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Table of Contents

EDITORIAL MESSAGE

EDITORIAL

The Public Health Impact of the Nigerian Abortion Policy and the Case for the Reform of the Nation's Abortion Laws
Omo-Aghoja LO 7

ORIGINAL ARTICLES

Ectopic Pregnancy In An Urban Tertiary Centre In Southern Nigeria: Emerging Trends
Osaikhuwuomwan JA Aderoba AA & Ande AB 11

Angular Profile of the Knees of Nigerian Children in Lagos, Nigeria
Odatuwa-Omagbemi DO, Odunubi OO & Ugwoegbulem OA 18

Musculoskeletal Manifestations of Rickets: An Eighteen- month Observational Study
Bafor A & Ogbemudia AO 27

Obesity and Hypertension, Prevalence and Correlates among Patients Seen in a Tertiary Hospital in South-south Nigeria
Azinge N & Anizor C.O 33

Morbidity Associated with Vaginal and Abdominal Hysterectomy in a Northern Nigerian Hospital
Nwobodo Emmanuel I & Oyetunji Jaiyeola A 39

Environmental and Socio-demographic Determinants of the Age at Menarche among Secondary School Girls in the Niger-Delta Region of Nigeria
Onohwakpor EA, Omo-Aghoja LO & Omotoso JO 43

Diabetes Mellitus in Childhood and Adolescence: Analysis of Clinical Data of Patients Seen in a Nigerian Teaching Hospital
Alphonsus N. Onyiriuka, Phillip O. Abiodun, Louis C. Onyiriuka & Humphery O. Omoruyi 50

Evaluation of the Efficacy of Chemotherapy Based Control of Soil-transmitted Helminth Infections and Schistosomiasis among School-age Children in sub-Saharan Africa
Oyibo P.G 58

CASE REPORTS

Drug - Induced Diabetes Mellitus in Oghara, Delta State, Nigeria
Awusi V 72

Unilateral Renal Agenesis: A Case Report
G I Mcgil Ugwu, B O Okperi & E N Ugwu 75

REVIEW ARTICLES

Entrapment Neuropathies
Philip-Ephraim E E & Agan TU 80

Erratum:

The 2nd issue of this Journal was inadvertently labeled as Volume 2 No. 1. Rather it is Volume 1 No. 2 otherwise the contents remain unchanged. Authors and users should note this please.

Editorial

The Public Health Impact of the Nigerian Abortion Policy and the Case for the Reform of the Nation's Abortion Laws

Omo-Aghoja LO

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The policy on abortion in Nigeria is restrictive except to save the life of the woman or preserve the mental health[1]. This policy derives from the Nigerian national abortion laws which were introduced by the British colonial masters in 1916. The criminal code was then adopted throughout the country and 43 years later, the penal code was introduced to replace the criminal code in northern Nigeria to reflect the norms of the British law in colonial India being an Islamic country, as this is the predominant religion in northern region of Nigeria. The criminal code is retained in southern Nigeria and the relevant sections are: section 228, 229 and 230 respectively[2]. Section 228 stipulates guilt of felony for the persons that perform the abortion and liable to 14 years jail term. Section 229 prescribes guilt of felony on a woman who induces abortion on herself or submits herself for abortion and liable to 7 years imprisonment. Section 230 prescribes guilt of felony on the supplier of the materials used for the abortion and liable to 3 years imprisonment.

The relevant sections of the penal code that operates in northern Nigeria are sections 232, 233 and 234 respectively[3] (the Penal Code, Law No. 18 of 1959). Section 232 prescribes 14 years imprisonment or option of fine or both on the person who performs the abortion. In section 233, it stipulated that if the procedure resulted in the death of the woman, the person is liable to imprisonment which may extend to 14 years and also liable to fine. If it was done without the consent of the woman, the person who undertook the procedure is liable to jail term for life or less and also liable to fine. Section 234 prescribes punishment for some who caused miscarriage unintentionally by force, if it was unknown that the woman was pregnant the person is liable to 3 years imprisonment or fine or both. Knowing that the woman was pregnant may cause the jail term to be extended to 5 years.

A critical question that must be raised is that despite the robust and elegant nature of the Nigeria abortion laws, how many people have been arraigned, prosecuted and convicted for performing the act of abortion in Nigeria? Practically none from available records and yet Nigeria has one of the highest rates of abortion in the world. Worst still it has been and still is a very viable means for the law enforcement agencies to extort money from abortion service providers, and this drives the practice underground with quacks and backstreet professional taking the center stage. Interestingly, the colonial masters who imposed restrictive abortions laws on most of the countries that still hold tenaciously to these laws, have all since liberalized their laws with drop in abortion rates, morbidity and mortality from abortions. Opposition to liberalization of the Nigeria abortion laws have been largely on ethical, cultural and religious grounds. But of significant

note inspite of these perceived opposition is that, when individuals on both sides of the divide have an unwanted pregnancy, they do seek abortion because of the odium and stigma associated with an unwanted pregnancy particularly when it is of doubtful paternity.

The impact of anti-abortion laws on maternal mortality is best illustrated by data showing the prevalence of unsafe abortion and abortion mortality in countries with restrictive laws compared with those with liberal abortion laws. The prevalence of unsafe abortion is highest in countries with the most restrictive laws, up to 25 unsafe abortions per 1000 women of reproductive age[4,5] while countries that allow abortion on request have a median unsafe abortion rate of two or less per 1000 women. Case-fatality rates from unsafe abortion are also highest in countries where abortion is legally restricted. In such countries, the median ratio for unsafe abortion mortality is 34 deaths per 100,000 live births, compared to one or less per 100,000 live births in countries that allow abortion on request. The reader should be aware that abortion statistics are often hard to obtain, and those statistics that are available are frequently inaccurate. Official abortion statistics are often low due to incomplete reporting particularly in countries with restrictive laws. In contrast, other organizations that provide estimates of abortion statistics may be motivated to inflate the numbers, for example, high numbers of illegal abortions are an element of their rationalization for legalized abortion. Romania and South Africa are two countries that best demonstrate the effects of liberal abortion laws on maternal mortality. Maternal mortality due to abortion increased in Romania after a restrictive abortion policy was introduced in 1966. By 1989, mortality ratios had risen seven-fold to peak at 148 deaths per 100,000 live births, with abortion accounting for 87% of the deaths[4,6]. When the policy was reversed in 1989, mortality ratio fell by more than half to 68 within one year, and by 2002 the ratio had fallen to as low as nine per 100,000 live births, with abortion accounting for less than 50% of the deaths. Similarly, abortion became legal and available on request in South Africa in 1997[7]. After the law was passed, abortion-related deaths dropped by 91% in South Africa from 1994 to 1998-2001[8].

Without doubt, liberalization of abortion laws is an important strategy to reduce mortality due to unsafe abortion. In the last 12 years, 12 developing countries have liberalized their abortion laws. These include Albania, Benin, Burkina Faso, Cambodia, Chad, Ethiopia, Ghana, Guinea, Guyana, Mali, Nepal and South Africa[4]. Although the effects of these laws on mortality have not been systematically quantified in all these countries, for countries where accurate data is available, abortion liberalization has been shown to result in substantial decline in maternal mortality[4]. With the known positive effect of abortion liberalization in reducing maternal mortality, it is surprising that many developing countries are still holding on to restrictive anti-abortion laws.

Two types of arguments are often put forward by those opposed to abortion liberalization in developing countries. The first is that liberalization will increase the rate of abortion and overburden the health-care infrastructure. However, experiences in countries that liberalized abortion laws such as Barbados, Canada, South Africa, Tunisia and Turkey indicate that abortion liberalization has not been associated with increase in abortion[9]. By, contrast the Netherlands, which has unrestricted access to free

abortion and contraception, has one of the lowest abortion rates in the world[9]. The second argument, especially for low resource countries, is that women will still not seek safe abortion services even when abortion is liberalized. The examples of India, Zambia and Ghana where women continue to experience poor access to safe abortion care despite liberal abortion laws are often cited to support this viewpoint[10,11]. Factors associated with poor access in such circumstances include women's and providers' inadequate knowledge of the revised law, continued stigmatization of abortion and sexuality due to socio-cultural and religious reasons, and weak health systems in some of the developing countries[11,13]. Addressing these problems as part of abortion law reform, in addition to advocacy and public health education would increase the benefits of liberalization in reducing mortality associated with unsafe abortion[4].

Clearly unsafe abortion remains a major challenge and significant contributor to maternal morbidity and mortality. If the set millennium development goal of maternal mortality reduction is to be achieved and the ICPD programme of action realizable in Nigeria, then concerted efforts must be made and geared towards addressing the key reasons and all intermediating factors why women undertake unsafe abortion. Key amongst these is that it is necessary to advocate for a review of the existing restrictive laws in Nigeria and other developing countries in order to reduce the high morbidity and mortality from unsafe abortion. Advocacy and public health education that would increase the women's and provider's knowledge of the revised law, help deal with the issue of religious and socio-cultural stigmatization of abortion, would certainly increase the benefits of liberalization in reducing mortality associated with unsafe abortion and this is advocated for priority attention.

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Original Research Articles

Ectopic Pregnancy in an Urban Tertiary Centre in Southern Nigeria: Emerging Trends

Osaikhuwuomwan JA[1] Aderoba AA[1] & Ande AB[1]

ABSTRACT

Introduction: Ectopic pregnancy is an important cause of morbidity and mortality in early pregnancy. Its' incidence is rising and management has shifted to less radical and conservative methods with less complications. In resource limited countries like Nigeria, it is pertinent to review management options available in a tertiary referral centre.

Methodology: All cases of ectopic pregnancies managed at University of Benin Teaching Hospital (UBTH) Nigeria between 1st January 2003 and 31st December 2007 were retrospectively reviewed. Socio-demographic and clinical data were retrieved from case files, operating notes, theater and ward registers for analysis.

Results: There were 242 cases of ectopic pregnancies, and 7848 total deliveries during the period reviewed thus giving an ectopic pregnancy incidence of 3.1% (1 in 32 deliveries). Most of the patients (50.9%) were nulliparous. The major identified predisposing factors were previous abortion (64.5%) and history of pelvic inflammatory disease (37.7%). Majority of the patients (98.7%) had laparotomy while 2.6% had conservative medical management with methotrexate. Ruptured tubal pregnancy (95.6%) was the most common type of ectopic gestation. There was one maternal death, giving a case fatality rate of 0.4%.

Conclusion: The incidence of ectopic pregnancy in the centre is rising compared to previous report from the institution. Although there is an increasing trend towards provision of conservative management in developing countries, the benefits are largely unharnessed because most patient still present late. This should stimulate aggressive promotion of the benefits of early presentation which include less invasive treatment options.

Keywords: *ectopic pregnancy, rupture, conservative management, methotrexate, Nigeria.*

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Introduction

Ectopic pregnancy remains a major cause of maternal morbidity and mortality in early pregnancy. Early diagnosis and treatment is an important factor in reduction of mortality following ectopic pregnancy.[1-3] The incidence of ectopic pregnancy is difficult to determine because of variations in the population studied.1

Globally, the incidence of ectopic pregnancy varies between 1 in 28 and 1 in 106 per live birth (i.e. 0.094% to 3.57%).[2,3] In Nigeria, the overall incidence as reported by various authors is between 3 and 30 ectopic pregnancies per 100 deliveries (i.e. 0.29% - 3%).[4-8]

The development of immunoassays utilizing

monoclonal antibodies to human chorionic gonadotrophin (hCG) and the use high resolution ultrasonography, have led to early diagnosis of ectopic pregnancy (ie before tubal rupture).[3,9] This ability to make early diagnosis coupled with developments in endoscopic surgical procedures has led to the shift in management options towards more conservative surgical and non-surgical approach. The resultant effect is an improvement in the fertility rate after an ectopic pregnancy.[1,3,9] In addition, conservative therapeutic approach has less morbidity in terms of anaemia, infection and need for blood transfusion. Consequently, hospital stay is less with conservative treatment when compared to conventional surgical management.[5,9]

In view of the recent advances in diagnostic and interventional procedures available in this centre; it became necessary to review ectopic pregnancy in order to ascertain the rate of uptake of conservative management options.

Materials and Methods

All cases of ectopic pregnancy managed at the Department of Obstetrics and Gynaecology of the University of Benin Teaching Hospital, Southern Nigeria from 1st January 2003 to 31st December 2007 were retrospectively reviewed. There were 242 cases of ectopic pregnancies during the study period. Of these, 228 (94.2%) case notes were found.

Data were retrieved from the case files and operation notes of the patients and analysed for age, parity, marital status, risk factors, clinical presentation, mode of management and associated morbidity and mortality.

Results were presented as frequency tables with percentage, graphs and cross tabulations. Statistical test of significance was done with INSTAT statistical package as appropriate. P-value <0.05 was considered statistically significant.

Results

In the five year period reviewed, there were 7,848 deliveries and 242 ectopic pregnancies, giving the incidence of the latter as 3.1% (1 in 32 deliveries).

Amongst the 228 cases analysed, majority (56.6%) were married, while 40.3% were single and 3.1% widowed or separated. The mean age of patients was 27.3 ± 2.3 years with a peak age incidence of 21 – 30 year (61.4%); *figure 2*. Half of the patients (50.9%) were nulliparas (*figure 3*). As

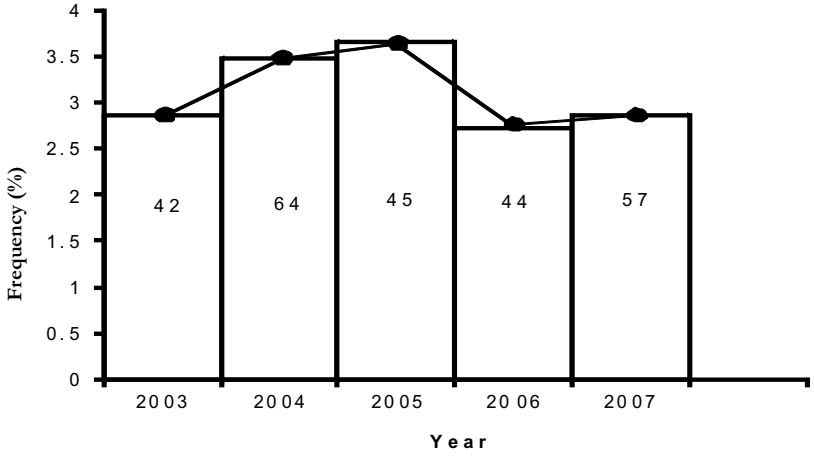

Figure 1:*Frequency polygon showing yearly trend in incidence of ectopic pregnancy*

Table 1: *Presence of risk factors for ectopic pregnancy*

Risk factors	Frequency	Percentage
Previous abortion(s)	147	64.5
History of PID	86	37.7
Previous abdomen/pelvic surgery	41	18.0
History of puerperal sepsis	5	2.2
History of previous ectopic	7	3.1
History of infertility/treatment	6	2.6
Use of IUCD/progesterone*	4	1.8
No identifiable factor	22	9.6

*****162 (71.1%) cases did not use any contraceptive method.*

Table 2: *Analysis of clinical presentation of patients with ectopic gestation*

Clinical presentation	Number	Percentage
2° Amenorrhoea	209	91.7
< 6 wks	13	5.7
6 – 10 wks	157	75.1
> 10 wks	36	15.8
No period of Amenorrhoea	22	9.7
Abdominal pains	213	93.4
Irregular vaginal bleeding	160	70.2
Abdominal distension	134	58.8
Dizziness/weakness	156	68.4
Fainting/collapse	98	42.9
Pallor	168	73.7
Asymptomatic (USS)	5	2.2

depicted in table 1, history of previous abortion (64.5%) was the most common risk factor identified among the patients. In addition, majority of the patients (71.1%) did not use contraception.

The most frequent presenting clinical complaints were abdominal pains (93.4%), amenorrhoea (91.7%) and irregular vaginal bleeding (70.2%).

Table 3: *Management options adopted for patients with ectopic pregnancy.*

Management option	Number	Percentage
Intramuscular Methotrexate (medical)	6	2.6
Laparascopy	1	0.4
Laparotomy	225	98.7
Salpingectomy	201	89 4
Cornual resection	12	5.3
Fimbriectomy	9	4.0
Salpingo oophrectomy	3	1.3

Table 4: *Morbidities/mortality amongst patient with ectopic pregnancy*

Complication	Number (N=228)#	Percentage
Whole blood transfusion	151	66.5
Auto transfusion	112	49.3
Anaemia	55	24.2
Wound sepsis	4	1.8
Hospital stay > 7 days	6	2.6
Maternal death	1	0.4

some patients had more than one complication

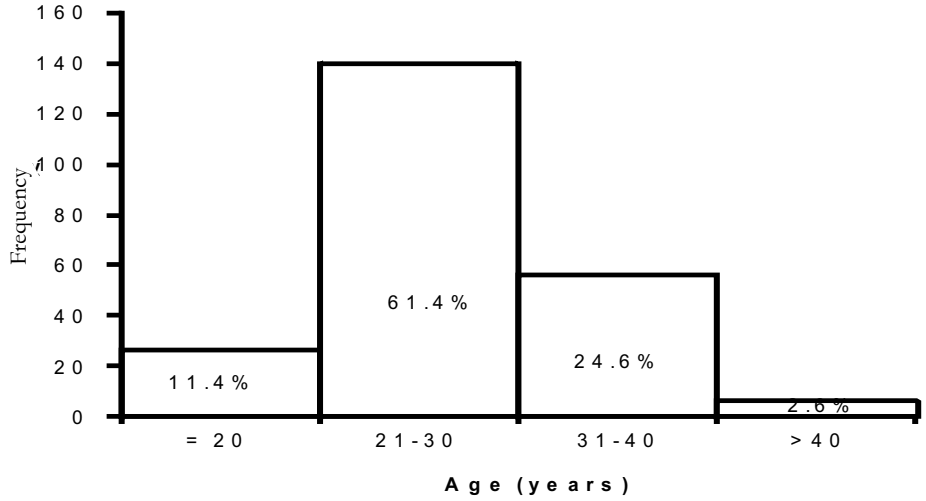

Figure 2: *Histogram showing age distribution of patients with ectopic pregnancy*

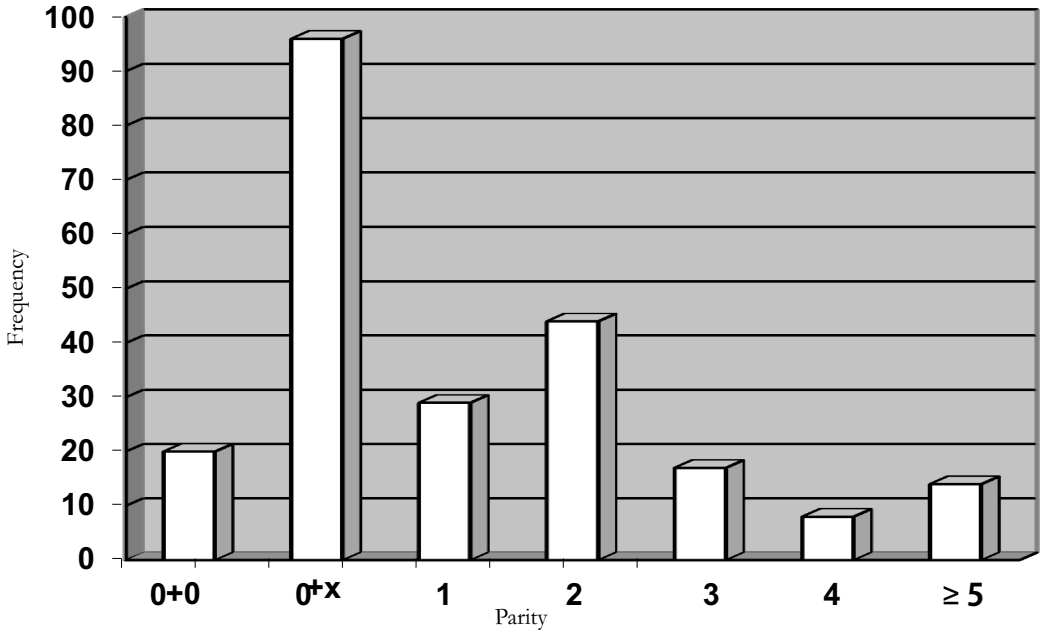

Figure 3: Bar chart showing parity distribution of patients with ectopic pregnancy
X = ⩾ 1

Five patients (2.2%) were asymptomatic; the diagnosis was made based on positive pregnancy test and ultrasound result (Table 2).

Table 3 shows the different mode of management and majority of the patients (98.7%) had laparotomy. Of the six patients (2.6%) that had medical treatment with methotrexate, only 3 (1.6%) were successfully managed. Laparoscopy was used in confirming diagnosis in one case.

Most patients (66.5%) had blood transfusion (a range of 1 – 4 and an average of 2 units of blood transfused) and the most common postoperative complication was anaemia (24.2%). There was one case of maternal death, giving a case fatality rate of 0.4% in this study (Table 4). This patient presented at UBTH in a state of shock and she died few hours after surgery, despite blood transfusion.

Discussion

The ectopic pregnancy incidence of 3.1% in this study is higher than 2.3% and 1.7% reported from previous studies in the same centre.[5,8] The rising incidence is also consistent with other reports both locally and internationally.[2,10,11]This rising trend in the incidence of condition has been observed by other authors both within and outside Nigeria.[2,10,11]

Various risk factors have been implicated in the rising incidence worldwide.[1,3,9] In this study, the predominant risk factors identified were previous induced abortion(s) and a past history of pelvic inflammatory disease. This was consistent with an earlier prospective case control study at this centre in which a history of previous induced abortion was a statistically significant risk factor of ectopic pregnancy.[12] Other authors within and outside Nigeria have also reported similar findings.[13–17] This may be due to a higher incidence

of unprotected sexual activity and poor contraceptive uptake amongst the younger age group.18 Although we did not analyze the association between age and contraceptive practice in this study, we however noted that overall most patients did not use any contraceptive method. Consequently, there may be an increased incidence of unwanted pregnancies, multiple illegal induced abortions, post abortal sepsis and pelvic inflammatory disease, thus increasing the risk for ectopic pregnancy.

Diagnosis was made clinically in majority of the cases (over 90%) in this study, with only a few patients (2.2%) having diagnosis made based on transvaginal ultrasound scan and serum -HCG findings alone. These were comparable to findings from other studies.[5,14-17] Most of the patients with ectopic gestation in our setting tend to present late and are usually in compromised haemodynamic state. In such a condition, there is little or no opportunity for early diagnosis and conservative intervention despite the improvement in diagnostic and management tools now available to us. Sadly, the late presentation observed may be a reflection of our sociocultural behaviour and the low socio-economic state of most women which make them want to initially conceal pregnancy or seek abortion illegally from unskilled attendants. In addition, misdiagnosis by various health workers may also contribute to the late presentation of most patients.[19]

The resulting effect was that most of the patients in this series, like in other studies in developing countries,[4-5,15-16] had salpingectomy. In this study, only three patients (1.3%) had successful conservative medical management. This is low compared to figures from the developed countries.[3,9] It is however a remarkable improvement when compared to previous studies in this centre.[5,8]

There was a single case of maternal death in this study. This death was due to an initial misdiagnosis by a care-giver and subsequent late presentation at UBTH in a state of shock. She died few hours after surgery, despite blood transfusion. This low case fatality rate is similar to the pattern observed in other studies both locally and internationally.[5,19.20] This largely reflects improvement in diagnosis, blood transfusion services and management skills such that despite a rising incidence the associated mortality have substantially decreased.[20] It is however important to note that majority of maternal deaths that occur in developing countries like in this case, results from failure to seek professional medical care early or due to an initial misdiagnosis by a care giver.[19] Obviously while more maternal deaths from ectopic pregnancy may follow an initial misdiagnosis, many more may be completely missed.

Conclusion

This study has shown that the incidence of ectopic pregnancy is rising and still contributes significantly to morbidity and mortality in early pregnancy. Most patients still present late, thus limiting attempts at provision of conservative medical treatment.

We recommend as a means of curbing the rising incidence of ectopic pregnancy an improved contraceptive awareness/uptake. This may result in a reduction in incidence of associated risk factors (unwanted pregnancies, illegal induced abortion and pelvic inflammatory disease) and thus ectopic pregnancy. In addition, public enlightenment on the need/benefit of early presentation is advocated.

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Angular Profile of the Knees of Nigerian Children in Lagos, Nigeria

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ABSTRACT

Introduction: Angular misalignments of the knees in children are common in our environment. Many of these variations fall within normal limits. Only a few will require further investigations and treatment.

During normal growth, physiological changes occur in the angle of the knees as the child grows. This phenomenon has been investigated and documented by scholars in different environments. Some similarities and differences have been noted between children of different races and environments by various authors.

Aim: This study strives to investigate the presence or absence of these findings in Nigerian children and provide local reference data to aid management of similar cases in our environment.

Methodology: The clinical methods of assessment of knee angles were used in this study. Six hundred children aged 3-8 years (age last birthday) were selected from public and private nursery/primary schools in Lagos metropolis and had their tibiofemoral angles measured with a goniometer and their intercondylar/intermalleolar distances measured with an inextensible tape rule.

Results: The 600 children were divided into six age groups for the purpose data collation and analysis. The mean tibiofemoral angle for the six age groups was 6.0 + 8.1°. A valgus inclination of 8.4 + 7.2° was noted at 3 years of age which decreased to 3.4 + 8.6° at 8 years of age. The intercondylar/intermalleolar distance was 2.5 + 3.4cm at age 3 years and 0.7 + 3.3cm at 8 years of age. The tibiofemoral angle was found to be quite correlated with the intercondylar/inermalleolar distances with a correlation coefficient of r=0.765.

Conclusion: Compared with figures from previous similar studies in other places, most of the parameters show similar pattern of changes with growth but the degree and timing of the changes show some basic differences attributable to racial/genetic factors, methods of measurements and other environmental factors. Figures gotten in this study is of use for clinical reference when similar cases present in our clinics in this this sub-region .

Keywords: *Angular Profiles, Nigerian Children, Knees, Orthopaedic*

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Introduction

Children presenting with perceived angular problems of the knees are common in our clinics. The usual presentation is either that of bow legs or knock knees.[1,2,3,4]

The tibiofemoral angle varies widely between individuals and within the same individual child with growth. Many authors both national and international have shown that at birth, the knees

are in marked varus [1,2,3,5,6] . This tends to change to 0o at the age of about 11/2 to 2 years. At 3 to 31/2 years, the knees change to maximum valgus, and with further growth, the valgus inclination tend to gradually correct itself[1,2,3,5,6] . The adult value is usually attained at the age of about 9-10 years, with only a minimal further change after this age.[1,2,3,5,6] Some local variations in the degree of these changes in children from different racial, genetic and environmental back grounds have nevertheless also been highlighted by some authors[1256789], hence the need to obtain local reference figures.

A knowledge of these changes is necessary to enable the attending Physician differentiate these normal physiological variations which usually will not need treatment, from pathological conditions that will need further investigations and treatment.

Various methods including: radiologic, photographic, clinical or a combination of methods have been used by different authors in their studies.[1,2,5,6-16] The clinical method was used in this study because, it is cheap, harmless and can be routinely used in our clinics.

This study aims to provide local reference figures for the age group and parameters measured for routine clinical use by Orthopaedic surgeons and other physicians who care for children with similar presentation. Any notable differences and similarities between findings here and previous national and international studies will be appropriately stressed for better overall patient management.

Subjects, Materials and Methods: This cross-sectional descriptive study involved the measurement of:

1. The tibiofemoral angles,
2. The intercondylar/intermalleolar distances of 600 asymptomatic Nigerian children (1200 lower limbs) residing in Lagos .

Two local government council areas were selected by balloting system of random sampling.17,18 The list of private and public nursery/primary schools in the selected council areas were obtained from the Local Government Education Authorities (LGEA) where consent was also obtained. From the list of schools, systematic random sampling was used to select 12 schools (6 private and 6 public).17,18 At the selected schools, a list of children that fell within the study age group arranged in alphabetical order using their surnames was obtained after taking consent form the school authorities and PTAs (Parents/Teachers Association).Verbal ascent was also obtained from each child before taking measurements. The lists were used as sampling frames to select 50 children from each of the 12 schools to give a total of 600 children. All measurements were done by the first author. Intra-observer variation was assessed by measuring the above parameters repeatedly in six children (aged 3, 4, 5, 6, 7 & 8 years) alternate daily for 2 weeks. The average standard deviations were: 2.1o and 0.4cm for tibiofemoral angle and intermalleolar/intercondylar distances respectively.

Measurement of Tibiofemoral Angle, Intercondylar/Intermalleolar Distances.

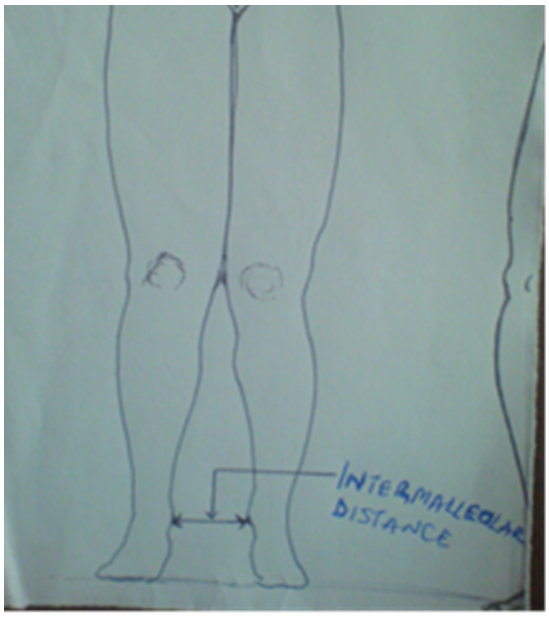
The methods used by Cheng *et al*[2] and also, Arazi *et al*[14] were used in this study. The child in under pants with lower limbs exposed from groin down (a male or female chaperon being present as applicable) was made to stand erect with the hips in neutral position and the knees fully extended with patellae pointing forward. The knees and the ankles were positioned with the condyles or malleoli touching each other for valgus or varus inclinations respectively. The axis of the femora (up to the mid-thigh) and tibiae (down to the mid-ankle) were palpated and marked with a skin marker on the skin. The centre of the patella is also marked on the skin. A standard goniometer (

with attached extensible arms) is centred on the patella and used to measure the tibiofemoral with arms directed along the tibial and femoral axes as previously marked out on the skin for each limb. Varus angles were recorded as positive (+) angles while valgus angle are recorded as negative (-) angles.

In the same position, the intercondylar (IC) and intermalleolar (IM) distances were measured with an inextensible tape rule and recorded in centimetres as positive (+) or negative (-) values respectively. See, pic.1-4.

Pic. 1. *Position and Skin Marking For Measurement Of Tibiofemoral Angle And IC/IM Distances*

Picture 2. *Measurement of Tibiofemoral Angle*



Picture 3. *Intermalleolar (IM) Distance*

Picture 4. *Intercondylar (IC) Distance*

Data Handling

The subjects were divided into six different age groups. The Statistical Package for Social Sciences (SPSS) version 15 software was used for data handling and analysis.

In all statistical tests, the null hypothesis was rejected at $P<0.05$.

Results

Six hundred children aged 3-8 years were studied giving a total of 1200 limbs. Of this number, 311 were females and 289 were males. The age/sex distribution is shown in table 1. and the bar chart (fig. 1).

Tibiofemoral Angle: A maximum valgus angle of 8.4+7.2o was observed at age 3 years. This gradually decreased to 3.4+8.6o at the age of 8 years of age. Of the 600 children, only 1 varus inclination was observed at age 3 years, 4 were observed at 4 years, 3 at 5 years, 9 at six years, 13 at 7 years and the highest number of 20 at 8 years of age giving a total of 50 children (8%) with varus angles. Table 2. shows mean tibiofemoral angle values for the six age groups +2SD (2 Standard deviations). The graph in *fig. 2* also depicts the progression.

A comparison of the mean values for the tibiofemoral angles in the age groups between left

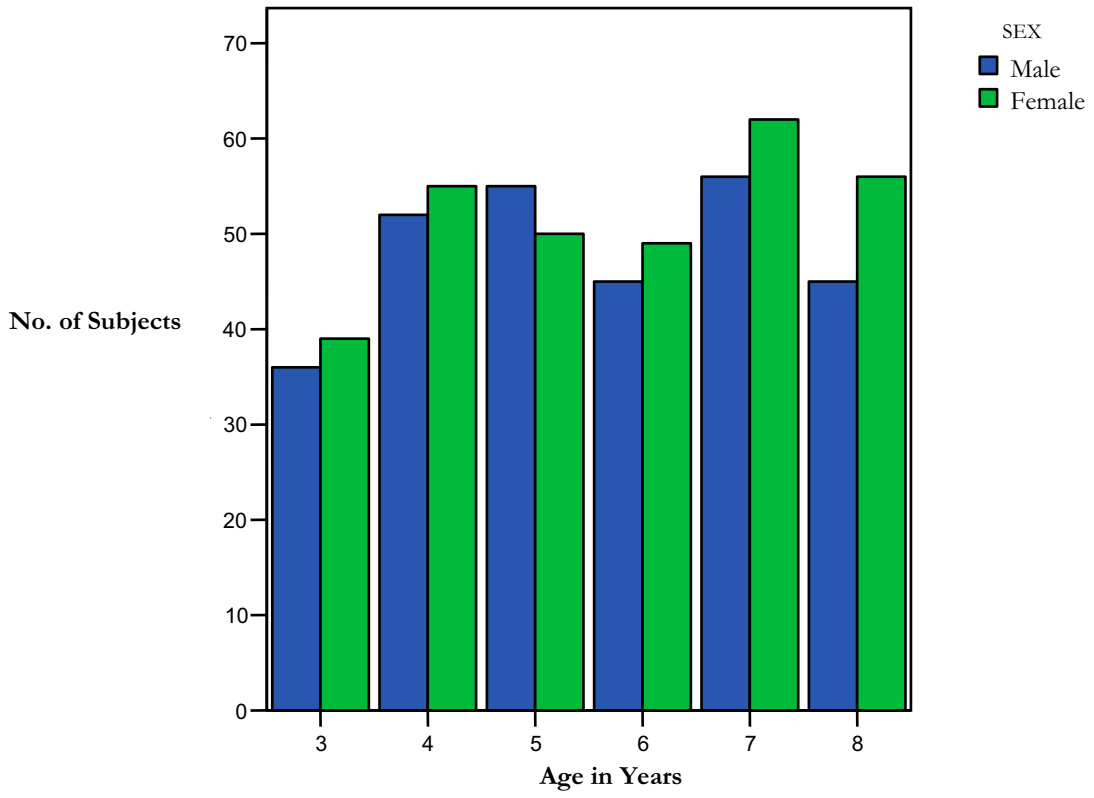


Figure 1: *Bar Chart Showing Frequency Distribution, Age and Sex*

Table 1: *Age in Years/Sex Cross Tabulation*

	SEX		Total
Age In Years	**Male**	**Female**	
3	36	39	75
4	52	55	107
5	55	50	105
6	45	49	94
7	56	62	118
8	45	56	101
Total	289	311	600

Table 2: *Mean Tibiofemoral Angle± 2SD (Rt. & Lt. Combined)*

AGE IN YEARS	MEAN TF ANGLE	MEAN +2SD	MEAN -2SD
3	-8.4	-1.3	-15.6
4	-7.7	-1.1	-14.4
5	-6.5	0.2	-13.1
6	-5.1	2.2	-12.3
7	-5.2	2.5	-13.0
8	-3.3	5.2	-12.0

Table 3: *Mean Tibiofemoral Angle for Right and Left in the Ages Studied*

AGE IN YEARS	MEAN TF ANGLE(RT)	MEAN TF ANGLE(LT)
3	-8.4	-8.50
4	-7.7	-7.7
5	-6.4	-6.5
6	-5.0	-5.0
7	-5.2	-5.3
8	-3.3	-3.5

and right lower limbs did not show any appreciable difference between the two lower limbs. (Table. 3) although, in most of the age groups, the mean for the left tended to show more valgus inclination than the right. However, application of the t-test to the raw data showed a significant difference between the values from the right lower limb and that form the left lower limb ($P<0.027$) indicating that even in normal individuals, the limbs are not exact mirror images

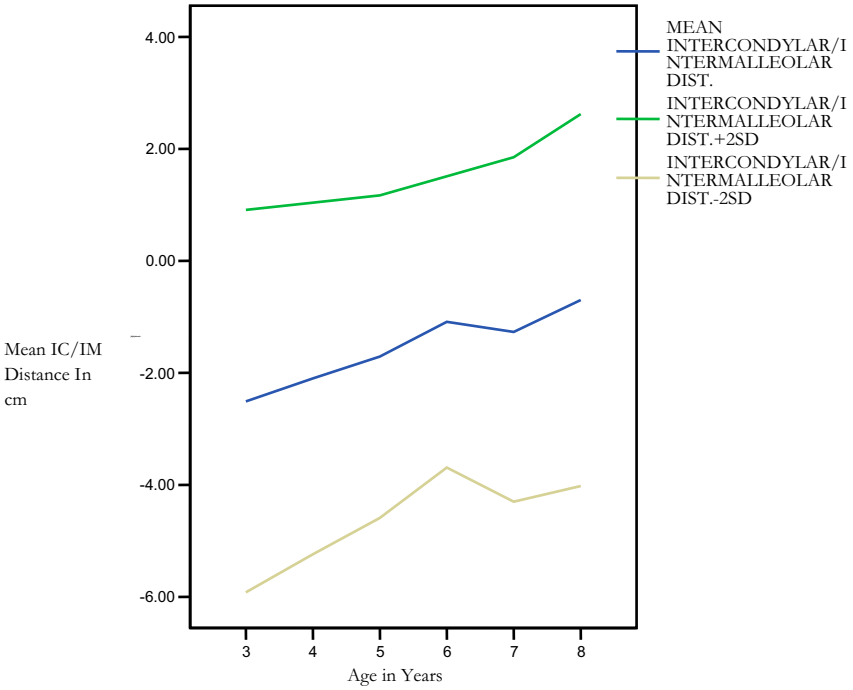


Figure 3: *Mean Intercondylar/Intermalleolar (IC/IM) Distance ± 2SD Versus Age in Years*

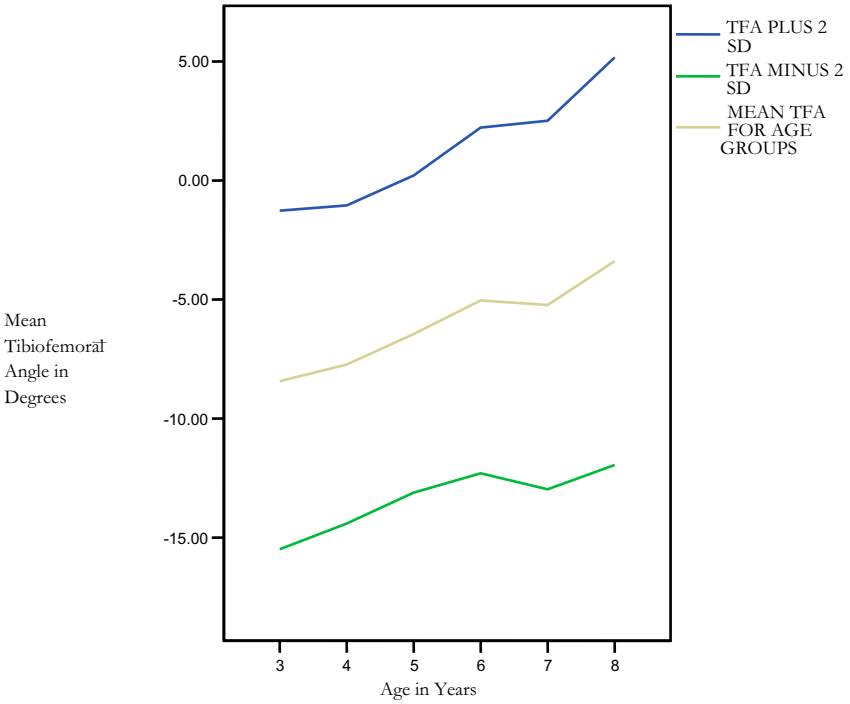


Figure 2: *Mean Tibiofemoral Angle in Degrees Versus Age in Years.*

of each other. Values from both lower limbs nevertheless showed a very high degree of correlation (r=0.971) hence the use of the mean value of the tibiofemoral angles from both limbs for most of the computing.

Intercondylar (IC)/intermalleolar (IM) Distances: The maximum mean intermalleolar distance of 2.5+3.4cm was observed at age 3 years. This decreased gradually to a valgus of 0.7+3.33cm at 8 years of age.

The values for the ages + 2SD are as displayed in the graph in *fig.3*. The IC/IM distance was further confirmed in this study to be highly correlated to the tibiofemoral angle with a correlation coefficient of r=0.765. P<0.0001.

Discussion

Complains of angular problems of knees in children are common in our clinics. Many researchers both national and international have through their publications shown that most of these perceived problems are normal variations with growth that would not necessarily need treatment. The knee angle has been reported to be of varus inclination at birth, neutral at 18-24 months and of maximum valgus at 3-4 years of age followed by a less dramatic reduction to a lesser degree of valgus in adult life.[2,4,5,6,7,8,10,12,14,15,16,19,20].

In this study, a maximum valgus tibiofemoral angle was observed at the age of 3 years (8.4+7.2°).

Badru6 and Oginni *et al*[7], Cheng *et al*[2], and Selenius and Vankka[5] also reported similar findings in their studies.

Badru6 and Oginni *et al*[7] in Ilesha, reported a valgus inclination of the knees of 7.1+1.7° at age 3 years while Cheng *et al*[2] reported a maximum valgus inclination of 8° in Chinese children at 3.5 years of age. Selenius and Vankka[5] on the other hand, found a maximum valgus of 10-11° at 3-4 years in Finnish children. In contrast, Arazi *et al*[14] reported a maximum valgus of 11° at ages 6 and 7 years for boys and girls respectively in Turkish children while Omololu *et al*[8] in Ibadan reported a constant valgus angle of 11° at ages 1-10 years. It is important to note that while in most other studies including this one both varus and valgus angles were computed together, Omololu *et al* computed the two separately making comparison of their findings with other results difficult.

At 8 years old, the valgus angle in this study has decreased to 3.4+8.6°. Badru6 and Cheng *et al*[2] reported a valgus angles of 5.5° and 1° respectively in the same age group in their studies.

Most authors did not report differences between the right and the left lower limbs as recorded in this study. However, Oginni *et al*[17] noted that the left showed 1o more valgus than the right. That the two limb are not exact mirror images of each other is also obvious in the monogram in the publication of Omololu *et al*[8]. The left showed more valgus in this study. It is nevertheless pertinent to note that method s of measurements, the precision of such measurements and observer variations may contribute to the observed differences.

The intercondylar/intermalleolar distance has been reported by various authors to be well correlated with the tibiofemoral angle and has been suggested by many as an alternative way of indirectly assessing knee angles.[2,5,6.8,9,12,14].

A mean intermalleolar (valgus) distance of 2.5+3.4cm at 3 years of age which decreased to 0.7+3.3cm at 8 years was observed in this study. Cheng *et al*[2] observed an intermalleolar distance of 2.8cm at 3 years which decreased to 0+3cm at 8 years of age.

A combined (for both sexes) correlation coefficient of r=0.765 between the IC/IM distance and the tibiofemoral (TF) was found in this study. Cheng *et al*[2] reported a value of r=0.71

for boys and r=0.74 for girls in Chinese children while Harcourt reported a coefficient of r=0.77 in Enugu and Cahuzac *et al*[12] found r=0.82 and r=0.74 for boys and girls respectively in European children. A lower degree of correlation was recorded by Arazi *et al*[14] in Turkish children (r=0.40for boys and r=0.43 for girls).

Different views have been expressed on which of the two parameters to use routinely in the assessment of knee angles in our clinics. While Cheng *et al*[2] feel that the IC/IM distance is simple and quite reliable and thus should be the one used routinely, Arazi *et al*[14] and Cahuzac *et al*[9], feel otherwise (i e, TF angle should not be used). From this study, one would rather opine that both parameters are good for assessing physiological variations in which the deformities are largely symmetrical. The use of IC/IM becomes unreliable when deformities are not symmetrical, unilateral and of course in wind swept deformities.

Conclusion

Like most previous studies, this study has further confirmed that children during normal growth display physiological variations in their knee angles. Here, the Nigerian children exhibited a maximum valgus tibiofemoral angle at 3 years of age that gradually decreased with age as alluded some previous authors too. The intercondylar/intermalleolar distance also showed a similar trend in this study and the highly significant correlation between it and the tibiofemoral angle was also apparent here. Also this study revealed further that some minor differences in the value of the measured parameters between the right and the left lower limbs can occur even in normal individuals.

The values of the parameters obtained in Nigerian children in this study showed some basic similarities and differences between them and children of other races and environments which need to be borne in mind by Orthopaedists and other physicians caring for children in this sub-region.

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Musculoskeletal Manifestations of Rickets: An Eighteen- month Observational Study

Bafor A[1] & Ogbemudia AO[1]

Abstract

Objectives: to determine the pattern of presentation of musculoskeletal features of rickets in a large urban health care facility.

Study design: prospective

Setting: University of Benin Teaching Hospital, Orthopaedic Unit.

Subjects: Children aged 16 or less who present at the out-patient clinic with features of rickets.

Outcome measurements: Age at presentation, sex, type of angular knee deformity, time of onset of angular knee deformity, family history of knee deformity, weight, height, body mass index (BMI), serum calcium, serum phosphate and serum alkaline phosphatase levels.

Results: Thirty seven (37) patients aged between birth and 16 years with clinical and radiological evidence of rickets were evaluated during the study period. The mean age at presentation was 3.7±2.08 years and the male: female ratio was 2.4:1 (26 male and 11 female). Windswept deformity was found to be the commonest mode of presentation in our environment, making up 51.4% of all cases seen.

Conclusion: Rickets is a relatively common cause of angular deformity of the knee. In this environment, it is commoner in males and windswept deformity of the knees is the commonest mode of presentation.

Keywords: *Rickets, angular knee deformity*

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Introduction

Rickets is the clinical manifestation of a failure of calcification of bone matrix in growing children. Its most common aetiology is a dietary lack of vitamin D[1]. Other causes include a dietary lack of calcium and phosphate among other things[1].

Its most dramatic presentation involves changes in the musculoskeletal system. Indeed, it represents an important cause of angular deformity of the knee in children with several studies showing it to be the commonest cause of angular knee deformity in children[2,3]. Knee deformity in rickets is thought to result from the effects of axial loading on bones that have been weakened by the disease. It is, however, not generally known which type of deformity represents the more usual presentation of angular knee deformity in patients with rickets.

This paper is aimed at providing some epidemiological statistics for the musculoskeletal

manifestations of rickets and in particular defining the most common form of presentation in patients who have suffered angular knee deformity resulting from rickets.

Materials and methods

This was an observational study involving patients who were aged between birth and 16years, presenting with clinical, laboratory and radiological features of rickets at the Orthopaedic outpatient clinic of the University of Benin Teaching Hospital between December 2005 and May 2007. They were evaluated clinically at the first visit. They were seen two (2) weeks later with results of blood chemistry and radiographs for biochemical and radiological evaluation.

Clinical evaluation included relevant medical history and physical examination. This involved determination of the presence of swollen wrists or ankles (evidence of epiphyseal overgrowth), ricketty rosary, Harrison's sulcus, frontal bossing, dental defects and/or the presence of a protuberant abdomen as well as the presence of angular deformity of the knee. The type of deformity was also recorded. Weight and height measurements were taken using a bathroom scale and a wall mounted chart respectively. For patients younger than 2 years, a paediatric weighing scale was used to determine their weights while height measurement was taken in the supine position with a simple tape measure. The Body Mass Index was determined using the Johan Van Hespen BMI calculator[4].

Radiological criteria for the diagnosis of rickets included widening/cupping of the metaphyses, fraying and widening of the physes and generalized bone rarefaction.

Laboratory evaluation consisted of determination of full blood count, genotype, serum calcium, phosphate and alkaline phosphatase.

Criteria for the diagnosis of rickets were based on the clinical and radiological parameters.

The results obtained were subjected to statistical analysis using Microsoft excel statistical package. The range as a representation of a measure of dispersion was determined with variance expressed as standard deviation. Measures of central tendency, which included the mean, were also determined.

The study was approved by the hospital's ethics committee prior to its commencement.

Results

There were 37 patients whose ages ranged from 1 to 10years presenting with rickets. The mean age at presentation was 3.7±2.08 years and the median age was 3years. There were 26 males and 11 females, giving a male: female ratio of 2.4:1(fig. 1). Thirty six (36) patients had their deformities noticed after the commencement of walking. Windswept deformity was the commonest type of deformity in this group of patients accounting for 19 of the 37 cases seen (51.4%) with knock-knees accounting for 17 cases (45.9%) and bow-legs accounting for only 1 case (2.7%) (fig. 2). Majority of the patients in this group had bilateral affectation (32 patients or 86.5%). Only 6 (16.2%) of the 37 patients reviewed had a positive family history of knee deformity. The mean weight for patients in this group was 15.46±4.93kg, the mean height was 96.73±15.03centimeters and the mean BMI was 16.49±3.97. The mean serum calcium, phosphate and alkaline phosphatase in this group were 7.95±1.19mg/dl, 4.27±1.09mg/dl and 124.22±66.06iu/L respectively (Normal reference values 8.6 – 10.2mg/dl, 2.4 – 4.4mg/dl and 60 – 250i.u/L for serum calcium, phosphate and alkaline phosphatase respectively).

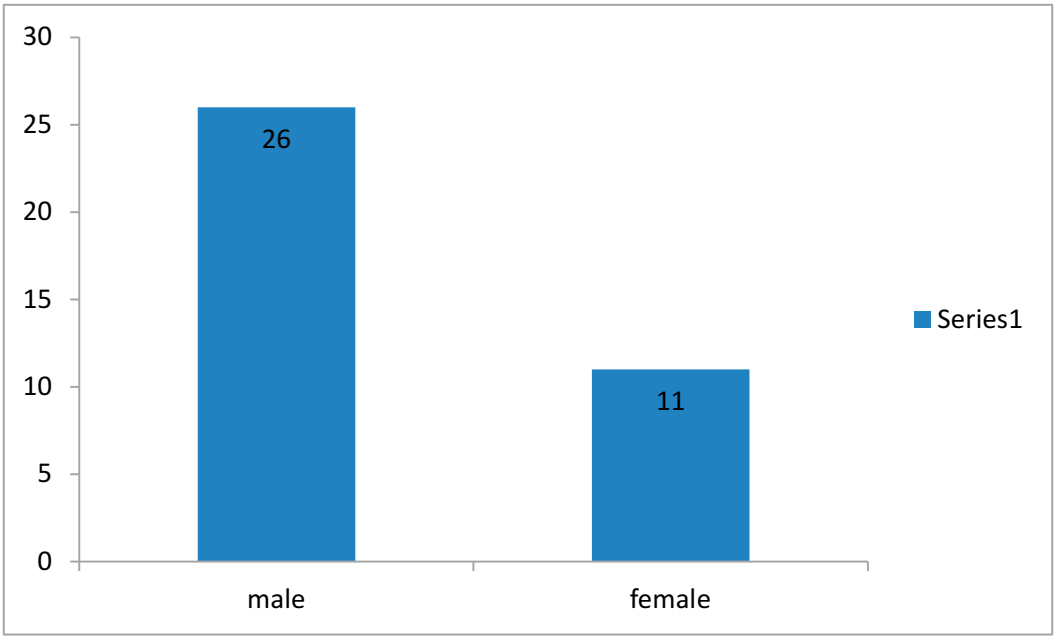

Figure 1: *Sex distribution in patients with rickets*

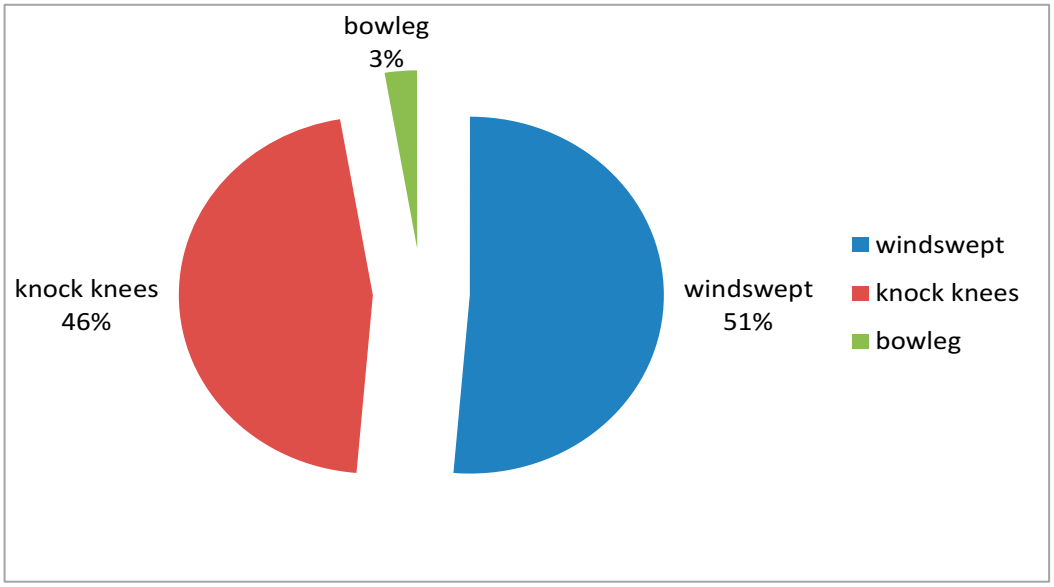

Figure 2: *Distribution of knee deformity in patients with rickets*

Discussion

Rickets is one of the metabolic conditions affecting bone[1]. It is characterized by a failure of calcification of osteoid to osseous bone. The classic cause is a dietary lack of vitamin D, however it may be a consequence of other pathologies like steatorrhoea, renal osteodystrophy, and liver disease[1].

Several studies in Nigeria have shown rickets to be the commonest cause of angular deformity of the knee in children and indeed the commonest cause of pathologic knee deformity in Nigeria[2,3]. Bafor[2] et al found a 46% incidence of rickets among 78 patients with angular knee deformity in Southern Nigeria. Salawu[3], evaluating 103 children with angular knee deformities in Northern Nigeria, found a 70% incidence of rickets. Oyemade[5] in his study in western Nigeria, found a 41% incidence of rickets among 114 subject studied. In these three studies, rickets was found to be the commonest aetiology for angular knee deformity. Solagberu[6] in contrast found a 25% incidence of rickets among 72 patients with angular deformity of the knee, making it the second most common cause of angular knee deformity in that study. The reason for these discrepancies is not evident. Oyemade[5] had determined that 35 of 47 children with clinically proven rickets where children of women living in purdah. It was not however determined if the consequent deprivation of exposure to the ultra-violet rays of the sun brought on by the cultural practice of purdah in that environment was responsible for the relatively high incidence of rickets in Oyemade's study. Indeed in Salawu's study, a very high rickets rate in Northern Nigeria suggests that the practice of purdah may be a determining factor in the aetiology of ricket but Salawu did not attribute the high incidence of rickets to this practice. In the study by Bafor et al, none of the patients evaluated came from homes where the practice of purdah is rife. Akpede[7] *et al*, reviewing children less than 5 years of age in 461 households in Northern Nigeria, found significantly higher rates of rickets in infants who had been exclusively breastfed for 6 months, children of working class mothers and Christians from the southern part of Nigeria. They surmised that the aetiology of rickets was more likely to be linked to environmental and dietary factors, rather than cultural practices and religion.

Studies from the USA have shown that, exclusively breastfed infants have an increased risk of developing vitamin D deficiency rickets, particularly if they are African-American[8-13]. It has been suggested that in Nigeria, the commonest aetiology for rickets is a dietary lack of calcium[14,15]. Indeed, there is literary evidence of resolution of symptoms of rickets with treatment with calcium replacement only[16,17]. This finding has been corroborated by other workers from developing countries[18,19]. Oginni[14] et al in his evaluation of 26 Nigerian children with active rickets, found statistically higher levels of plasma 1,25-dihydroxyvitamin D levels and low levels of 25-hydroxyvitamin D when compared with normal children. This argument seems plausible especially since Nigeria has an abundance of sunlight and gives less credence to the argument that underexposure to the ultra-violet rays of the sun is the major aetiology for rickets in the tropics. In this study, we found the mean serum calcium below the mean average for our population. The significance of this, however, was not evaluated.

The male: female ratio of 2.4:1 in rickets found in this study is at variance with findings by Solagberu[6], who reported a female preponderance in his own study. He did not however ascribe any significance to it. Just as Solagberu opined, the significance of gender in the aetiology of rickets remains yet to be ascertained, more so with variation in results from different studies.

There were 32 patients with bilateral affectation amongst patients with rickets, accounting for

86.5% of all patients with rickets in this study. This suggests a contribution by weight bearing in the aetiology of rickets. The mean BMI in patients with rickets was 16.49±3.97. This represents underweight using the Johan Van Hespen BMI chart.

We found windswept deformity to be the commonest type of angular knee deformity in this group of patients with only 3% of the population presenting with bilateral bowleg deformity. We had imagined however that the age at the onset of the pathology may be a major determining factor in the type of deformity that results. The natural history of the evolution of the knee angles in children has been defined in various races[20-24]. It is generally agreed that beyond the age of 2 years, a valgus tibio-femoral knee alignment is the norm. The mean age of onset of almost 4 years in this study suggests that most patients would already have physiologic valgus alignment of the tibio-femoral angle at the onset of rickets. Axial loading against a background of structurally weakened skeleton is the cause of angular knee deformity in these patients. Against this background, we expected that genu valgum would be the most common mode of presentation of angular knee mal-alignment and not windswept deformity which was observed in this study. The reason for this is not known. Perhaps biomechanical studies may shed more light on this.

Conclusion

We found that in this environment, rickets is more than twice as common in male patients, bilateral lower limb affectation is present in more than 80% of patients seen and that windswept deformity is the commonest mode of presentation of angular knee deformity.

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Obesity and Hypertension, Prevalence and Correlates among Patients Seen in a Tertiary Hospital in South-south Nigeria

Azinge N[1] & Anizor C.O[1]

Abstract

Background: The relevance of both hypertension and obesity as important public health challenges is increasing world-wide. The growing prevalence of obesity is increasingly recognized as one of the most important risk factors for the development of hypertension. This study is aimed at determining the prevalence of hypertension and obesity with its associations in patients seen in a tertiary hospital in South-South Nigeria

Method: This study was carried out at the Delta State University Teaching Hospital, Oghara. It is a cross sectional descriptive study of 1045 adult patients seen at the Out-patient department between January – December 2010. Blood pressure and their anthropometric were measures taken at their first clinic visit. Overweight and obesity were determined using the body mass index (Quetelet index)

Result: Prevalence of hypertension was 28% while the prevalence of obesity was 22.1%. Specifically, 19.5% of the males and 24% of the females were obese respectively. Mean body mass index was 24.63 + 8.52kglm2. Male prevalence of hypertension was 14.4% while female prevalence was 14.1%. The prevalence of hypertension was significantly higher among obese patients compared to non-obese patients (32.5% vs. 23.5%) $p<0.05$.

Conclusion: Hypertension places an excessive financial burden and populations and health systems, consuming scarce resources. Body mass index is positively and independently associated with morbidity and mortality from hypertension and cardiovascular disease. Lifestyle modification would help in controlling hypertension as well as reduce its prevalence and its subsequent financial burden.

Keywords: *Obesity, hypertension, prevalence*

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Introduction

The relationship between body mass and blood pressure has been established more than 10 years ago. Both cross-sectional and longitudinal studies[1,2,3] in western populations have consistently indentified an association between overweight and hypertension [1,2]

According to the current definition of hypertension from the Seventh Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC7) guidelines many Nigerians (20-25%) would be classified as hypertensives[3]. The relationship between body mass index and hypertension is of particular interest to developing countries as reduced cardiovascular mortality among lean hypertensive subjects has been reported in some

longitudinal studies [4,5].

In the INTERSALT study, the relationship between body mass index (BMI) and blood pressure was studied in over 10,000 men and women between 20 and 59 years of age, sampled from 52 centers around the world. BMI was significantly associated with systolic and diastolic blood pressure, independent of age, alcohol intake and smoking habit[2].

Population based preventive approaches are thus central for the control of obesity and management of deviated blood pressure in developing countries where hospital based care of complications is not a readily available option.

This study intends to generate relevant information that helps understand the patterns of high blood pressure, prevalence and correlates with obesity in patients at a tertiary hospital in a semi-urban area in South-South Nigeria. Such information would thus be relevant to the prevention and control of hypertension and obesity in these areas.

Materials and Methods

This study was carried out at the Department of Internal Medicine, Delta State University Teaching Hospital (DELSUTH), Oghara, Delta state, Nigeria. The Ethics and Research Committee of DELSUTH, Oghara approved the study. The study was conducted at the medical outpatient clinic involving 1045 patients seen between January, 2010 and December, 2010.

At each clinical visit, blood pressure was measured using a standard mercury(Accoson) sphygmomanometer. The weight and height of each patient was also taken and the body mass index calculated using the Quetelet index (kg/m^2). Hypertension was defined and classified using the JNC VII criteria while obesity was defined according to the WHO criteria[3]. Normal Body mass index (BMI) is 19.5 – 24.9, Overweight is BMI of 25 – 29.9, while obesity is BMI > 30kg/m^2.

All statistical analysis was done with SPSS version 11 and a P value of less than 0.05 was taken as significant. Results were expressed as mean +_ standard deviation.

Results

A total of 1045 patients were involved in the study with 502 (48%) being males and 543 (52%) being females. The mean age of patients was 44.08 + 14.14 years while mean BMI was 24.63 + 8.522kg/m^2. Prevalence of hypertension was 28.5% while prevalence of obesity among patients was 22.1%.

The prevalence of hypertension among normal, overweight and obese patients were 23.7% , 33.7% and 32.5% respectively. Conversely, 59% of the hypertensives were overweight. By gender, the prevalence of hypertension was 30% and 27.1% among males and females respectively. The prevalence of obesity by gender was 9.4% among males and 12.7% in females. Similarly, 19.5% of the males were obese while 24.5% of the females were obese.

Male prevalence of hypertension was 14.4% while female prevalence was 14.1%. There was a significant difference between the prevalence of hypertension among obese patients compared to non-obese patients (P<0.05).

Table 1: *Pattern of Body Mass Index among the Sexes*

BMI	MALE	FEMALE
Normal	259(49.6%)	255 (47.%)
Overweight	145 (28.9%)	155 (28.5%)
Obese	98 (19.5%)	133 (24.5%)

Table 2: *Pattern of Body Mass Index and Hypertension*

BM 1	NORMAL	PRE-HTN	HTN
Normal	215(41.8%)	177 (34.5%)	122 (23.7%)
Overweight	101 (33.7%)	98 (32.6%)	101 (33.7%)
Obese	76 (32.9%)	80 (34.6%)	75 (32.5%)

Table 3: *Gender, Body Mass Index and Hypertension*

	MALE NO HTN	FEMALE NO HTN
Normal	61 (40.4%)	61 (41.5%)
Overweight	55 (36.4%)	46 (31.3%)
Obese	35 (23.4%)	40 (27.2%)

Discussion

Obesity and in particular central obesity have been consistently associated with hypertension and increased cardiovascular risk. Based on population studies, risk estimates indicate that at least two-thirds of the prevalence of hypertension can be directly attributed to obesity[6].

In our study, the overall prevalence of hypertension amongst our study population was 28.5%. Many studies have been done in various areas of Nigeria involving specific subsections of the population on the prevalence of hypertension. Osilesi *et al* estimated a prevalence of 11.5% in the cardiovascular clinic of the University College Hospital. Similar work at the University of Nigeria Teaching Hospital, Enugu yielded 15.2% prevalence[7,8]. In our study, we obtained a higher prevalence of 28.5%. This could be attributed to different socio-economic and lifestyle differences between patients residing in these communities.

Recent reports from various studies have indicated increasing prevalence of obesity[16,17]. Some recent studies have documented alarming prevalence rates of 71.6% in females and 50.5% in males in a population of hypertensive patients[18]. In our study, 28.7% were overweight and 22.1% were obese. These results are slightly less compared to studies done at the University College Hospital among patients where prevalence of 54.4% and 32.8% were observed for overweight and obesity respectively [9]. This higher prevalence could be attributed to the higher carbohydrate content of staple foods in the South Western Nigeria compared to the South-South Nigeria. This study shows that obesity is more prevalent among females then males which is in agreement with similar studies [10,11,12]. Women are more prone to gluteo- femoral lipogenesis and fat deposition and account for the increased frequency of obesity among females[12]. Another plausible explanation for the higher prevalence of obesity among our female patients could be a superimposition of sedentary lifestyle on the nutritional transition being witnessed in the country although we did not obtain information on physical activity in our study. The perception of obesity as a sign of affluence by many people (especially women) in this part of the world could have also contributed. A study in a university community in South-Western Nigeria found that in spite of the higher education of their subjects, many of the respondents believed that being obese gives respect and that it is a sign

of good living[13].

This study showing increased prevalence of overweight and obesity among patients with hypertension which also agrees with earlier studies [13,14]. The precise mechanism linking obesity to hypertension and increased cardiovascular risk are not fully understood. However, neuro-endocrine mechanisms and most recently factors derived from adipose are thought to play a major role [15,16]. While obese subjects are prone to hypertension, hypertensive subjects appear to be prone to weight gain.

The association between body mass index and blood pressure has been widely reported across populations in Asia, Latin America, United States and Canada. In a study that included five Latin American populations (urban) and seven Asian populations (four urban, three rural), significant positive relationships of similar magnitude were observed between BMI and BP, despite differences in mean BMI levels between the populations studied [15]

In the INTERSALT study, the relationship between body mass index (BMI) and blood pressure was studied in over 10,000 men and women from 52 centers around the world. It was observed that BMI was significantly associated with systolic and diastolic blood pressure[2].

Both the Framingham and Tecumsell studies have shows that future weight gain is significantly greater in hypertensive patients than in normotensives suggesting that even normal weight hypertensives are at a risk of developing obesity [20]. Weight gain in adulthood is in itself an important risk factor for the development of hypertension[21]. Studies among Nigeria adults also observed that females with obesity had a risk of hypertension three times that of normal weight females[22].

The precise prevalence of obesity related hypertension varies with age, race and sex of the population studied and with the criteria used for the definition of hypertension and obesity[23]. In the Framingham offspring studying, 78% of cases of hypertension in men and 64% in women were attributable to obesity[24.]

Limitations

The researchers have identified certain constraints that imposes some degree of limitations to the absolute generalizations of the finding. Ideal measurement of obesity should consider both the amount and the site of deposition of the adipose tissues, the waist indices (waist circumference, waist-hip ratio, Rohrer's index, Ponderal index) were not used for the definition of obesity in this study. However, many studies have documented that Quetelet index provides a simple clinical estimate of generalized adiposity that can be compared across studies and populations[25,26]. Furthermore, the limitations imposed by it being hospital-based retrospective is recognized, however this study still provides useful baseline information for more large scale analytical and longitudinal studies on obesity and hypertension in the community on which subsequent interventions could be based and evaluated.

Conclusion

There is a high prevalence of both obesity and hypertension in the population studied. There is a clear need to develop a strategies for managing the increasing number of overweight and obese subjects in the community. Effective long-term weight loss necessitates persistent changes in dietary quality, energy intake and physical activity which is associated with a significant reduction of blood pressure

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Morbidity Associated with Vaginal and Abdominal Hysterectomy in a Northern Nigerian Hospital

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Abstract

Background: hysterectomy is one of the most common surgeries performed in gynaecological practice. It can be carried out either by vaginal or abdominal route. We compared the complications associated with the two types of surgeries.

Methods : A retrospective study involving all patients that had vaginal and total abdominal hysterectomy for benign conditions between January 2002 and December 2009 (8 years) at the Federal Medical Centre Birnin- Kebbi, Kebbi State, Nigeria

Results : During the period, 493 major gynaecological operations were performed in the health centre with vaginal and total abdominal hysterectomy constituting 48 (9.7%) and 69 (14.0%) of the surgeries respectively. The only indication for the former was uterine prolapse while the main indication for the latter was uterine fibroid (82.6%). Excessive primary haemorrhage was statistically significantly higher in vaginal hysterectomy compared with abdominal hysterectomy (45.8% versus 17.4%; p-value <0.05). Other complications did not yield any statistically significant difference : bladder injury (8.3% versus 3.0%), bowel injury (0% versus 3%), ureteric injury (0% versus 1.4%), wound infection (4.2% versus 8.7%) and maternal death (2.1% versus 3.0%). The average duration of hospital stay in vaginal hysterectomy was 4.2 ± 0.6 days compared to 7.8 ±1.2 days in the abdominal procedure ($p<0.05$).

Conclusion: Excessive primary haemorrhage was significantly commoner in vaginal hysterectomy compared to its abdominal counterpart, however, other complications were not. Furthermore, the former had the advantage of shorter duration of hospital stay compared to the latter.

Key words: *Vaginal and abdominal hysterectomy, morbidity*

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Introduction

Hysterectomy is one of the most common surgeries performed in gynaecological practice[1,2]. It can be carried out either by vaginal or abdominal route. Several studies have been conducted to compare the complications between abdominal and vaginal hysterectomy[3-7]. Some authors reported that vaginal hysterectomy was associated with less febrile morbidity, less haemorrhage, shorter hospitalization and faster convalescence than abdominal hysterectomy[3,4,7]. Dorsey and his associates[5] in their study found that the post-operative complications were

similar between abdominal and vaginal hysterectomy but the duration of hospital stay was significantly greater in the former than the latter[8]. Similar study has not been conducted in North-western Nigeria hence the present one.

Materials and Method

Records of all the patients that had vaginal hysterectomy and total abdominal hysterectomy for benign conditions between January 2002 and December 2009 (8 years) at Federal Medical Centre Birnin Kebbi, Kebbi State, Nigeria were sought in the theatre register and thereafter, their case records were retrieved from the central medical library. The patients' demographic characteristics, indications for surgery and intra-operative/ post-operative complications including haemorrhage, bladder injury, ureteric injury, bowel injury and wound infection were extracted and analyzed. Blood loss of $\geqslant$ 500ml intra-operatively was considered excessive primary haemorrhage while presence of offensive discharge from the wound site was regarded as wound infection. Chi square was used to compare findings in both group with 95% confidence and level of significance put at p-value less than 0.05.

Results

A total of 493 major gynaecological operations were performed within the study period with vaginal hysterectomy and total abdominal hysterectomy accounting for 48 (9.7%) and 69 (14.0%) of the surgeries respectively. The ages of the former ranged from 25 to 80 years with a mean of 49.1±7.1 years while those of the latter ranged from 20 to 55 years with an average of 42±6.3 years. Forty seven percent of patients who had vaginal hysterectomy were at most 45 years of age compared to 34.3% in those who had total abdominal hysterectomy. The parity in the vaginal hysterectomy group ranged between 3 and 10 with an average of 6 while their total abdominal counterpart ranged between 0 and 8 with a mean of 4. The only indication for vaginal hysterectomy was uterine prolapse (41.7% for 2nd degree and 58.3% for 3rd degree) while the main indications for total abdominal hysterectomy were uterine fibroid (82.6%), chronic pelvic inflammatory disease (7.2%), adenomyosis (4.3%), endometrial polyps (2.9%) and chronic cervicitis (2.9%). All the procedures were performed by consultant gynaecologist. General anaesthesia was employed in all the cases of total abdominal hysterectomy and 85.4% of vaginal hysterectomy. Spinal anaesthesia was used in 7 cases (14.6%) of vaginal procedure. All the patients had intravenous ciprofloxacin (or ceftriazone or ampiclox) and metronidazole for at least 24 hours post-operatively. The total morbidities from vaginal hysterectomy 28(58.3%) were significantly higher compared with those from abdominal procedure 23(33.3%); p=0.03. As shown in table1, excessive primary haemorrhage (45.8% versus 17.4%) and

Table 1: *Complications of vaginal and abdominal hysterectomy*

Complications	Vaginal hysterectomy N=48 n (%)	Abdominal hysterectomy N=69 n (%)	X^2	P-value
Excessive primary Haemorrhage	22(45.8)	12(17.4)	10.96	0.01
Bladder injury	4(8.3)	2(3.0)	1.25	0.54
Bowel injury	0(0)	2(3.0)	2.00	0.38
Ureteric injury	0(0)	1(1.4)	1.44	0.49
Wound infection	2(2.4)	6(8.7)	0.15	0.93
Total morbidity	28(58.3)	23(33.3)	7.04	0.03
Maternal death	1(2.1)	2(3.0)	0.04	0.98

bladder injury (8.3% versus 3.0%) were more common in vaginal hysterectomy than its abdominal counterpart. In contrast, bowel injury (3.0% versus 0%), ureteric injury (1.4% versus 0%), wound infections (8.7% versus 4.2%) and maternal death (3.0% versus 2.1%) were more common in the latter compared to the former. The differences in the primary haemorrhage in the 2 groups were significant ($p<0.05$) but not in the other complications.The 2 maternal deaths in abdominal hysterectomy were due to complication of general anaesthesia in morbidly obese patients while the single maternal death in the vaginal hysterectomy was due to complication of spinal anaesthesia in a 78 year old patient. The average duration of hospital stay for vaginal hysterectomy was 4.2 ± 0.6 days while that of abdominal hysterectomy was 7.8 ± 1.2 days ($p<0.05$).

Discussion

The overall morbidity of vaginal hysterectomy (58.3%) in this study was higher than that of abdominal hysterectomy (33.3%). This trend was similar to the report of Juha et al in Finland where total morbidity rates for vaginal and total abdominal hysterectomy were 23.3% and 17.1% respectively[5]. Umeora *et al* in southern Nigeria made similar observation[7].However, it was contrary to the findings of Dicker *et al* in United States where the morbidity rate in total abdominal hysterectomy (42.8%) was higher than that of vaginal hysterectomy[6].

Excessive primary haemorrhage was significantly commoner in vaginal than abdominal hysterectomy in this study. Kayastha and Tuladhar9 found the opposite in Nepal while Juha *et al*[5] in Finland had similar experience. This finding could be attributed to the fact that 47% of the patients that had vaginal hysterectomy in the present data were 45 years and below compared with 34.3% amongst those that had abdominal hysterectomy; and pelvic tissue tend to be relatively more vascularized in premenopausal age . As reported by some previous authors6,8, there was no significant difference in the rate of bladder injury, bowel injury, wound infection and ureteric injury between vaginal and abdominal hysterectomy in this study. However the duration of hospital stay in this data was significantly shorter in vaginal hysterectomy than in abdominal hysterectomy as reported by previous authors[3,4,7,8,9,10,11].

In conclusion, while patients who had vaginal hysterectomy were more prone to excessive primary haemorrhage, they were likely to be discharged earlier from the hospital compared to those that had total abdominal hysterectomy.

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Environmental and Socio-demographic Determinants of the Age at Menarche among Secondary School Girls in the Niger-Delta Region of Nigeria

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Abstract

Background: Menarche is one of the most significant events in the transition to reproductive capability. It is believed to be influenced by genetic, physiological, environmental and social factors.

Methods: It was a cross-sectional survey over a two month period of two cohorts of 400 secondary school girls from two different communities of Rivers State Nigeria to determine the age at menarche and identify any peculiar environmental or socio-economic variables that may influence this.

Results: The mean menarcheal age (years) for the respondents from school 'A' was 13.99 + 1.060 SD and that for school 'B' was 14.53 + 1.148 SD. The earliest age of menarche was 9 years for school 'A' and 11 years for school 'B'. The latest age of menarche of 17 years was same for both schools 'A' and 'B'. Only one respondent who is an athlete from school 'A' was involved in strenuous physical exercise, she was 14 years old and had not attained menarche. The differences in the post-menarcheal mean heights and weights of the respondents from schools A and B at their current ages were statistically significant and when compared against a standard female normogram for height and weight, there were more small framed respondents from school 'B' compared to the individuals from school 'A'.

Conclusion: Respondents from the more affluent background had significantly lower age of menarche than girls from the less affluent setting. Better socio-economic status, nutrition, greater height and weight are positively associated with a lower age of menarche.

Keywords: *Environmental, socio-demographic, determinants, menarche, secondary school girls, Niger-Delta region of Nigeria*

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Introduction

Menstruation is an important feature in the reproductive life of a woman. Menarche, the first menstruation, is one of the most significant events in the transition to reproductive capability that occurs at puberty. Over the past few decades, it has been observed in various parts of the world that there has been a secular trend associated with the decline in the age of onset of menarche[1-4]. This trend has been very well documented in the developed countries particularly the United States and some Western countries1. General improvement in nutrition and health has been suggested to explain the downward trend. The same pattern of earlier age

of attainment of menarche is being seen in developing countries like Bangladesh[5] and Nigeria[6]. However, over the past few decades, this trend seems to have reached a plateau or even reversed in most parts of Europe and other developed countries[3]. It is hypothesized that this might be due to either the effect of a ceasing improvement of environmental factors/infrastructural facilities or the impact of reaching the genetically determined limits of normal menarcheal age for those populations[3,7,8].

Few studies on puberty and menarche from developing countries including Nigeria are available[1,3,9-16]. Earlier study from Rivers State Nigeria indicated that urban school girls had a lower mean age of menarche than rural school girls, and socioeconomic status and sports were reported as important correlates of age of attainment of menarche in that study[1]. Similar trend have been reported by other researchers[1,9-16].

Menarche is believed to be influenced by genetic, physiological, environmental and social factors[3,6,16]. Rivers State is a typical African settlement. Because of her geographical terrain two sets of environments are discernable. The riverine and the upland, and these have effect on the occupation and possibly nutritional status of the communities with its attendant effect on the age of attainment of menarche. It is against this background that this study was conceptualized and conducted in two girls' secondary schools located in two different communities within the state viz; a typical riverine area and a typical upland area with the overall goal of determining the age at menarche and identify any peculiar environmental or socio-economic variables that may influence this.

Methodology

This was a cross-sectional survey over a two month period of two cohorts of secondary school girls from two different communities of Rivers State – one in a typical riverine community and the other from a typical upland community to assess the influence of environment and socio-economic factors on the age of menarche in Nigerian girls. The first cohort of 200 girls from the riverine area was recruited from Government Girls Secondary School at Bonny (Headquarters of Bonny Local Government Area – [LGA]) and was referred to as school 'A' in this study. The other cohort of 200 girls from the upland area was recruited from the community Secondary School Isiokpo (Headquarters of Ikwerre LGA) and was referred to as school 'B'. The girls recruited were within 10-20 years age bracket and this was confirmed from their school registers. To ensure that the confounding effect of different set of environmental conditions was eliminated, only those born within the respective LGA, lived there and had their primary education within were recruited in the respective schools. The respondents from school 'A' were from the community where their parents were predominantly fishermen, while the respondents from school 'B' were from the community where their parents were mainly peasant farmers.

The survey was undertaken using a data collection sheet designed for the purpose of this study. It was in two parts, the first part was the segment of a pre-tested and validated questionnaire which was administered on the respondents by the researchers after careful explanation to the respective interviewed students. This was done in the presence of their female class teachers who acted as chaperone to eliminate fear and undue embarrassment. The specific information elicited were the date of birth and age of the respondents, place of birth, place of primary education, the age of onset of menarche, sporting activities if any, chronic ill-health, parents occupation and determination of their social class. The social class in this study was determined using the employment status and cadre of their parents.

The girls were accordingly classified into three different social groups: Low social group if the parents were unskilled workers (farmers, fisherman amongst others), medium social group if parents were civil servants/small scale business personnel and high social group if the parents were professionals/large scale entrepreneurs. The second part contained the anthropometric measurements – height (in centimeters) and weight (in kilograms) of the respondents. The height and weight were taken using a standard commercial height/weight scale, the Detecto height and weight scale manufactured by Detecto Scales Inc., Brooklyn, U.S.A. Their weights were measured with their shoes off and they had their uniform made from light cotton material on.

The authorities of the schools and the girls concerned were informed and educated on the study to be carried out. Also, informed consent was obtained from all the girls and the school authorities before the study was carried out.

The completed data collection sheets were collated, coded and entered into the computer using statistical packages for social scientist (SPSS PC+). The data was analyzed using same statistical packages for social scientist (SPSS PC+). This consisted of univariate analysis and comparisons of identified relationships. Test of the statistical significance was based on 95% confidence interval using students' t test or Chi –square test with the Yates or Fischer exact correction where applicable.

Results

Of the 400 hundred girls recruited into the study, 309 (77.3%) were menstruating and the remaining 22.7% were premenarcheal. There were 140 (70.0%) postmenarcheal girls in school 'A' and 169 (84.5%) postmenarcheal girls in school 'B'. The mean menarcheal age (years) for the respondents from school 'A' was 13.99 + 1.060 SD and that for school 'B' was 14.53 + 1.148 SD. The difference was statistically significant (p-value <0.05). The earliest age for attainment of menarche was 9 years for school 'A' and 11 years for school 'B', the difference was statistically significant. The latest age for attainment of menarche of 17 years was same for both schools 'A' and 'B'. The median family size was 11 and 10 for respondents from schools 'A' and 'B' respectively with a range of 3-26 for school 'A' and 4-24 for school 'B'. Only one respondent from school 'A' was involved in strenuous physical exercise being an athlete, she was 14 years old and had not attained menarche. None of the respondents from school 'B' was involved in strenuous physical exercise. The respondents interviewed did not volunteer any history of chronic illness and no observed physical habitus suggestive of chronic medical disorder in any of them. However malaria and helminhtic infestation are reported to be quite common in the two communities. We indirectly assessed the nutritional status of the respondents by measuring their post-menarcheal mean heights and weights at their current ages and compared against a standard female normogram for height and weight (not shown). Almost all the respondents from school 'B' were small framed individuals while about 42.9% of the respondents from school 'A' were small framed individuals and the remaining were between small and medium framed individuals which falls within the

Table 1: *Socioeconomic Group Frequency Distribution versus Mean Menarcheal Age*

Socioeconomic Group	Frequency (%)		MMA (yrs)		SD	
	A	B	A	B	A	B
High	17 (12.1)	21 (12.4)	13.5	14.2	1.009	1.380
Medium	76 (54.3)	88 (52.0)	14.1	14.5	1.146	1.030
Low	47 (33.6)	60 (35.6)	14.4	14.9	0.865	1.032

F ratio = 10.28, P-value < 0.05

Table 2: *Frequency distribution of the menstrual age versus the socioeconomic group*

MENSTRUAL AGE TO THE NEAREST WHOLE NUMBER	FREQUENCY A	B	HIGH A	B	MEDIUM A	B	LOW A	B
9 years	1	-	-	-	1	-	-	-
10 years	-	-	-	-	-	-	-	-
11 years	1	2	1	1	-	-	-	1
12 years	9	8	4	4	5	2	-	2
13 years	25	20	5	2	15	13	5	5
14 years	48	41	5	6	23	27	20	10
15 years	39	81	1	8	19	40	19	31
16 years	16	16	1	-	12	6	3	10
17 years	1	1	-	-	1	-	-	1

Table 3: *Anthropometric parameters of respondents from both schools*

Age (years)	Mean weight (kg)		Mean height (cm)	
	A	B	A	B
20	54.5	50.8	171. 0	162.0
19	55.5	51.1	162.2	161.5
18	56.5	52.1	165.2	160.1
17	54.1	50.8	161.1	153.6
16	53.5	50.5	160.6	153.6
15	52.6	49.9	160.0	158.1
≤14	48.6	44.0	155.6	157.0

p-value for weight <0.05, p-value for height <0.05

normogram for growth. The girls from school 'A' were therefore more physically developed age for age more than the girls from school 'B'.

The socioeconomic group distributions versus the mean menarcheal age of the respondents are as presented in table 1. A greater proportion – 54.3% and 52.0% of the parents of respondents from schools 'A' and 'B' respectively were of medium social group. This was closely followed by the low social group with 33.6% of school 'A' respondents belonging here and 35.6% of respondents from school 'B' belonging here. Compared to respondents that belonged to the high social class (12.1% and 12.4% from schools 'A' and 'B'' respectively), the differences were statistically significant (p-value <0.05). The frequency distribution of the menstrual age versus the socioeconomic group is presented in table 2. The modal menarcheal age for school 'A' was 14 years and that for school 'B' was 15 years.

The weight and height for age of the respondents are presented in table 3. The height and weight for age in the respondents from school 'A' was higher than that for respondents from school 'B'.

Discussion

All over the world available evidence indicates that the literature is replete with data on the age at which menarche is attained[1-21]. Several Nigerian authors have similarly documented on this important subject from the different regions of the country[3,6,17-19]. Numerous factors such as socioeconomic status, nutrition, geography, genetics and chronic disease states amongst others are known to influence the age and physical size of girls at menarche and there appears to be a secular trend related to improvements in nutrition and healthcare[15].

The mean menarcheal age (MMA) of girls from Rivers State in south-south Nigeria compares favorably with that gotten from an earlier study in rivers state6 and also from school girls in non-urban areas of Plateau State[14]. However the MMA reported from Europe and other developed nations of the world are much lower than the figure from this study[3,16]. The income per capita is much higher in Europe and other developed settings compared to developing nations including Nigeria. The effect of socioeconomic effect is further underscored by the fact that this study demonstrated that a higher and or improved socioeconomic status was a factor responsible for an earlier age of menarche, such that girls in each of the schools from a lower socioeconomic group seemed to have menstruated at a slightly higher age. Similar findings have earlier been reported[6,15].

The difference in the MMA of the girls from both schools was statistically significant. We hypothesize that this is due to the fact that girls from school A were of more affluent background as compared to girls from school B. Additionally, there was ready availability of various sea foods in the riverine community of Bonny where school A was situated as compared to Isiokpo community where school B was located, and these scarcely available commodities in Isiokpo community are usually costly and beyond the reach of majority. The inhabitants of Isiokpo community were largely peasant farmers and their meals most probably consisted more of carbohydrate as staple diets. Nutrition has been demonstrated to affect the reproductive efficiency just as it affects the age of commencement of menstruation[20.] A higher incidence of difficult deliveries due to feto-pelvic disproportion in women from upland areas compared to women from typical riverine areas of the state was previously observed and the possibility of dietary differences in the two groups of communities was advanced as being responsible (personal communication). A review of the British historical data from the nineteenth century on nutrition showed similar trend[20]. This is further buttressed by the fact that when we indirectly assessed the nutritional status of the respondents by measuring their post-menarcheal mean heights and weights at their current ages the differences were statistically significant and when compared against a standard female normogram for height and weight, there were more small framed respondents from school 'B' compared to the individuals from school 'A'. Better nutrition certainly must be a factor as to why the girls from school 'A' were more physically developed age for age more than the girls from school 'B'.

The possibility of physical exercise being a determinant of the age of attainment of menarche may be weakly deduced from this study as the only respondent who was an athlete from school 'A' and involved in strenuous physical exercise was 14 years old and had not menstruated. This corroborates an earlier report that active sports increase the age of menarche[6,21]. This may be due to the release of androgenic hormones (aldosterone) in sporting girls which is likely to delay menarche.

In conclusion, the mean menarcheal age (years) for the respondents from school 'A' was 13.99 + 1.060 SD and that for school 'B' was 14.53 + 1.148 SD respectively. Girls from the riverine

areas therefore had significantly lower age of menarche than girls from upland areas. Better socio-economic status, nutrition, greater height and weight are positively associated with a lower age of menarche.

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Diabetes Mellitus in Childhood and Adolescence: Analysis of Clinical Data of Patients Seen in a Nigerian Teaching Hospital

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ABSTRACT

Background: The clinical profile of African children and adolescents with diabetes mellitus is known to differ from that of their non-African counterparts.

Objective: To present an analysis of the clinical data of children and adolescents with diabetes mellitus seen in a Nigerian teaching hospital between 2005 and 2011 and highlight the management challenges encountered.

Methods: In this retrospective study, the case notes of all children and adolescents with diabetes mellitus seen in the Paediatric Endocrine-Metabolic Clinic and of those admitted into the paediatric wards of the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria were audited. Information extracted included age, sex, presenting features, educational attainment of parents, occupation of parents, insulin management, complications and outcome of patients. The clinic attendance registers of the Department of Child Health, UBTH was examined to obtain information on total number of patients seen by all the units in the department between 2005 and 2011.

Results: Seventeen (0.2%) of the 8,350 cases seen during the period under review had diabetes mellitus, representing 2 per 1000 cases with a male-to-female ratio of 1: 1.8. The mean age at presentation was 12.8±2.9 years for both sexes combined. The mean body mass index (BMI) was 18.6±2.5 kg/m^2. Diabetic ketoacidosis (DKA) was the initial presentation in 9(52.9%) of cases. The mean duration of symptoms before presentation was 2.7±1.8 months. Only 10(58.8%) of the 17 patients had glucose meter for self-monitoring of blood glucose at home. Of the 17 patients, 6(35.3%) had documented evidence of hypoglycaemia. During the period under review, 4(23.5%) were re-admitted; of which 3 were for DKA. Seven (41.2%) of the parents had difficulty procuring insulin on a regular basis.

Conclusion: In the present study, the unique clinical features observed among children with diabetes mellitus were late presentation, high number of cases presenting with DKA and requiring re-admission. The major management challenges included difficulty procuring insulin on a regular basis and inability to acquire a glucose meter with test strips for self-monitoring of blood glucose at home.

Keywords

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Introduction

Diabetes mellitus (DM) is the commonest endocrine disorder in childhood with chronic hyperglycaemia as the cardinal biochemical feature.[1,2] Diagnosis of DM is based on the

presence of its cardinal signs (polyuria, polydipsia and weight loss) and a fasting blood glucose level of 126 mg/dl (7.0 mmol/L) and above or a random blood glucose of 200 mg/dl (11.1 mmol/L) and above on two separate occasions.[1,2]

The incidence of new cases of DM varies with geographical location, being highest in Finland and Sweden (40 per 100,000 children per year) and lowest in Japan (less than one per 100,000 children per year).[2] In Africa, the estimated incidence varied from 1.5 per 100,000 in Tanzania to 20 per 100,000 in Morocco.[3,4] The reported prevalence in Nigeria was 0.33 per 1,000.[5] Given that these prevalence and incidence figures were documented decades ago,[6-9] they may have changed. Reports from African countries indicate that the incidence of DM is increasing.[6-9] Some important demographic and socioeconomic factors may differ from country to country with health implications.

The clinical profile of African children and adolescents with DM is known to show certain variations in its clinical spectrum from that observed among their non-African counterparts.[5,10-12] For instance, equal sex prevalence has been documented in temperate countries while studies in sub-Saharan African countries like Ethiopia, Sudan, Nigeria and Libya reported higher prevalence in girls than boys.[6,13-15] Another study in Nigeria found the prevalence to higher in boys than girls.[11] In Tunisia, no gender difference was observed.[16] Although it is generally believed that socioeconomic status has no influence on prevalence, a study from Nigeria reported a higher prevalence among children from poor homes.[11] Studies from Tunisia, Ethiopia and Sudan reported that ketoacidosis was the commonest mode of presentation.[10,13,17] A study in Sweden among children aged 0-14 years reported that the annual variation in incidence of diabetes mellitus was considerable.[12]

The purpose of this study is to present an analysis of the clinical data of children and adolescents with diabetes mellitus seen in a Nigerian teaching hospital between 2005 and 2011 and highlight the management challenges encountered.

Subjects and Methods

The study was conducted in the Department of Child Health, University of Benin Teaching Hospital (UBTH), Benin City, Nigeria and involved all children and adolescents with diabetes mellitus seen between 2005 and 2011. Majority of the patients seen in the Paediatric Endocrine-Metabolic Clinic of UBTH come from Edo State and the neighbouring states of Delta, Ondo and Kogi. The clinic receives referrals from both within and outside the hospital (UBTH). The Paediatric Endocrine-Metabolic unit consists of the medical team (comprising one Consultant, 2 Senior Registrars, 2 Registrars, and 4 House Officers) and all the Nursing Staff (52) working in the Paediatric ward. The bed capacity of the Paediatric ward is 56.

In this retrospective study, the case notes of all children and adolescents with diabetes mellitus seen in Paediatric Endocrine-Metabolic Clinic and those admitted into the paediatric wards were audited. Information extracted included age, sex, presenting features, educational attainment of parents, occupation of parents, insulin management, complications, and outcome of patient. The socio-economic status of the patients' parents was determined using the criteria suggested by Ogunlesi *et al.*[18] This was analyzed via combining the highest educational attainment, occupation and income of the parents (based on the mean income of each educational qualification and occupation). In this Social Classification System, Groups I and II represent high socioeconomic class, Group III represents middle socioeconomic class while Groups IV and V represent low socioeconomic class. In this way,

the subjects were categorized into high, middle and low socioeconomic classes. The paediatric clinic attendance registers of the Department of Child Health, UBTH was examined to obtain information on the total number of new cases seen (by all the units in the department) between 2005 and 2011. Statistical analysis involved calculation of percentages, ratios, means, and confidence intervals.

Results

Among a total of 8,350 new cases seen during the 7-year period under review, 17 (0.2%) had diabetes mellitus, representing 2 per 1000 new cases. Male-to-female ratio was 1:1.8. The mean age at presentation was as follows: boys 11.0±4.2 years; girls 13.5±1.6 years; and both sexes combined 12.8±2.9 years. Mean age at presentation: boys versus girls t= 1.28 p>0.05. The mean body mass index (BMI) was 18.6±2.5 kg/m^2 with 6(35.3%) having a BMI below 19.0 kg/m^2. None of the subjects had BMI > 25 kg/m^2. The age group distribution of the patients with diabetes mellitus was as follows: 1-4 years 0 (0.0%); 5-9 years 2(11.8%); 10-14 years 10(58.8%); and 15-19 years 5(29.4%); Table 1. As shown in Table 1, the male-to-female ratio was 1:2.4. Diabetic ketoacidosis was the initial mode of presentation in 9(52.9%) of cases (Table 2). The mean number of blood glucose measurements per day was 2.6±0.9. As shown in Table 3, the point-of-admission mean blood glucose value was 27.8±12.1 mmol/L. Over half of the families (52.9%) of the subjects belonged to the middle social class while 11.8% belonged to high social class and 35.3% belonged to low social class. The mean duration of symptoms before presentation was 2.7±1.8 months. Majority (88.2%) of the patients had symptoms for 1 month and above before presentation. The distribution of duration of symptoms before presentation were as follows: < 1 month 11.8%; 1-3 months 41.2%; 4-6 months 29.4%; and > 6 months 17.6%. The frequency of the presenting clinical features is displayed in Figure 1. Among the cardinal features of diabetes mellitus, polyuria usually prompts the parents to seek medical care. Three (33.3%) mothers of the 9 patients who presented with diabetic ketoacidosis admitted they did not know that diabetes mellitus can occur in children. Two (11.8%) of the 17 patients with diabetes had positive family history of diabetes mellitus. In both cases, it was the mother who was diabetic. Only 10(58.8%) of the 17 patients had a glucose meter for self-monitoring of blood glucose at home. Four out of the 10 had difficulty procuring the test strips on a regular basis. One (8.3%) of the 12 girls with diabetes mellitus had delayed pubertal maturation; Tanner Stage II at the age of 15 years. She has not attained menarche and weighed 29 Kg, with BMI 16.0 kg/m^2. In addition, she had vaginal candidiasis. Of the 17 patients, 6(35.3%) had a documented evidence of hypoglycaemia during hospital admission. The total daily insulin dose per patient ranged from 12

Table 1: *Age and gender distribution of patients with diabetes mellitus*

Age group at presentation	Gender		
	Male No(%)	Female No(%)	Both sexes No(%)
Below 10 years	2(33.3)	0(0)	2(11.8)
10-12 years	0(0)	3(27.3)	3(17.6)
13-15 years	3(50.0)	8(72.7)	11(64.7)
Above 15 years	1(16.7)	0(0)	1(5.9)
Total	**6(100.0)**	**11(100.0)**	**17(100.0)**

T able 2: *Mode of presentation of 17 children with diabetes mellitus*

Mode of presentation	No (%)	Mean blood glucose (mmol /L) at presentation	Mean age at presentation(years)
DKA	9(52.9)	29.4±8.7	11.1±4.8
Classical DM symptoms	4(23.5)	21.3±7.1	14.7±1.2
Referrals	3(17.7)	24.8±8.9	13.6±1.7
Routine medical examination	1(5.9)	13.3±0.0	14.0±0.0
Total	**17(100.0)**	**27.8±10.8**	**12.8±2.9**

DKA=Diabetic ketoacidosis; DM= Diabetes mellitus

Table 3: *Distribution of mean blood glucose values in 17 children admitted for diabetes mellitus.*

Variable	Mean blood glucose (mmol/L)
Point-of-admission random blood glucose	27.8±10.9
Fasting blood glucose 48 hours post admission	14.2±9.5
Fasting blood glucose 7 days post admission	12.1±9.1
Fasting blood glucose 3 weeks post admission	9.8±6.2

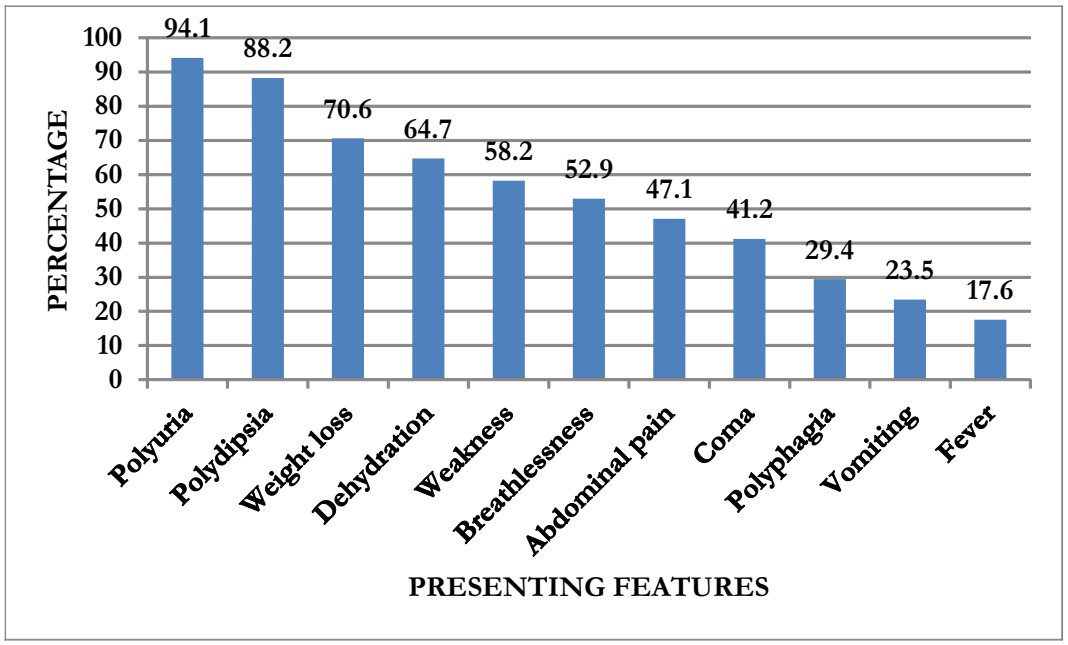

Figure 1: *Prevalence of presenting clinical features of 17 children with diabetes mellitus*

to 35 Units with an average of 26.5 Units per patient per day. Some parents (41.2%) had difficulty procuring insulin because of financial constraints. During the period under review, 4(23.5%) were re-admitted; 3(17.6%) for diabetic ketoacidosis (DKA) and 1(5.9%) following discharge against medical advice (DAMA) and subsequent clinical deterioration. One of the three patients with DKA required two re-admissions. The three patients re-admitted for DKA were due to patient error (omission of insulin following advert by a drug company that sells natural products in one case and claim of cure by a spiritual healing home in the remaining two cases). Of the 4 patients re-admitted, 3 were females and one was a male.

Discussion

The prevalence (2 per 1000 new cases) of diabetes mellitus found in the present study is higher than 0.33 per 1000 reported by Afoke et al among Nigerian Igbo school children. [5]The difference might be explained by differences in population, methodology, setting and timing of study. It is noteworthy that the present study was hospital-based while the study by Afoke et al [5]was community-based. Another hospital-based study in Abakaliki, Nigeria reported a lower prevalence than that of the present study.[19] The higher prevalence reported here might be explained by the difference in the denominators used. In the present study, the denominator was new cases only (resulting in a smaller denominator) while in the study in Abakaliki, the denominator was all cases (both old and new cases), with a resultant lower prevalence figure. Another study from the northern part of Nigeria reported a higher prevalence of 3.1 per 1000 cases, suggesting that there might be some regional variation in prevalence within the same country.[20] The prevalence found in this study compared favourably with that reported from Tanzania.[3] The prevalence of diabetes mellitus observed in the present study and in previous studies conducted in other black African countries were generally lower than the prevalence reported from European countries. The low prevalence observed in black African countries like Nigeria might be explained by various factors such as death from other causes, different genetic susceptibility, and absence of toxin in food additives.[21] Indeed it has been reported that the incidence of type 1 diabetes mellitus was higher in children of black origin living in Europe compared to those living in the African continent; an observation attributed to exposure to environmental diabetogenic agents.[3]

In keeping with previous studies in Nigeria,[14,19] the present study showed that there was a female preponderance. This is not surprising as studies from other African countries have reported a higher prevalence of diabetes mellitus in girls than boys.[6,7,13] Various explanations have been proffered for the female preponderance. Bella, for instance, attributed it to the higher frequency of HLAB8/DR3 halotype in females, a halotype associated with autoimmune disorders including antibodies to islet cell of the pancreas.[14] This view has been strongly challenged by the report of Oli et al[22] which showed that HLAB8 haloytype and pancreatic islet cell antibodies were both absent among Nigerians with diabetes mellitus. On the other hand, Bloch et al[23] postulated that there was a relative increased incidence in females at the time of puberty due to the pubertal growth spurt induced by gonadal steroid together with increased pubertal growth hormone secretion, antagonizing insulin action and unmasking evolving diabetes. Yet other investigators stated that a female excess is seen in ethnic groups with low risk for diabetes, particularly among non-Caucasians.[24] Since Nigerian Africans are a relatively low risk ethnic group, this might apply to them, explaining the higher frequency in girls compared to boys.

In the present study, the mean age at presentation (12.8 years) was higher than the 11.4 years reported in Abakaliki but lower than 17.8 years reported in Ibadan.[11,19] The mean age at presentation in Sweden was 8.2 years. [12] The reason for these differences is not clear. The lower age at presentation observed in this study compared to the study in Ibadan might be explained by difference in age groups studied. The present study involved patients aged from 5 to 17 years whereas the study from Ibadan involved patients age from 10 to 20 years. The low mean age at presentation reported from Sweden suggests that diabetes mellitus occurs at a younger age in Sweden compared to Nigeria.[12] Bella in his study concluded that insulin-dependent diabetes rarely occurred in patients below 10 years old in Nigeria.[14] The mean age at presentation reported from Tunisia was 7 years.[17]

As has been observed in other studies in developing countries,[11,19] late presentation was observed in the present study. This observation might be due to multiple factors, such as general lack of awareness among the local communities of the signs and symptoms of diabetes mellitus in children, missed diagnosis and the tendency to wait and see if the presenting features will resolve spontaneously with time.[9, 10] It was observed in the present study that 52.9% of the patients presented for the first time in diabetic ketoacidosis (DKA). This finding is in consonance with 55.3% reported from Saudi Arabia.[25] Several other previous studies from developing countries have reported DKA as a mode of initial presentation in DM but with varying percentages, ranging from 30 to 88%.[10,19,26] The association between DKA and late presentation was revealed in a Tanzanian study.[3] The high prevalence of DKA as a presenting feature might be due lack of awareness with regard to occurrence of diabetes mellitus in children, high rate of concomitant infections and poverty. This view was supported by three mothers whose children presented with DKA in the present study and who admitted they did not know diabetes mellitus can occur in children, indicating the need for public health education to raise awareness concerning childhood diabetes mellitus.

In the present study, some of the complications documented included DKA, hypoglycaemia , vaginal candidiasis, and delayed pubertal maturation with late attainment of menarche. One of the patients was at Tanner stage II at the age of 15 years and has not attained menarche. These findings are not surprising as they have been documented in previous studies. In this patient, pubertal development was accepted as delayed because it has been documented that the mean age for achieving Tanner stage II for breast development in girls is 11.15±1.10 years and pubic hair is 11.69±1.21 years. [27] The lack of attainment of menarche might be related to the low BMI as a critical weight has been documented as one of the determinants of age of attainment menarche.[27]

With regard to the challenges of management, the principal challenges included lack of laboratory facility for determination of glycosylated haemoglobin level for long-term monitoring, inability (due to financial constraints)to acquire a glucose meter and the test strips for self-monitoring of blood glucose at home, and limited supply of insulin with the attendant high cost. Regular supply of insulin at an affordable cost is necessary for delivery of good quality care to children and adolescents with diabetes mellitus. In this regard, the National Health Insurance Scheme Initiative in some African countries is a welcome development as it is capable of protecting the patients' parents from huge financial cost.[28] Children and adolescents with diabetes mellitus should be captured in this scheme to enhance the quality of care being provided to this category of patients.

One limitation of the study was the relatively

small sample size. It is suggested that a multicenter study to increase the sample size in necessary to add more value to the observed findings. Nonetheless, the study highlighted some important observations concerning DM in Benin City.

In conclusion, a high frequency of DKA as initial presenting clinical feature of DM, difficulty procuring insulin on a regular basis and poor self-monitoring of blood glucose at home were the important observations. A more intensive health education of the populace concerning diabetes mellitus and provision of insulin at a subsidized price are advocated.

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Evaluation of the Efficacy of Chemotherapy Based Control of Soil-transmitted Helminth Infections and Schistosomiasis among School-age Children in sub-Saharan Africa

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ABSTRACT

Introduction: School-age children apart from being high risk group for soil-transmitted helminth (STH) infections and schistosomiasis, also play an important epidemiological role in the transmission of these infections. The objective of this review was to assess the efficacy of chemotherapy based control of STH infections and schistosomiasis among school-age children in sub-Saharan Africa.

Method: A systematic review of studies on the use of chemotherapeutic interventions in the control of STH infections and schistosomiasis among school-age children in sub-Saharan Africa was conducted. Using the Medline Entrez-Pubmed Search, relevant publications were identified via combination of keys words such as soil-transmitted helminths, schistosomiasis, school-age children, chemotherapy, Africa.

Result: Praziquantel was the most common schistosomicidal drug evaluated, while mebendazole and albendazole were the common chemotherapeutic agents used in the treatment of STHs evaluated. Egg reduction rates (ERR) of >90 % and cure rates (CR) of >80 % were recorded in most cases of schistosomiasis in school-age children following praziquantel treatment. Majority of the studies recorded cure rates of >75 % for Ascaris lumbricoides and hookworm infections following albendazole treatment. However, the efficacy of albendazole was poor against Trichuris trichiura infection.

Conclusion: Regular anthelminthic treatment of school-age children will significantly reduce both morbidity and adverse consequences attributed to STH infections and schistosomiasis.

Key words: *School-age children, soil-transmitted helminth, schistosomiasis, chemotherapy, Africa*

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INTRODUCTION

Helminth infections particularly those caused by soil-transmitted helminths (hookworm, Ascaris lumbricoides, Trichuris trichiura) and schistosomes (Schistosoma haematobium, Schistosoma mansoni) constitute a major public health and developmental challenge in the tropical and sub-tropical regions of the world. These infections are associated with poverty and underdevelopment and are most prevalent in the poorest communities of the developing world including almost all countries of the sub-Saharan Africa.[1,2] Current estimates indicate that an

estimated 4.5 billion people are at risk of STH infections and the global estimate of number of cases of A. lumbricoides is 807 million, T. trichiura 604 million, Hookworm (N. americanus; A. duodenale) 576 million, Schistosomiasis (S. haematobium, S. mansoni and S. japonicum) 207 million.[3,4] School-age children apart from being high risk group for soil-transmitted helminth (STH) infections and schistosomiasis, also play an important epidemiological role in the transmission of these infections.[5] Soil-transmitted helminths and schistosomes are transmitted via eggs excreted in human faeces and urine in areas that lack adequate sanitation.[1] Due to the enormous number of eggs produced by one adult female worm, a single contaminated stool passed in the soil is sufficient to infect an entire village for years.[6] The burden of these helminth infections has been consistently underestimated in the past, but there is now a general consensus that STH infections and schistosomiasis represent an important public health problem especially for school children.[2,3,7,8] Helminthic infections therefore exert a negative effect on the health status, nutritional status and performance (cognitive task) of school-age children. On a global scale soil-transmitted helminth infections and schistosomiasis accounts for 40% of the global burden of disease of all tropical disease excluding malaria.[1,9] The global burden of disease caused by the three major soil-transmitted helminths is an estimated 22.1 million disability-adjusted life years (DALYs) lost for hookworm, 10.5 million for Ascaris lumbricoides, 6.4 million for Trichuris trichiura and 39.0 million for the three infections combined as compared with malaria at 35.7 million.[10-12] The DALYs lost for schistosomiasis is 4.5 million.[1,10] Although estimates of disability-adjusted life years (DALYs) lost due to these helminth infections portray a more accurate picture of the disease burden caused by the infections, the estimates of DALYs lost differ greatly from one source to another.[2,13-15] In the current Global Burden of Disease (GBD) assessments by the WHO for instance, it is not clear whether prevalence of infection per se was used to gauge the disease burden of helminths or the more appropriate duration of infection-associated pathology, which is often irreversible.[4] However, total DALYs lost annually may range from 4.7 million to 39 million.[15]

Among the principal reasons for the high estimates of DALYs lost to soil-transmitted helminth infections and schistosomiasis are the associations between hookworm and anaemia; ascaris and stunting of growth; trichuris and impaired school performance; and the causal relationship between schistosomiasis and anaemia, stunting, and cognitive impairment.[16-23] The burden of disease resulting from these infections has been calculated by classifying the spectrum of possible consequences of infection into defined disease states. The classification is based on two worm-burden thresholds; a lower threshold above which there are detrimental effects on physical fitness and school performance, which may be temporary or permanent; and a higher threshold above which there is a risk of clinically overt illness.[1,12] The morbidity caused by soil-transmitted helminth infections and schistosomiasis is most commonly associated with infections of heavy intensity. Because STHs are transmitted through poor sanitation and hygiene, and schistosomiasis by contact with infected freshwater streams and lakes, school-aged children are typically at increased risk resulting in high prevalence and intensity of infection due to high level of exposure.[1,2] Although light helminthic infections are often asymptomatic, the adverse health and nutritional impacts of severe worm infections on children are well documented: helminthic infections often lead to iron deficiency anaemia, protein energy malnutrition, stunting (a measure

of chronic undernutrition), wasting (a measure of acute undernutrition), listlessness and abdominal pain and may negatively affect class-attentiveness of schoolchildren.[3,13,14] Without chemotherapeutic treatment, the infections may also have more serious medical consequences in a minority of cases: roundworm infections sometimes lead to fatal intestinal obstruction, hookworm infection can cause severe anaemia, whipworm is associated with chronic dysentery, and urinary schistosomiasis can result to severe damage of the kidneys and/or bladder, while S. mansoni infection can cause lesions of the liver, portal vein, and spleen, leading to periportal fibrosis, portal hypertension, hepatosplenomegaly, splenomegaly, and ascites.[24]

The availability of safe and relatively inexpensive drugs for both schistosomiasis (praziquantel) and STHs (albendazole and mebendazole) has made control through chemotherapy a potentially affordable option even in resource-poor countries.[25] Consequently, the World Health Assembly (WHA) in May 2001 observed that where control measures including chemotherapeutic interventions have been implemented in a sustainable way, as demonstrated in several countries, mortality, morbidity and transmission of helminth infections have decreased dramatically. Therefore the WHA passed resolution 54.19 endorsing regular anthelminthic treatment of high-risk groups, particularly school-age children, as an effective public health measure to reduce the morbidity and mortality attributable to STH infections and schistosomiasis.[26] The WHA therefore recommended that Member States should sustain successful control activities in low-transmission areas in order to eliminate schistosomiasis and soil-transmitted helminth infections as a public health problem, and to give high priority to implementing or intensifying control of schistosomiasis and soil-transmitted helminth infections in areas of high transmission while monitoring drug quality and efficacy; with the goal of attaining a minimum target of regular administration of chemotherapy to at least 75% and up to 100% of all school-age children at risk of morbidity by 2010.[26] Implementation of this recommendation was facilitated by the establishment of the Partners for Parasite Control and the Schistosomiasis Control Initiative.[27-30]

The objective of this review was to evaluate the efficacy of chemotherapy based control of STH infections and schistosomiasis among school-age children in sub-Saharan Africa. This is with the view to highlighting the need for pragmatic public health policy on the control of soil transmitted helminth infections and schistosomiasis through regular school deworming programmes in the light of the epidemiological importance of and the effects of these infections on child well-being in sub-Saharan Africa.

Materials and Methods

A systematic review of published articles on the use of chemotherapeutic interventions in the control of STH infections and schistosomiasis in school-age children in sub-Saharan Africa was conducted within January and February 2011. Using the Medline Entrez-Pubmed Search, relevant publications were identified via combination of keys words such as soil-transmitted helminths, schistosomiasis, school-age children, chemotherapy, Africa. The search yielded 108 published articles which focused on the outcome of chemotherapeutic intervention against soil-transmitted helminth infections and/or schistosomiasis in school-age children most relevant to the objective of the review.

Particular attention was paid to published articles providing information on the pre-chemotherapeutic treatment and post-chemotherapeutic treatment prevalence of soil-transmitted helminth infections and schistosomiasis in school age children. The

various published articles were systematically reviewed with respect to the location, population, the period, type of study and outcome of study to enhance comparison between studies.

Results

A total of thirty-two (32) studies fulfilled the criteria for this review and were categorized into two groups. The first group was made up of studies which investigated the efficacy of mass chemotherapy using anthelminthic drugs against soil-transmitted helminth infections among school-age children in sub-Saharan African (Table 1). The second group was made up of studies which investigated the efficacy of schistosomicidal drugs for mass chemotherapy against schistosomiasis among school-age children in sub-Saharan Africa (Table 2).

Efficacy of mass chemotherapeutic control using anthelminthic drugs against soil-transmitted helminth infections in school-age children

There were thirteen (13) identified studies in this group which investigated the efficacy of mass chemotherapeutic control against soil-transmitted helminth infections using the following drugs: levamisole, mebendazole, albendazole and pyrantel-oxantel. There were significant reductions in the prevalence of soil-transmitted helminth infections among school children following the chemotherapeutic intervention (Table 1). Although cure rates were not always high, all the drugs however produced significant increase in egg reduction rates. Albendazole was very effective against *Ascaris lumbricoides* and hookworm infections with majority of the studies recording cure rates >75%, but the efficacy of the drug was poor against *Trichuris trichiura* with many of the studies recording cure rates <27% (Table 1). Other drugs used (mebendazole, levamisole, prantel-oxantel) also recorded poor efficacy against *Trichuris trichiura*. Higher cure rates and higher egg reduction rates were recorded when mebendazole and levamisole were combined than when each drug was used separately.[31]

Efficacy of mass chemotherapeutic control using schistosomicidal drugs *against schistosome infections in school-age children*

There were nineteen (19) identified studies in this group which investigated the efficacy of various schistosomicidal drugs used for mass chemotherapy among school children. The drugs assessed were praziquantel, artesunate, oxaminiquine, amodiaquine, metrifonate and sulphadoxinepyrimethamine (Table 2). Generally there were significant reductions in the prevalence of schistosomiasis among school children following the chemotherapeutic interventions as well as significant increase in cure rates and egg reduction rates. Most of the studies used praziquantel and cure rates >80% and egg reduction rates >90% were recorded in most cases, however low cure rates of 33 % [32] and 41 % [33] were also observed. Other schistosomicidal drugs such as artesunate and oxaminiquine produced cure rates >70% in Kenya [34] and Nigeria [35] respectively. Drug combinations such as praziquantel and artesunate, sulphadoxinepyrimethamine and artesunate, amodiaquine and artesunate produced higher cure rates than when one schistosomicidal drug was administered.[36,37] Cure rates for *S. haematobium* ranged from 33.0% in Cote d'Ivoire to 94.5% in Senegal,[32,37] while cure rates for *S. mansoni* ranged from 57.8% in Uganda to 100% in South Africa[38,39] (Table 2).

Table 1: Summary of studies on the efficacy of anthelminthic drugs against soil-transmitted helminth infections in school children in sub-Saharan Africa

Country	Type of Study	Drug used	Hookworm			A. lumbricoides			T. trichiura			Post-treatment assessment	Reference
			P/P (%)	CR (%)	ERR (%)	P/P (%)	CR (%)	ERR (%)	P/P (%)	CR (%)	ERR (%)		
Ethiopia	CI	ALB	NA	84.2	95.0	NA	83.9	96.3	NA	NA	NA	NA	Adugna et al., 2007
		MEB	NA	83.5	94.2	NA	90.6	96.7	NA	NA	NA	NA	
Ethiopia	RCT	MEB	NA	NA	NA	NA	NA	NA	NA	89.8	99.1	NA	Legesse et al., 2004
		ALB	NA	NA	NA	NA	NA	NA	NA	17.1	69.8	NA	
South Africa	CI	ALB	3.1/0.0	100	NA	29.5/4.7	84.1	NA	51.9/38.0	26.8	NA	16 weeks	Jinabhai et al., 2001
South Africa	CI	ALB	59.4/0.0	100	NA	58.9/17.4	68.9	NA	83.6/61.5	26.4	NA	12 months	Taylor et al., 2001
South Africa	CI	ALB	NA	NA	NA	NA	NA	NA	NA	23.0	96.8	NA	Adams et al., 2004
South Africa	CI	ALB	82.9/17.6	78.8	93.2	22.0/0.8	96.4	97.7	59.8/52.2	12.7	24.8	3 weeks	Saathoff et al.2004
Tanzania	RCT	MEB	NA	NA	68.0	NA	>96.0	>95.0	NA	23.3	>80.0	4 weeks	Albonico et al., 2002
		PY-OX	NA	NA	67.0	NA	>96.0	>95.0	NA	35.1	>80.0	4 weeks	
Tanzania	CI	ALB	61.0/11.0	82.0	97.6	NA	NA	NA	NA	NA	NA	6 weeks	Guyatt et al., 2001
Tanzania	CI	ALB	45.6/11.9	73.9	NA	0.9/0.7	22.2	NA	4.8/0.7	85.4	NA	8 months	Massa et al.,2009
Tanzania	RCT	MEB+LEV	94.0/71.8	26.1	88.7	62.0/1.4	98.5	99.1	93.1/74.5	22.9	85.0	3 weeks	Albonico et al., 2003
		LEV	96.2/87.6	11.9	61.3	59.5/5.7	91.2	98.5	93.8/90.0	9.6	41.5	3 weeks	
		MEB	94.9/91.5	7.6	52.1	59.7/3.0	96.5	99.0	90.7/75.0	22.9	81.0	3 weeks	
Uganda	CI	ALB	50.9/10.7	79.0	92.9	2.8/0.6	78.6	NA	2.2/1.6	27.3	NA	2 years	Kabateriene et al,2007
Kenya	CI	MEB	NA	50.0	66.3	NA	79.6	NA	60.6	NA	NA	6 months	Muchiri et al., 2001
		ALB	NA	92.4	96.7	NA	83.5	NA	67.8	NA	NA	6months	
Kenya	CI	ALB	16.7/ 0.2	98.8	NA	1.6/0.0	100	NA	0.8/0.6	25.0	NA	8 weeks	Kihara et al., 2007

CI=Chemotherapeutic intervention; RCT=Randomized controlled trial; MEB=Mebendazole; ALB=Albendazole; LEV=Levamisole; PY-OX=Pyrantel oxantel; P/P= Pre/post treatment prevalence; CR= Cure rate; ERR= Egg reduction rate; NA= not accessible/not determined

Table 2: Summary of studies on the efficacy of schistosomicidal drugs against schistosomiasis in school children in sub-Saharan Africa

Country Reference	Type of Study	Species	Drug used	Pre/post Treatment prevalence (%)	Cure rate (%)	Egg reduction rate (%)	Egg assessment time	Post-treatment
Nigeria	CI	S. haematobium	PZQ	NA	72.7	NA	8 weeks	Inyang-Etoh et al., 2009
		S. haematobium	ART	NA	70.5	NA	8 weeks	
		S. haematobium	PZQ+ART	NA	88.6	NA	8 weeks	
Nigeria	CI	S. haematobium	ART	NA	70.1	NA	4 weeks	Inyang-Etoh et al., 2004
Cote D'Ivoire	CI	S. haematobium (Taabo)	PZQ	94.0/63.0	33.0	87.7	6 months	N'Goran et al., 2001
		S. haematobium (Bodo)	PZQ	90.0/14.0	84.4	91.5	6 months	
		S. haematobium (Batera)	PZQ	88.0/49.0	43.3	62.4	6 months	
		S. haematobium (Assinze)	PZQ	67.0/10.0	85.1	77.8	6 months	
Senegal	RCT	S. haematobium	SP+ART	NA	92.6	NA	4 weeks	Boulanger et al., 2007
		S. haematobium	ADQ+ART	NA	68.7	NA	4 weeks	
Ethiopia	CI	S. mansoni	PZQ	NA	94.0	97.0	NA	Degu et al., 2002
Sudan	CI	S. haematobium	PZQ	NA	73.2	NA	3 months	Kardaman et al., 1985
		S. mansoni	PZQ	NA	64.7	NA	3 months	
Burkina Faso	CI	S. haematobium	PZQ	59.6/7.7	87.0	92.8	2 years	Touré et al., 2008
South Africa	CI	S. haematobium	PZQ	68.0/13.2	57.8	97.9	12 months	Saathoff et al., 2004
South Africa	CI	S. haematobium	PZQ	22.3/3.3	85.2	NA	16 weeks	Jinabhai et al., 2001
	CI	S. mansoni	PZQ	0.8/0.0	100	NA	16 weeks	
	RCT	S. haematobium	PZQ	43.4/8.3	80.9	NA	12 months	Taylor et al., 2001
South Africa	CI	S. haematobium	PZQ	NA	97.0	NA	NA	Schutte et al., 1983
		S. mansoni	PZQ	NA	97.0	NA	NA	
Zimbabwe	CI	S. haematobium	PZQ	NA	88.5	98.2	6 weeks	Midzi et al., 2008
Cameroon	CI	S. haematobium	PZQ	NA	41.0	90.4	3 weeks	Tchuente et al., 2004
Tanzania	CS	S. haematobium	PZQ	59.0/4.0	94.0	99.0	6 weeks	Guyatt et al., 2001
Uganda	CI	S. mansoni	PZQ	42.4/17.9	80.7	83.0	2 years	Kabateriene et al., 2004
Kenya	CI	S. mansoni	PZQ	47.4/8.6	81.9	NA	8 weeks	Kihara et al., 2007
Kenya	PC	S. haematobium	PZQ	67.0/21.0	94.5	NA	12 months	Satayathum et al., 2006
Kenya	CI/CS	S. mansoni (Kangudo)	PZQ	NA	77.6-87.2	NA	5 weeks	Thiong'o et al., 2002
		S. mansoni (Kibwezi)	PZQ	NA	67.1-81.1	NA	5 weeks	
		S. mansoni (Kibwezi)	OXA	NA	56.7-87.2	NA	5 weeks	
		S. mansoni (Kangundo)	OXA	NA	71.6-79.7	NA	5 weeks	
Kenya	CI	S. haematobium	PZQ	69.0/19.0	NA	NA	NA	King et al., 1988
		S. haematobium	MEF	69.0/19.0	NA	NA	NA	

CI=Chemotherapeutic intervention; PC=Prospective cohort; RCT=Randomized controlled trial; CS=Cross sectional; PZQ=Praziquantel; ART=Artesunate; OXA=Oxamniquine; SP=sulphadoxinepyremethamine; ADQ=Amodiaquine; MEF= metrifonate; NA= not accessible/not determined.

Discussion

The high prevalence and high infection intensity prior to chemotherapeutic intervention recorded in the studies reviewed clearly indicates that in the absence of mass chemotherapy, the prevalence of STH infections and schistosomiasis among school-age children in sub-Saharan Africa remains high. This observation necessitates regular treatment of school-age children in sub-Saharan Africa. Although STH infections and schistosomiasis rarely cause fatality, chronic infection with high worm burden can lead to serious health consequences including malnutrition, physical and intellectual growth retardation, and cognitive and educational deficits in school-age children.[13,14] The need for sub-Saharan African countries to embark on a pragmatic approach to mass chemotherapy against STH infections and schistosomiasis cannot be overemphasized. The World Health Assembly (WHA) resolution 54.19 in 2001, endorsed regular anthelminthic treatment of high risk groups particularly school children as an effective public health strategy to reduce the morbidity and adverse consequences attributable to STH infections and schistosomiasis.[26] This resolution resulted in the establishment of several major control efforts. Great progress had been made in a number of sub-Saharan African countries in the control of STH infections and schistosomiasis via mass chemotherapy among school children.[39-45] In many parts of sub-Saharan Africa there is currently a growing awareness of the public health significance of these helminth infections which previously were grossly neglected, and concerted advocacy for their control has resulted in increased political will and financial means to combat them .[46] It is however unclear whether existing financial resources and global political commitments are sufficient to reach the World Health Assembly's ambitious goals in the sub-region and other developing parts of the world.[47] The obstacles to achieving this are substantial and depend in large part on whether countries have reliable and sustainable systems for delivering deworming drugs and addressing other challenges associated with the large scale use of anthelminthic drugs. Four anthelminthics (albendazole, mebendazole, levamisole, and pyrantel pamoate) are currently on the WHO model list of essential medicines for the treatment and control of STHs,[2,48] while chemotherapy with praziquantel is the mainstay for the treatment and control of schistosomiasis. [48,49] Each of these drugs has an excellent safety record; adverse reactions are minimal and transient, and serious adverse experiences are extremely infrequent.[48] The interventional studies reviewed indicated that a single oral dose of 40 mg of praziquantel per kg of body weight was safe, showed no or only a few but transient side effects, but resulted in high parasitological cure and egg reduction rates against both S. mansoni and S. haematobium.[50,51,54-57] Interestingly, a randomized comparison of low-dose (20mg/kg) with standard dose (40 mg/kg) praziquantel therapy suggests an equivalent effect of these two regimens in reducing structural urinary tract morbidity over a nine-month period and concluded that in certain settings, a 20 mg/kg dose of praziquantel may be sufficient in providing practical control of renal and bladder morbidity due to S. haematobium infection.[58] Further studies are however required to validate this finding in other areas of sub-Saharan Africa. In view of the operational and therapeutic properties as well as the gradually decreasing costs of praziquantel, millions of people have been treated with praziquantel over the past 20 years and it is predicted that many more millions of individuals suffering from schistosomiasis especially school children will be treated with this drug several years to come.[49,59,60]

Most of the interventional studies on STHs reviewed in this report used only the

benzimidazoles (albendazole and mebendazole) because of the added advantage that they are given as a single-dose tablet and children do not need to be weighed.[31] Furthermore, the findings of this review indicated that the benzimidazoles exhibits considerable cure rates and egg reduction rates particularly against A. lumbricoides and hookworms [39,43,44,50,51] and aside from reducing the load of worms, benzimidazole treatment has been shown to improve the nutritional status and cognitive development of children infected with A. lumbricoides, T. trichiura, and hookworms and reduces hookworm associated anaemia in children.[52,53] It is important to state that these anthelminthic drugs have witnessed large scale administration in sub-Saharan Africa and other parts of the world where STH infections and schistosomiasis constitute a public health concern, which is in line with the resolution of the WHA.[26] However, the fact that STH infections and schistosomiasis do not confer protective immunity even after repeated infections and that people treated with the drugs especially children soon become re-infected implies a continual need for drug treatment in control programs. Therefore there is a considerable concern that repeated use of these few drugs over a long period of time might result in the development and spread of drug resistant helminths, which is already a significant problem in veterinary medicine.[46] In fact, some of the studies reviewed in this report which investigated the efficacy of albendazole, mebendazole and levamisole showed a parasitological cure rates lower that 30% particularly with T. trichiura infection.[31,38,39,43,51,54,61,62] Although there is limited evidence from the studies reviewed of a possible emergence of drug resistance, this may not be completely overruled. A number of previous studies have indicated that there are no drugs available that are highly effective against T. trichiura infection as single dose treatments, but other studies show that two or three repeated doses of albendazole on consecutive days are more effective than a single dose.[39,54,63] To repeat the dose on 2 or 3 days would however increase cost, and might reduce compliance and complicate management.[40] As a result of this, the need for alternative STH anthelminthics cannot be overemphasized. Pyrantel-oxantel (10 mg/kg) have been reported to offer a valuable alternative to mebendazole as a single-dose treatment for the control of intestinal nematode infections in children in endemic areas of sub-Saharan Africa, due to its comparable efficacy, its low cost and its suitability for use in young children.[64] Although praziquantel was efficacious against both S. mansoni and S. haematobium infections with little or no evidence of possible resistance as indicated in this report;[45,50,51,57] other antischistosomal drugs investigated such as oxamniquine and antimalarial drugs eg. artesunate, amodiaquine and sulphadoxine-pyremethamine were also reasonably effective.[34-36,65] Oxamniquine is the only main alternative antischistosomal drug, but its use is declining [59] and moreover in contrast to praziquantel, which displays activity against all human schistosome species, the activity of oxamniquine is confined to S. mansoni.[66] The antimalarial drugs particularly the derivatives of artemisinin (e.g., artemether and artesunate), have been shown to be schistosomicidal and have exhibited high parasitological cure rates. Consequently discussions are on-going on how this evidence base can be translated into sound public health actions and the possible implications especially in sub-Saharan Africa where the malaria scourge is most severe.[36,65,67,68] Because of the possible emergence of drug resistance to the anthelminthic compounds, STH infections and schistosomiasis remains a matter of serious public health concern. Against his background, the efficacy of combined anthelminthic

treatments with differing modes of action was assessed in some of the studies reviewed in this report.[31,36,65] The goal of this combination therapy is to identify a combination that would be efficacious and at the same time could delay the occurrence of anthelminthic drug resistance to each class of drug.[69] The evaluation of the efficacy of the combined administration of mebendazole 500 mg and levamisole 40 or 80 mg revealed higher efficacy than either drug alone against hookworm infections.[31] Similarly, in an evaluation of the efficacy of combined praziquantel and artesunate in the treatment of urinary schistosomiasis in Nigeria, it was confirmed that the treatment of urinary schistosomiasis with the combination of praziquantel and artesunate is safe and more effective than treatment with either drug alone.[36] In conclusion, it is important to state that there is an urgent need to rapidly develop safe and effective new drugs to complement the existing treatment options for STH infections and schistosomiasis. In recent times efforts have been made to evaluate new anthelminthic drugs,[3] these include nitazoxanide, a nitromidazole compound and tribendimidine both of which were explored as a broad-spectrum antiparasitic agents with anthelminthic properties against many soil- transmitted helminths.[70,71] Although these efforts are steps in the right direction, there is however a need for the development of new generation of tools for helminth infections control, appropriate environmental control measures and health education.[72-75] One of such new generation tools which holds the best prospect for the sustainable control of STH infections and schistosomiasis is the development of vaccines.[4,76,77] It is proposed that the availability of appropriate anthelminthic vaccines to be used alongside drugs in an integrated interventional programme linking vaccination with chemotherapy might result in a greater success in the control of these helminth infections.[73,77,78] However there is little evidence that anthelminthic vaccines would be available in the nearest future. Finally, existing evidence indicates that mass school-based deworming is extraordinarily cheap and cost-effective.[79] There is need for a pragmatic public health policy on the control of soil transmitted helminth infections and schistosomiasis through regular school deworming programmes in the light of the epidemiological importance of and the effects of these infections on child well-being in sub-Saharan Africa. Therefore, the well being of school-age children must be made a matter of utmost priority by the governments of countries in the sub-Saharan region and pragmatic efforts must be geared towards the strengthening of school health services as an important component of disease control programmes.

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Case Reports

Drug - Induced Diabetes Mellitus in Oghara, Delta State, Nigeria

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Abstract

Diabetes mellitus can result from drugs or chemicals among other causes. The drugs include anti-hypertensives and corticosteroids. And considering that diuretics and diuretic-containing anti-hypertensive formulations works better in blacks, these drugs are prescribed extensively; therefore, drug-induced diabetes may be frequent in our environment. Three patients with drug-induced diabetes are reported in this case series . All were on high doses of thiazide diuretic drugs and beta-blockers. Strategies to reduce the risk of drug-induced diabetes mellitus are suggested.

Keywords: *Diabetes Mellitus, Oghara, Drugs, Hypertension.*

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Locational Background

Oghara, is the suburban town in which the Teaching Hospital of the Delta State University is situated. It is about 2 hours drive to the state capital, Asaba, and about 30minutes drive to the oil-rich commercial "capital" of the state, Warri. The hospital in addition to teaching and research, provides medical services to the whole of Delta State and other surrounding states of Edo, Anambra, Bayelsa and Rivers. It has various departments including that of Family Medicine, which is the first point of call for over 80% of patients(classified or unclassified) attending the hospital for the first time. Information from the Medical Records department indicates that a minimum of 80 patients are seen per day in the Family Medicine department.

Introduction

Drug-induced diabetes occurs due to a variety of drugs and mechanisms1. The incidence of diabetes in diuretic-treated hypertensives has been reported to be around 1%, even when large doses are used[2]. The prevalence of hypertension in Nigeria is put at between 10 – 12%(rural) and 12 – 14%(urban)[3]; and the drugs commonly prescribed for hypertension are the thiazide diuretics and beta-blockers because of their efficacy in the blacks and their relative cheap cost[3] .Factors that influence the choice of drug for a patient include affordability, presence or absence of other co-morbid conditions, and availability of the drug.

One of the challenges in medicine is in the area of therapeutics, wherein the Physician attempts to match the needs of the individual patient with a specific agent from the pharmacopoeia at a dose that might be best suited to treat the individual

patient's problem [4] This report present three cases of drug-induced diabetes mellitus seen in our practice.

Case Reports

Case 1

A 49 year old female civil servant was diagnosed hypertensive. There was no family history of diabetes or hypertension. Her body mass index (BMI) was 26.4Kg/m^2 . She was started on one tablet of 'moduretic' (amiloride 5mg + hydrochlorothiazide 50mg), one tablet of 'minizide'(prazosin 0.5mg + polythiazide 0.25mg) and propanolol tablet 80mg (all to be taken once daily). Symptoms of diabetes mellitus developed 3 years later, confirmed by laboratory tests. Her anti-hypertensive drugs were changed to nifedipine and captopril. Diabetes was controlled by dietary modification. Her blood glucose remained within the normal range 1year after withdrawing thiazides and beta-blockers.

Case 2

A 50 year old full time house wife was diagnosed hypertensive, with no family history of diabetes or hypertension. Her body mass index was 25.6Kg/m^2. She was placed on bendrofluazide, 5mg and minizide (prazocin 0.5mg + polythiazide 0.25mg) and atenolol 100mg daily. The patient developed diabetes mellitus developed [4] years later . Her drugs were changed to lisinopril, and advised on dietary modification. Her blood glucose and blood pressure remained controlled from then.

Case 3

A 59 year old male hypertensive had good blood pressure control on 'moduretic' (amiloride 5mg + hydrochlorothiazide 50mg), bendrofluazide and propranolol 80mg daily. He had no family history of diabetes or hypertension. His body mass index was 27.4Kg/m^2. Diabetes developed 3 years later. His drugs were replaced by nifedipine and captopril, and he was advised on dietary modification. Six months later his blood glucose control was not satisfactory, and he required insulin. When last seen his glycaemic and blood pressure control were good and, he was not on any hypoglycaemic drugs.

Discussion

Hypertension itself may be associated with impaired glucose tolerance, insulin resistance, and obesity.[5] In addition, various classes of anti-hypertensive drugs may increase the risk of diabetes. In a meta-analysis study[6] the following drugs were implicated in causing incident diabetes : angiotensin receptor blockers, angiotensin-converting enzyme inhibitors, calcium channel blockers, beta-blockers and diuretics. All the three cases in our series were on thiazides and beta-blockers. Diuretics are an essential component of a two or three drug-regimen containing other classes of anti-hypertensive drugs, partly because the cost of drugs is an important determinant of compliance with drug treatment[7] . The use of low- dose diuretics carries only slight risk of inducing diabetes. The risk from beta-blockers is also quite small, but there is some evidence that thiazides combined with beta-blockers may be more likely to cause diabetes than either drug alone.[8] All the cases reported were prescribed thiazides and beta-blockers. The combination is best avoided in patients with a family history of type 2 diabetes .

Thiazide diuretic-induced deterioration in glucose control appears to be less with potassium supplementation.[8] The diuretic effect on glucose tolerance is attenuated when angiotensin-converting enzyme(ACE) inhibitors are given with thiazide diuretics [9].

In conclusion, proper drug selection, use of lower doses of thiazides where necessary, potassium

supplementation, and the appropriate use of angiotensin –converting enzyme inhibitors should reduce cases of drug-induced diabetes. Close monitoring of glycaemic status of hypertensive patients receiving treatment regardless of historical risk factors of diabetes mellitus should also be undertaken.

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Unilateral Renal Agenesis: A Case Report

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Abstract

Unilateral renal agenesis is the congenital absence of one kidney. The incidence ranges from 1:500 to 1:3200 with a slight male preponderence. The diagnosis is usually made as an incidental finding. Complications such as hypertention, proteinuria and renal impairemnt are commoner in this condition than in those with both kidneys, though majority will lead a normal life.

We present a four year old girl who presented with anarsaca and proteinuria and was found to have a solitary left kidney. She reponded to prednisolone but is currently on captopril and levamisol and has been asymptomatic for five years

Keywords:

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Introduction

Unilateral renal agenesis is development of a sngle kiney. It can occur in isolation or combined with other abnormalities.[1] the condition has been known since the time of Aristotle.[2,3] About a quarter of all renal agenesis is associated with genital abnormalities, making it possible to determine the point in time when the anomaly appeared in the emryonic life.[4] It may occur with mullerian duct abnormalities,[5] or as an association with other systemic congenital defects.[6] Its association with mullerian agenesis could be an autosomal dominantly inherited disorder[7]. The incidence in adult life ranges from 1:500 and 1:320. [8].

We present here a four year old girl who presented with unilateral renal agenesis and review of the literature on the subject.

Case Presentation

A four year old girl presented in our clinic with a three week history of periorbital swelling, initially worse in the morning but later became persistent throughout the day. There was associated abdominal and leg swellings with passage of cola-coloured urine but with no change in the frequency or volume of urine. There was no history of rashes or sore throat ante-dating the onset of symptoms. She had severe neonatal jaundice at age four days requiring an exchange blood transfusion, and has been apparently well before the onset of symptoms, apart from occasional malaria. The mother is not a diabetic and neither smokes or drinks, and had no illness during the pregnancy of the child.

Clinical examination showed her to have normal vital signs with a blood pressure of 80/50mmHg. She had anarsaca with fine basal crepitation in both lungs. There was no tenderness or palpable

organs in the abdomen.

A diagnosis of nephrotic syndrome was made witha differential dianosis of acute glomerulonephritis. Broncho-puemonia waas also diagnosed. The investigations ordered for include, full blood count, ESR, serum uera, electrolytes and creatinine, serum protein, ASO titer, urinalysis, urine microscopy culture and sensitivity, 24hour urinary protein and plain chest X-ray. The laboratory results are shown in Tables 1 and 2. The haemoglobin was 9.6g/dl, packed cell volume, 28%, (Table1). The electrolyte profile showed sodium of 129mmol/l and chloride 85mmol/l. The serum albumin was 2.5g/dl and the ASO titre was 125Todds unit (normal range 120-160Todss units). Urinalysis showed 1+ of protein on dipstick examination and the 24hour urinary protein was 110mg, with a urine volume of 1.2litres in 24hours. Plain chest X-ray showed bilateral patchy opacities.

She was started on prednisolone, paracetamol, atermasimin, amodiaquine and frusemide.

The edema regressed but she represented one month later with similar symptoms. An abdominal ultrasonography revealed a single kidney on the left with absent right kidney. (Fig 1). She was then given another course of prednisolone for four weeks and tapered down for another two weeks. She is currently on captopril and levamisol and has remained asymptomatic for four years now.

Discussion.

Unilateral renal agenesis occurs more in males with a male:female ratio of 1.2-2.3: [1].This has been attributed to the fact that the Wolfian duct

Table 1: *Haematological indices of case (values in bracket are the normal range)*

Haematologic Index	Laboratory Value
Haemoglobin	9.6g/dl (12-15g/dl)
Packed Cell Volume	28% (36-46%)
Total White Cell Count	6800 (4000-10000)
Neutrophils	46% (40-75%)
Lymphocytes	49% (20-40%)
Monocytes	2% (0-10%)
Esinophils	3% (0-6%)
Basophils	0% (0-1%)

Table 2: *Clinical Chemistry Results of Case (values in bracket are the normal range)*

Substance	Laboratory Value
Serum Urea	20mg/dl (10-55mg/dl)
Serum Creatinine	0.7mg/dl (0.6-1.2mg/dl)
Serum Sodium	129mmol/l (133-146mmol/l)
Serum Potasium	4.0mmol/l (3.5-5.5mmol/l)
Serum Chloride	85mmol/l (97-106mmol/l)
Serum Bicarbonate	26mmol/l (24-32mmol/l)
Serum Protein (Total)	5.4g/dl (6-8g/dl)
Serum Albumin	2.5g/dl (3.2-5.5g/dl)
Serum Globulins	2.9g/dl (2-3g/dl)
Aso Titer:	125Todds units (120-160T U)
24hour Urine Protein	110mg (less than 1g)
24hour Urine Volume	1.2litres (normal)

differentiates earlier than the Mullerian duct and at about the time of the ureteric bud formation. 2Unilateral renal agenesis occurs more on the left3. This is unlike in our patient who is a girl and with right renal agenesis.. The laboratory data showed she had anaemia, hyponatremia and hypochloraemia, all of which are dilutional. There is also hypoalbuminaemia probably due to the proteinuria, which is however not in the nephrotic range.

Renal agenesis is a developmental abnormality occuring at 4-6 weeks of embryonic life. Normal kidney development requires the following three events take place: first the ureteric buds must arise bilaterally from the mesonephric (wolffian) ducts, secondly the bilateral metanephric blastema must form from the mesoderm in the caudal region of the nephrogenic cord and thirdly, ureteric buds must grow, contact and invaginate the metanephric blastema, thereby inducing differentiation of theblastema into two mature kidneys.[9]. Failure of the metanephros to develop results in complete absence of the kidney. This can either be due to nonexistence of the ureteric bud or failure of the unilateral bud to develop from the metanephric duct.[9] Most cases of unilateral renal agenesis results from lack of induction of the metanephric blastema by the ureteric bud, though some may be due to in utero regression of a multicystic dysplastic kidney.10 Maternal febrile illness, medication use especially those that affect the renin-angiotensin system, cocaine,smoking and alcohol comsunption have been implicated in this condition.[2,11] So also maternal diabetes12Others have implicated diabetes.[13]

Diagnosis in majority of cases is made as an incidental finding.[14] Our patient however presented with generalized edema and proteiunuria, making us make a diagnosis of nephrotic syndrome. Occassionally, what is diagnosed assolitary kidney may be a rudimentry dysplastic nonfunctional kidney.[15]

Renal agenesis survellance in the USA, has shown an increase in its incidence[16]

Unlike bilateral renal agenesis which is not compartible with life, or infact babies born as stillbirths, patients with single kidney often lead a normal life, with compensatory hypertrophy of the single kidney by upto 10%.[17] This begins prenatally[18.] There is however a controversy about people with this condition participating in vigorous/contact sports. Those against their involvement are of the opinion that damage to that kidney im those events will be catastrphic.[19] however those in favour argue that there other single organs in the body which have not caused exclusion or limitation in sports participation.[20] Infact research has shown that head injuries are more likely to occur in such sports as cycling than kiney injuries.[21]

Prognosis of of this condition has shown that the relative risk of gestational hypertention, pre-eclampsia or gestational proteinuria is about 2-3 times higer. Argueso et al in a study of 157adults with this condition diagnosed at mean age of 37yrs, proteinuria (>50mg/day), was found in 19% of 37patients tested, hypertension in 47%, of 47 tested, and renal impairement in 13% of 32patients with six deaths on follow up.[22]. Gonzalez *et al* in a retrospective study of 33 adults with this condition found that those with hypertension, proteinuria and renal insufficiency had higher body mass index than those lacking this sign at diagnosis. They also found that progressive renal failure was less common in those treated with drugs that block angiotensiin II.[23]. Our patient is currently on captopril and levamisol to slow proteinura

Conclusion

Unilateral renal agenesis is an uncommon condition and if documented, follow up of such patients is necessary especially if evidence of renal pathology is present. Although the

proteinuria in our patient is not in the nephrotic range, persistent proteinuria can lead to chronic renal impairement[23] An excretory urography and magnetic resonance imaging are necessary in our patient to rule out such conditions as hypoplastic or rudimentary kidney which may cause hypertension as shown in a study.[24]

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Review Articles

Entrapment Neuropathies

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Abstract

Background: Entrapment neuropathies are common medical disorders frequently encountered in all fields of medicine. They are focal peripheral nerve injuries due to mechanical compression of a nerve through a fibro-osseous tunnel. Magnetic resonance imaging techniques provide useful information in dealing with these conditions.

Objectives: This was a review of current information on entrapment neuropathies.

Methodology: A literature search of current information on entrapment neuropathies was done. Articles on print and electronic publications were read and current information extracted.

Results: The causes were unknown in about 50% of cases. Nerve injuries were neuropraxia, axonotmesis or neurotmesis. Entrapment neuropathies usually existed close to joints where reduction in space and nerve pressure compromised neural blood supply resulting in anoxia. This made repetitive joint movement a major risk factor. Carpal tunnel syndrome (CTS) was commoner in women while cubital tunnel syndrome was commoner in men. The median nerve could be compressed in the carpal tunnel and lacertus fibrosus, ulnar nerve in the cubital tunnel, and the common peroneal at the fibular neck. Fibrous bands and arches compress the posterior interosseous nerve, deep motor branch of the radial nerve at the arcade of Frohse. Myofascial bands compress the sciatic nerve between the adductor magnus and biceps femoris. Nerve entrapment might follow soft tissue swellings in rheumatoid arthritis, or ganglion. Pregnancy, hypothyroidism, amyloidosis, diabetes, rheumatoid disease, myeloma and trauma to nerve increase risk of carpal tunnel syndrome. The idiopathic CTS were associated with females 40 -60 years old, hypercholesterolemia, stroke, and anticoagulation therapy. Pain, numbness, tingling sensation and loss of function were common complaints.

Electrodiagnostic testing involving electromyography, nerve conduction studies, computed tomography and magnetic resonance imaging were used for diagnosis. Standard magnetic resonance pulse sequence helped in visualizing various anatomical features of peripheral nerves and the nearby tissues. Management included both medical and surgical treatments. Education on vocation especially sports offered non-drug therapy. Use of non-steroidal anti-inflammatory drugs and steroidal drugs gave variable results. Local injections with lidocaine were also successful. Refractory cases had surgical decompression.

Conclusion: Entrapment neuropathies were common conditions prevented by early identification and treatment.

Keywords: *Nerve entrapment, neuropathies*

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Introduction

Entrapment neuropathies are a common medical disorders encountered in all fields of medicine irrespective of age, sex or nationality. They may be acute or chronic. They create a state of misery for even the obstetric client. The majority of the patients present to the physician with diverse symptoms.

Entrapment neuropathy is a term that applies to focal peripheral nerve injuries due to mechanical compression of a nerve through a fibro-osseous tunnel. Fibrous bands have also been observed to constrict a peripheral nerve in a closed space leading to entrapment of such a nerve[1,2]. Entrapment neuropathy runs a gradual continuing chronic course with a typical pathological process [3]. There are many risk and predisposing factors which have been identified although in some the cause is unknown. Some entrapment neuropathies are commoner in some gender than others. For example, carpal tunnel syndrome is commoner in females 4while cubital tunnel syndrome is commoner in males 5. Entrapment neuropathy of the upper extremities is commoner than the lower extremities. The clinical features are often very classical and follow the distribution of the affected nerve. In some, the diagnosis of such entrapment has been very challenging to some inexperienced doctors leading to misdiagnosis, mismanagement, waste of time and resources before referral. Investigations include electrodiagnostic testing and imaging studies. Treatment is usually conservative and surgical decompression in refractory cases.

The knowledge of the anatomy of the peripheral nerves is paramount in making a correct diagnosis. Studies identifying the various anatomical sites of chronic compression have been carried out to aid the surgeons[6].

Types of nerve injuries:

Nerve injuries are classified into three main types namely, neurotmesis, axonotmesis and neuropraxia. In neuropraxia, conduction block occurs only at the site of injury with normal conduction at the other sites of the nerve. The integrity of the nerve is still maintained with no injury to the axon. Areas of segmental demyelination have been found histologically. Compression is the usual cause of this type of injury and patients recover full function in days to weeks. Axonotmesis involves disruption of the axons with Wallerian degeneration occurring distally to the injury site. The endoneurium and perineurium are unaffected and therefore promote nerve regeneration. Schwann cells covering the injured axons are also not affected. In neurotmesis there is total transection of the peripheral nerves. This type of injury is seen in open traumatic wounds. Recovery here has a mixed picture[7]. Integrity of the axon is maintained till late but ultimately the number and function of the axons reduce. Chronic nerve compression usually leads to Schwann cell apoptosis and changes in myelination. There is multiplication of Schwann cells of the affected nerve segments culminating in striking increase in the number of Schwann cells. These signify that chronic nerve compression generate a sustained cycle of Schwann cell production and demyelination with subsequent remyelination which may be a consequence of an immediate reaction to mechanical stimuli [8].

Histologic changes do occur at sites of compression of a nerve. Only few cases have been reported since permanent nerve damage can result from nerve biopsy in humans. This has led to paucity of histologic studies in humans. The changes that may occur histologically in a resected nerve segment include thickening of the walls of the micro vessels in the endoneurium and perineurium , oedema in the epineurium and perineurium, fibrosis and thickening at area of

injury, myelin thinning with nerve fibre degeneration and regeneration[9].

Pattern of entrapment

The peripheral nerves of the upper extremities originate from the brachial plexus and those of the lower extremities from the lumbosacral plexus. Some of the nerves involved in upper extremity entrapment are the suprascapular nerve, the axillary nerve, musculocutaneous nerve, radial nerve, median nerve, ulnar nerve and those involved in the lower extremity entrapment neuropathies include the iliohypogastric, ilioinguinal nerves, genitofemoral nerves, lateral cutaneous nerve of the thigh, femoral nerve, obturator nerve, sciatic nerve, tibial nerve, the peroneal nerves.

Entrapment neuropathies usually exist close to joints as the nerve traverses a fibro osseous tunnel making its way from one body segment to the other. Examples include the carpal tunnel syndrome (CTS) and cubital tunnel syndrome (CUTS) affecting the median and ulnar nerves respectively; the tarsal tunnel where the posterior tibial nerve gets entrapped10 and at the fibular neck as the common peroneal nerve spins round it to pass through the fibular canal [11,12]. Fibrous bands and arches have also compressed nerves leading to entrapment neuropathies. The posterior interosseous nerve, the deep motor branch of the radial nerve, has been observed to be vulnerable to entrapment at the arcade of Frohse [13, 14]. The sciatic nerve has been found to be compressed by myofascial band between the adductor magnus and the biceps femoris [15] while the superficial branch of the radial nerve was compressed at its exit by fascial bands[16]. Entrapment can also result from soft tissue swelling e.g. rheumatoid arthritis, or by anomalies in muscles e.g. pronator teres syndrome, deformities of bone or by a mass e.g. ganglion.

Carpal tunnel syndrome

This is the commonest entrapment neuropathies of the upper extremities[17,18] and the most frequently seen by hand surgeons[19]. It is due to entrapment of the median nerve in the carpal tunnel at the wrist. The tunnel contains the median nerve and nine tendons passing to the palm from forearm. After traversing the tunnel, the median nerve divides into both the sensory and motor branches. Compression of the median nerve at the tunnel leads to carpal tunnel syndrome (CTS) [19, 20]. It is commoner in females than males4. Predisposing factors include pregnancy, hypothyroidism, amyloidosis, diabetes, rheumatoid disease, myeloma, trauma causing raised pressure on the nerve. Nevertheless, the aetiology is unknown in about 50% of cases and this idiopathic group exceeds the other causes[19,] occurring in females between the age of 40-60 years where symptoms tend to be bilateral21. One of the risk factors for idiopathic CTS was postulated to be hypercholesterolemia. Carpal tunnel syndrome was also reported in stroke patients and this was attributed to excessive use of the non- paretic hand [22, 23]. Though unusual, CTS has resulted from anti-coagulation therapy[24]. Patients experience numbness, burning and tingling sensations over the lateral three and a half fingers and wrist. Symptoms worsen at night and are aggravated by frequent wrist flexion and extension. Phalen, Flick and Tinel's tests are usually positive. Atrophy of thenar eminence is present in only serious and chronic cases [18].

The median nerve can also be entrapped between the two heads of the pronator teres muscle at the lacertus fibrosus. The anterior interosseous nerve, the pure motor branch of the median nerve could be entrapped deep to the pronator teres heads by fibrous bands. Pain and numbness are experienced at the volar surface of the forearm and elbow. Sensation is reduced in the thumb, second and third and half of the ring fingers[25]. Patients find it difficult pinching thumb

Figure 1: Carpal tunnel showing compressed median nerve

and index finger[26].

Other neuropathies

The posterior interosseous nerve, a pure motor branch of the radial nerve is commonly entrapped at the arcade of Frohse causing difficulty in finger extension and thumb at the metacarpophalangeal joint (MCP) joint[11]. The sensory branch of the radial nerve can be compressed by brachioradialis and extensor carpi radialis tendons leading to pain, numbness and tingling sensation on the dorsolateral part of the hand[16]. The ulnar nerve is frequently entrapped at the elbow when passing through the cubital tunnel producing pain on the medial part of the elbow or forearm and numbness or tingling sensation on the little and ring fingers. The intrinsic muscles of the hand may be weak or even atrophy in severe cases[27]. Entrapment of ulnar nerve at the wrist as it traverses the Guyon's canal is not common. Symptoms depend on which branch is affected so patients can present with sensory, sensorimotor or purely motor symptoms[28]. The femoral nerve can be entrapped by the iliopectineal arch producing weakness of knee extension, loss of knee jerk and loss of sensation on the inner calf area[29]. The posterior tibial nerve is usually entrapped at the tarsal tunnel behind the flexor retinaculum. Examination reveals weakness of plantar flexion and foot inversion with reduced sensation over sole of foot[11]. The sciatic nerve entrapment at the sciatic notch, the piriformis syndrome, is well known. The sciatic nerve can also be bound down by myofascial bands. Patients present with weakness of knee flexion. Muscles of the leg and foot are also weak with reduced sensation in the foot and the lateral part of the leg[30]. The peroneal nerve can be entrapped at three sites which are: at the level of the fibular head, the anterior tarsal tunnel and at the ankle. Symptoms include weakness of both foot evertors and dorsiflexion.The lateral femoral cutaneous nerve, a purely sensory nerve, is usually entrapped at the inguinal ligament. Lesions result in numbness, burning and tingling sensation on the anterolateral part of the thigh[11].

Mechanisms of entrapment

Since carpal tunnel syndrome is the prototype of entrapment neuropathy and indeed the commonest, followed by cubital tunnel syndrome, the mechanisms of entrapment would be discussed in relation to them.

There are various mechanisms underlying entrapment neuropathies. Some of the mechanisms include compression by pressure, 'stretch', friction and angulations31. But the basic event is usually a reduction in the space needed by a peripheral nerve to function normally. This reduction leads to increase in tissue pressure which jeopardizes the blood supply to a nerve segment. The ensuing tissue anoxia leads to oedema formation which further compresses the peripheral nerve. The changes that occur pathologically can be easily reversible if the compression is mild and short –term. Intense and chronic compression result in alteration in axonal

transport and malfunction of the cell body. The duration of such chronic compression on a nerve has differing effects including increase in fibroblast formation and nerve scarring. [19,27]. In a study carried out on a Sprague Dawley rat, where the sciatic nerve of the adult male rat was banded with a silastic tube for differing periods of time, no histologic abnormality was demonstrated at three months. At five months, abnormalities of the nerve noted were perineural thickening and segmental demyelination at the periphery of the fascicles but with no abnormality found in the central fibres. At eight months, there were additional epineurial and perineurial thickening with considerable thinning of the myelin and Wallerian degeneration[32].

Movements at joints, such as flexion and extension, have been implicated as one of the mechanisms. The carpal tunnel volume is not static but changes with wrist position. It is inversely related to the interstitial pressure when the wrist is at neutral position[17]. Repetitive exercises and changes in position of wrist cause periodic increase in the interstitial pressure and intermittent chronic compression in predisposed patients[19,20]. Epidemiologic studies have linked CTS with abnormal wrist postures and repetitive movements. The angle of the metacarpophalangeal (MCP) joint has been observed to have considerable effect during various motion tasks involving wrist flexion-extension and radioulnar manouvres. Finger posture was postulated to increase the carpal tunnel pressure. Pressures were markedly increased with straight finger than during flexion of the MCP joint to 450. The difference was highest when the wrist was extended33. Entrapment of the posterior interosseous nerve was observed in those engaged in activities requiring repetitive pronation and supination such as is found in athletes, orchestra conductors, and tennis players [34, 35]. Cubital tunnel syndrome has been reported in athletes especially in baseball throwers where the vulnerability is more, due to extreme flexion at elbow during such events[36]. In cubital tunnel syndrome, the distance between the medial epicondyle and the olecranon widens by 5mm for every 450 flexion of the elbow. Flexion of the elbow puts tension on the medial collateral ligament and the retinaculum. This causes the cubital canal to lose height of about 2.5 mm thereby distorting its shape from a circular to an oval tunnel. This loss in height causes a 55% reduction within the canal leading to increased intraneural pressure from 7mmHg to 14mmHg. Marked increase in cubital tunnel pressure (CUTP) with a six times rise in ulnar intraneural pressure results from the additive effect of shoulder abduction, flexion of the elbow and extension of the wrist and this makes the nerve susceptible to entrapment [37]. Flexion of the elbow leads to excursion and traction of the nerve due to the location of the ulnar nerve behind the axis of rotation of the elbow, Valgus deformity can lead to increased traction forces on the ulnar nerve and this predisposes to compression[38]. Inflammation of the nerve results from the friction produced with frequent subluxation thereby making the nerve vulnerable to an accidental trauma predisposing to entrapment[37].

Flexion of the elbow with raised CUTP was reported in 10 patients with confirmed diagnosis of CUT syndrome. In that study, the cubital tunnel pressure was noted to be 9mmHg with elbow extension but with elbow flexion the pressure rose to 63mmHg. The pressures during extension increased further with contraction of the flexor carpi ulnaris to 92mmHg and with flexion of the elbow to 209mmHg. All the pressures were measured intra-operatively[20].

The carpal tunnel pressure (CTP) has been found to be a crucial factor in the mechanism of CTS. An association between CTP and nerve conduction was established by Luchetti *et al* where he found nerve conduction velocity action

potential amplitude to be diminished at the distal part of the tunnel where the pressure was markedly increased[39].

Narrowing of the tunnel has been attributed to certain congenital anomalies. Incursion of lumbricals into the carpal tunnel during flexion is considered a normal phenomenon [40], but the space within the tunnel can be compromised if the lumbricals are longer or hypertrophied. Anomalous tendinous flaps from long flexors and muscle bellies have been found in the tunnel[41].

Hypercholesterolemia has been known to cause entrapment neuropathy. Fibrogenesis causes proliferation of the connective tissue of the median nerve in the carpal tunnel and this has been linked with increased levels of low density lipoprotein in the serum which influences nerve enlargement with eventual increase both in volume and pressure of the tunnel contents[42].

Vibration has been found to cause peripheral neuropathy. Patients using vibrating tools have been found to be vulnerable to entrapment neuropathy. In animal studies, such vibration has caused intraneural oedema and in humans, demyelination of the nerve, axonal loss and fibrosis have been demonstrated. These changes are prone to occur in the median nerve in the carpal tunnel of such exposed workers[9].

Systemic diseases like chronic renal failure and diabetes mellitus have been found to cause entrapment neuropathies. Undoubtedly, carpal tunnel syndrome is more common in diabetics than in normal healthy individuals. The mechanism whereby diabetes mellitus causes CTS has been attributed to frequent unnoticed trauma, metabolic changes and oedema formation in the narrow space of the carpal tunnel. Different forms of entrapment neuropathies have also been observed in patients on chronic dialysis. Amyloidosis related to the dialysis is postulated to be the possible aetiology. There are changes in phosphate and calcium metabolisms leading to soft tissue calcification with resultant peripheral neuropathies. Factors contributing to the amyloidosis include the age of the patient, dialysis membrane biocompatibility, dialysate fluid, the length and type of dialysis. Thus long-term dialysis has led to carpal tunnel, cubital tunnel and Guyon's tunnel syndromes and rarely tarsal tunnel syndrome [43].

Clinical features

Entrapment neuropathies cause focal nerve dysfunctions leading to sensory loss, motor affectation or sensorimotor abnormalities in the distribution of the areas innervated by these nerves depending on whether the nerve affected is a pure motor, pure sensory or mixed nerve . The clinical features therefore include tingling sensations, numbness, burning pain, and atrophy of the affected muscles, difficulties in performing movements such as extension and flexion and positive Tinels sign. [11,17,27,44].

Investigations

These include electrodiagnostic testing involving electromyography, nerve conduction studies and somatosensory evoked potentials recording. Other investigations found useful include imaging techniques like computed tomography (CT) scan and magnetic resonance imaging (MRI) in diagnosing avulsions of spinal nerve roots, tumours and cysts. Standard Magnetic Resonance Pulse sequences have also been employed in visualizing various anatomical features of peripheral nerves and the nearby tissues[31,45].

Management

The management of patients includes both medical and surgical treatments. The medical treatment has two approaches, the non-pharmacological and the pharmacological therapies. The non-pharmacological therapy

involves the education of the patient with adjustment of vocational and recreational functions with reference to minimizing or preventing repetitive motions. Splinting of the affected site has also been employed. Treatment with non-steroidal anti-inflammatory drugs (NSAIDS) and steroids has given conflicting results. Whereas both drugs were found to be of no beneficial effect in the management of CUTS27, the use of steroids in combination with lidocaine injected locally were found to be quite successful in the treatment of entrapment neuropathy of the lateral femoral cutaneous nerve of the thigh[46]. Some patients have also been observed to recover spontaneously without any intervention. Surgical decompression by various methods has been used in the management of entrapment neuropathies in refractory cases where medical treatment has failed to reverse the process. This method was employed by Solheim *et al*[47] in reversing the compression of the sciatic nerve that was bound down by adhesions.

Conclusion

Entrapment neuropathies are common. Carpal tunnel and cubital tunnel syndromes are well recognized and are commoner than other entrapment neuropathies which are uncommon. A high index of suspicion in predisposed patients is needed. The knowledge of the anatomy and functions of the peripheral nerves with the possible sites of entrapment are invaluable in making the correct diagnosis. Early identification of the problem can prevent permanent nerve damage resulting in favourable outcomes.

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