres of eye care personnel is essential. HRD is a core component of V2020 with emphasis placed on mid-level personnel at the community level with a primary healthcare (PHC) approach. [42] Their job description and specific roles will vary from place to place depending on the prevailing needs. The role of the primary eye care (PEC) or community health worker (CHW),1 per 5000 population, is to identify and treat simple eye diseases such as conjunctivitis; identify poor vision, cataract and other more serious eye diseases and refer; and the follow-up and evaluation of patients after treatment. In this regard, community participation is encouraged so that individuals can report red eyes and poor vision to health-workers; volunteer for training as PEC workers or CDDs and optimally utilise the available services.

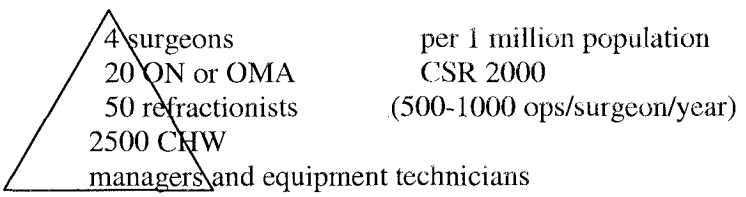
The V2020 implementation is anchored at the community/district/local government level. Although fashioned as a comprehensive eye care service, the V2020 diseases are priorities at this level. Glaucoma will still be treated at this level and other diseases such as retinal detachment identified and referred. The required numbers of cataract surgeon or ophthalmologist, ophthalmic nurses (ON) or ophthalmic medical assistants (OMA) are shown in figure 2. Refractionists, either from the nursing cadre or optometrists, are also needed. Hospital managers and equipment technicians should be available in at least 50% of secondary and all tertiary facilities. [10]

Regarding the targets for the control of childhood blindness, specially trained paediatric ophthalmic surgeons and nurses including anaesthetists are required. Here, the focus of eye care facilities is not only at the district/local government level but also at the tertiary level because childhood blindness is rarer and some patients require specialist care. The target required per population is 1 refractionist per 100,000; 1 low vision expert per 5 million, and 1 paediatric ophthalmologist per 10 million. [21]

At the tertiary level, the emphasis is on training for skills and efficient delivery of service; career development and focus on the task ahead. Training is for numbers and quality of the required personnel. Two-year diploma in ophthalmology programmes have already been instituted, ophthalmic nurses are being trained for trachoma trichiasis lid surgery, for refraction; and together with medical graduates, for cataract surgery. There is retraining of ophthalmologists for extracapsular cataract surgery with IOL implantation and instrument technicians

are developed for equipment maintenance/repair, low-cost spectacle production and eye drop preparation. Optometrists, traditionally in the private sector, are encouraged to join the V2020 programme. The Community Eye Health course (MSc CEH) at the London School of Hygiene and Tropical Medicine (LSHTM) has been re-fashioned to train towards V2020 implementation, International Council of Ophthalmology is also restructuring towards that. For increase in awareness and information dissemination, the journal of Community Eye Health is distributed free to people in developing countries and the British journal of ophthalmology has pioneered a "world view" column dedicated entirely to issues of world blindness.

Figure 2: The team




**Infrastructure and equipment development**

To ensure the quality of outcomes of these disease intervention programmes, infrastructure and equipment development with appropriate technology is a prime component of V2020. The aim is to provide universal coverage and access to services for the preservation of vision and restoration of sight, ensuring social equity, capacity productivity and utilisation, and long term sustainability. Facilities are to be equipped according to the task at hand - for training and disease control. The reorientation is that of the consumer provider model whereby the patient as the consumer is motivated to accept the service which is of high quality given by personnel who have job satisfaction and self-esteem in an optimal environment with developed infrastructure and management system. [10]

In view of the dearth of appropriate technology in many parts of the world that carry the burden of avoidable blindness, V2020 aims to equip centres with the necessary facilities. Good quality appropriate affordable technology - operating microscopes, A-scan biometres, surgical consumables, equipment for spectacle and eye drops production, computers and educational materials are to be provided to hospitals that cannot otherwise afford. Production and local entrepreneurship are encouraged in order to reduce costs and enhance sustainability. [10]

**Administrative structure for V2020** (Figure 3) [1]

Looking at the magnitude of the problems of world blindness - economic, psychologic, social, etc - the task embarked upon by V2020 seems daunting. However, V2020 has laudable goals and given the historical role of WHO in blindness prevention programmes, it seems set to take the necessary steps to achieve these goals. While executing the projects in phases, to ensure feasibility of the programme, planning is done around a million population with the basic implementation at the district/community level. The plan originates from the national/state level where a committee headed by a coordinator plays its role to set the policy, provide guidelines, provide the needed support and motivation, form coordination, ensure optimal use of resources, monitor and evaluate and take leadership responsibilities. The coordinator is also tasked with the job of advocacy.

The countries are grouped into 6 geographical regional coordinating groups with a chairperson each and co-chairs for sub-regions. E.g. the African region has 1 chairperson and 5 co-chairs for the 5 sub-regions of Anglophone West Africa, francophone West Africa, Central Africa, East Africa and South Africa. They help stimulate and facilitate a national programme.

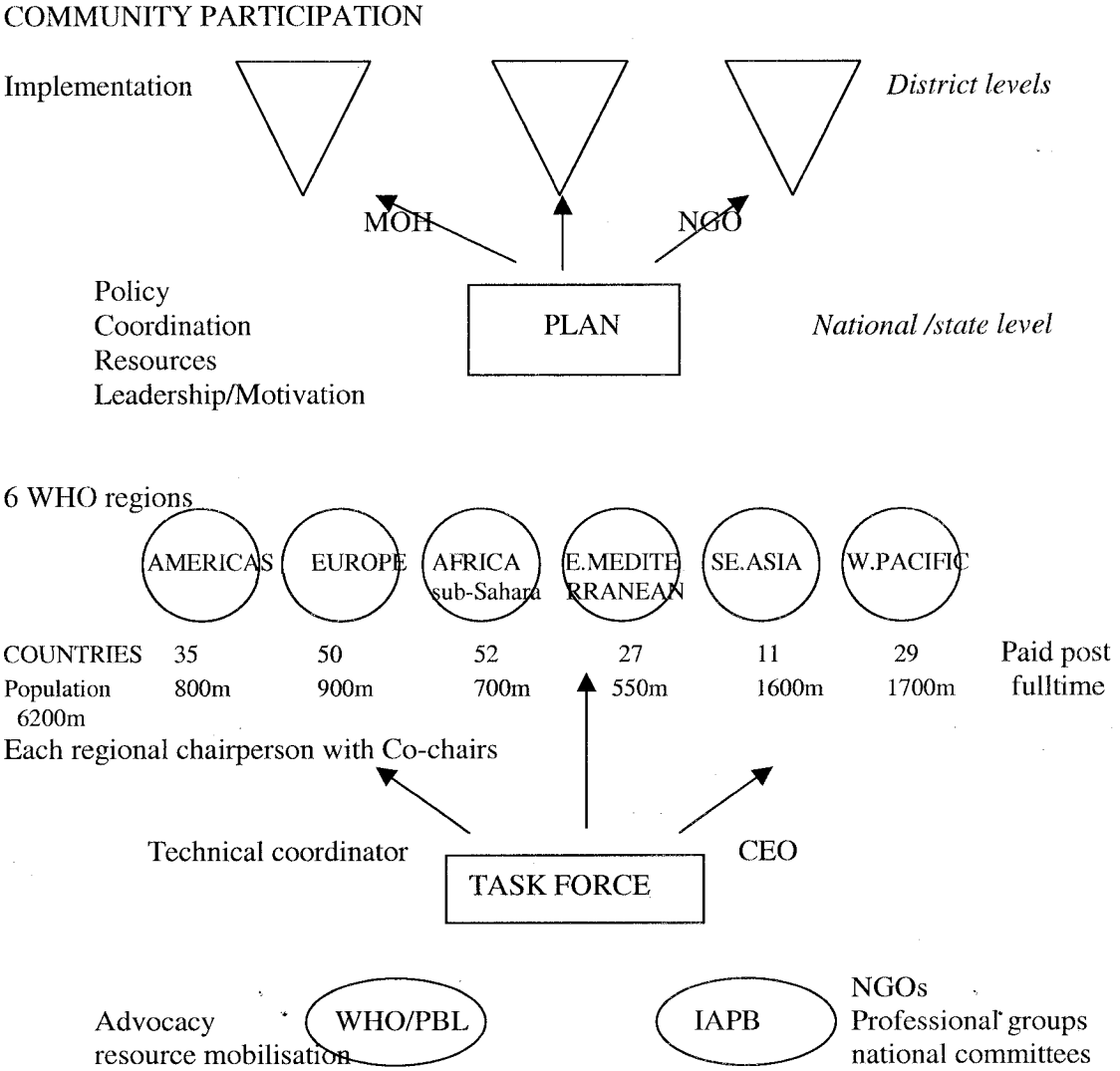
The IAPB is the umbrella body that coordinates all the NGOs, academic and professional groups involved in blindness prevention (PBL). Both are in the task force - president of IAPB has the chair and a WHO/PBL person as secretary while the Chief Executive Officer is employed. They have the task of advocacy, resource mobilisation and equitable distribution to the 6 regions through the chairs but may directly support the district programme. The V2020 technical coordinator is a full-time post paid by the task force. There is also a full-time paid post in each of the six regions.

WHO/IAPB are the overseeing partners. At the global level, WHO sets the targets and formulates the policy to be communicated to the respective ministries/departments of health (MOH).

The issue of cost-recovery and sustainability goes beyond perceived benefits. It requires an extensive health systems research to see where funds can be obtained from within the eye care programme. Local NGOs must be encouraged and involved in the V2020 programmes - though without much funds for the operational aspects, they are ever willing to provide the needed service. Professionals in the lucrative fields of the business should have a sense of

moral/professional obligation to contribute to this initiative. Where there is a limited contract with donor partners, there should be a structured transition programme where it is clear that disengagement is going on. As avoidable blindness is associated with low socio-economic development, strategies for control of blindness should not only include programmes for control of blindness but also concomitant economic development [7] working in concert with wealth creation schemes (rather than poverty alleviation) for a sustainable impact.

Figure 3: The administrative structure of VISION 2020




It is envisaged that support at national level may be a problem in some countries with competing needs. We must identify such countries and initiate tactful advocacy while giving increased support. It must be emphasized that "(control of) blindness is not only imperative; it is also a financial and moral obligation of our times. The increasing evidence and magnitude of the problem, its impact on development, and its implications on poverty and deprivation, should compel governments to undertake this challenge." [43]

In conclusion, it is worthy to note the unrelenting effort of the key players and partners of V2020 who must be commended for this noble initiative as they say "Our mission is to eliminate the main causes of blindness in order to give all people in the world, particularly the millions needlessly blind, the Right to Sight". [9]

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