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CONTENT



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**A peer-reviewed journal of
the Association of Resident Doctors
Jos University Teaching Hospital**

Association of Resident Doctors (ARD) Jos University Teaching Hospital



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In a separate section, acknowledge any financial support received or possible conflict of interest. This section may also be used to acknowledge substantial contributions to the research or the preparation of the manuscript made by the persons other than the authors.

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Halpern SD, Ubel PA, Caplan AL. Solid organ transplantation in HIV-infected patients. N Engl J Med 2002; 347: 284-7.

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Rose ME, Huerbin MB, Melick J. et al. Regulation of interstitial excitatory amino acids concentrations after cortical contusion injury. Brain Res 200, 935: 40-6.

***Books and other monographs:***

Murray PR, Rosenthal KS, Kobayashi GS, Pfaller MA. Medical Microbiology. 4th ed.

St Louis: Mosby; 2002.

***Editor(s), Complier(s) as Author:***

Gilstrap LC 3rd, Cunningham FG, Van Dorsten JP, editors. Operative obstetrics 2nd ed. New York: McGraw-Hill, 2002.

***Chapter in a Book:***

Meltzer PS, Kallioniemi A, Trent JM. Chromosome alterations in human solid tumors. In: Vogelstein B, Kinzler KW, editors. The genetic basis of human cancer. New York: McGraw-Hill; 2002. p.93-113.

***Dissertation***

Borkowski MM. Infant sleep and feeding: a telephone survey of Hispanic Americans [dissertations]. Mount Pleasantn(MI): Central Michigan University; 2002.

***Worldwide Web (www)***

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## LETTER FROM THE EDITOR

At the dawn of the year 2020 the world received reports of an outbreak of respiratory disease possibly of viral origin which gradually escalated to pandemic proportion. COVID-19 has changed the way we have lived, worked, related with one another and carried out our aspirations in the past months.

As a journal we have had to fend off these and other challenges to ensure the progress of our mandate to deliver carefully researched scientific content of proven excellence to you our esteemed readers. Hence, I welcome you to this edition of the Jos Journal of Medicine.

Special appreciation must go to members of the Editorial Team- the Publication committee and our greatly valued Editorial Advisors. Your patient, consistent and timely support continues to better our serve. I must mention specially Dr. Tope Selowo, our immediate past Deputy Editor for his tireless effort to get us across production hurdles. Your much valued input shall not go unrewarded sir.

We also highly appreciate our parent body, the Nigerian Association of Resident Doctors (NARD) and her current leadership for their proactive performance to ensure the tranquility we have enjoyed even in the midst of various storms weathered. The executive officers of the ARD JUTH chapter ably led by Dr. Steven Mawun Lukden have constantly supported and stood with us to ensure continuity for which we are deeply grateful.

Finally, we thank our esteemed authors and you, our readers, for your high regard of and interest in our journal which remains indexed in the African Journal Online (AJOL). Articles and other correspondences can be sent to us via the email; editorjjm@gmail.com.

Thank you as always for choosing the Jos Journal of Medicine, please enjoy the read!

Dr. Udoh, Phillips. A
+234 803 681 0771
phillipsudoh@gmail.com

**CONTENT**

# TUBERCULOSIS INFECTION CONTROL POLICY AND ITS IMPLEMENTATION IN HIGH BURDEN DOTS FACILITIES IN IBADAN: A QUALITATIVE EXPLORATION

**Kamiludeen Titilade Alebiosu** [a] (kameel.alebiosu@gmail.com)
**Oluwaseun Oladapo Akinyemi,**[a*] (ooakinyemi@comui.edu.ng, seunakinyemi@hotmail.com)

[a] ***Department of Health Policy and Management, College of Medicine, University of Ibadan, Ibadan, Nigeria***

**Corresponding author:** Dr Oluwaseun O. Akinyemi
Department of Health Policy and Management,
College of Medicine, University of Ibadan, Ibadan, Nigeria
+234 803 502 0136

## ABSTRACT

**Background:** Following the growing public health problem of Tuberculosis (TB), the TB Infection Control Policy and Guidelines was published in 2009 to reduce the transmission of this disease to healthcare workers and patients. This study assessed the TB policy and the factors influencing its implementation in Ibadan, Oyo State Nigeria.

**Methods:** This study was conducted in five of the urban Local Government Areas in Ibadan, Oyo State where 10 Directly Observed Treatment Services (DOTS) centres with high TB burdens were selected. Eighteen key informant interviews were conducted with purposively sampled DOTS Officers, Tuberculosis and Leprosy Control Program Local Government Supervisors (TBLS) and members of the State TB Control Program.

**Result:** Only few of the facilities assessed had a written facility-specific infection control plan (that includes TB infection control) and a fifth of the facilities had designated persons (and committees in larger facilities) responsible for implementing TBIC policy. There was a general shortfall in the implementation of administrative control measures except for compliance to triaging rules as revealed by very poor compliance to most details of this aspect of the TBIC policy in most of the centres visited. Poor funding, inadequate support from the government at all levels, shortage of personnel, inadequate supply of Personal Protective Equipment were all identified as the major challenges faced in implementing the TBIC policy.

**Conclusion:** Awareness on the content as well as the level of implementation of the policy still fall short of the WHO recommendation. Policy makers and implementers need to strengthen the administrative control measures which has shown to be very effective and efficient in curbing the spread of the disease.

**Keywords:** Tuberculosis, Infection control, Policy implementation, Directly observed treatment services, Personal protective equipment

## Background

Tuberculosis (TB), an ancient infectious disease caused by *Mycobacterium tuberculosis,* is the leading cause of death due to an infectious agent globally.[1] TB is both preventable and treatable and it is carried in airborne particles called droplet nuclei that can be generated when persons who have pulmonary or laryngeal TB disease cough, sneeze, shout, or sing.[2] Globally, there are more cases of TB nowadays than in previous era of human history and the World Health Organization records an average of 9 million new TB cases annually and about 5,000 TB deaths daily.[3] It is projected that by the year 2050, the annual death

rate from TB will exceed 5 million a year. TB is a major public health problem in Nigeria and it was declared a national emergency in 2001.[4] Following the Abuja Declaration in 2001, Directly Observed Therapy Short course (DOTS) activities have been scaled up across Nigeria. In spite of the documented effectiveness of DOTS in the Nigerian context, Nigeria has the tenth largest burden of TB cases in the world.[5]

In 2009 the World Health Organization (WHO) issued a TB Infection[6] Control (TBIC) policy including administrative, environmental and personal protection measures as a means to battle the increasing incidence of institutional settings, including health care facilities being a source of TB Infection. This infection control guideline was made universal and applicable even in resource-poor setting with emphasis on the administrative component of the policy as it the most easy to perform especially for poor resource settings where finance is a challenge.[7]

National Tuberculosis and Leprosy Control Program (NTBLCP), the organization in charge of TB and Leprosy in Nigeria, and other stakeholders developed guidelines for the country based on the WHO recommendations, for the control of TB infection in health care settings.[8] The World Health Organization (WHO) recommends a few infection control measures in health facilities that have been further classified into three: managerial and administrative measures, environmental measures and personal protective equipment. The WHO recommends that all health facilities caring for TB patients or persons suspected of having TB implement these measures. These measures have been found to minimize the transmission of TB in health facilities.[9,10]

Managerial and administrative control measures include the activities undertaken to set up and ensure the implementation of all other measures at the facility level. The managerial activities should ensure political commitment and leadership, identify and strengthen local coordinating bodies for TB infection control, and develop a facility plan (including human resources, and policies) for implementation.[11] Environmental control measures include methods to reduce the concentration of infectious respiratory aerosols (i.e. droplet nuclei) in the air, and methods to control the direction of infectious air. The choice of environmental controls is closely linked to building design, construction, renovation and use, which in turn must be tailored to local climatic and socioeconomic conditions.[6,12] Respiratory measures including personal protective equipment (PPE) are particularly vital in situations where there is an increased risk of transmission. The use of particulate respirators may afford health workers additional protection from TB through the use of particulate respirators that meet or exceed international standards.[6]

TB transmission frequently occurs before an accurate diagnosis is made, therefore it is the responsibility of health-care workers, particularly managers, to ensure the implementation of appropriate TB infection control measures in all high risk settings so as to ensure that "health care facilities become known as places of healing and safety".[13] Studies pertaining to low- and middle-income settings have identified some factors influencing the implementation of TBIC policy which include capacity and resources to correctly interpret, apply and manage policy directives in local contexts[14] and inadequate provisions of PPE.[15]

Also, poor practices regarding administering TB infection controls have been reported as a factor influencing the implementation of TBIC policy.[16] In a South African study, Malangua and colleagues reported that less than half of health facilities surveyed adhered to TB infection control measures.[15]TB-related training and knowledge are identified factors that may co-exist to influence the implementation of TBIC policy among healthcare workers. TB-related training was found to be a predictor of good practices and implementation of TBIC policy and positive correlations were established between knowledge and implementation of TBIC policy. There exists paucity of data linking health workers' practices and implementation of TBIC policy.[17] Thus it is important to not only train but also support healthcare workers on skills to strengthen the implementation of TB infection control strategies.[18] This study explored the tuberculosis infection control policy and factors influencing its implementation in Ibadan, Oyo State, Nigeria.

## Methods

### Study design and setting

This study was a cross-sectional qualitative study which used key informant interview (KIIs), in-

depth interviews (IDIs) and observational checklist. The research was carried out at DOTS sites in Ibadan that have high burden of TB patients which also fall among the top 20 high burden sites in Oyo state and are located within the urban Local Government Areas (LGAs) in Ibadan. Ibadan consists of 11 LGAs for governance and administrative purposes. Five of the LGAs are located in the metropolitan core of the city, while the remaining six are either predominantly peri-urban or rural settlements. The State has 1729 health facilities disaggregated into 712 Primary Health Centres (PHCs), 46 secondary health facilities, 3 tertiary health centres and 968 registered private health facilities. Out of these facilities, 254 are the ones providing DOTS services in the state - 186 PHCs, 32 Secondary health facilities, the 3 tertiary health facilities and 33 private facilities[19]

**Sampling and Participants**

Five (urban) LGAs in Ibadan, Oyo state were selected for this study. These study sites were purposively selected because they have high burden of TB patients. Eighteen participants were recruited through purposive sampling. These comprised members of the State TB Program which include the Monitoring and Evaluation (M&E) Officer, the Logistics Officer, the Drug Resistant -TB Focal Person and the Laboratory Focal person. Also, the head of TBIC committee at the facility where the committee was present, TB Local Government Supervisors (TBLS) in the five LGAs were recruited (see Table 1).

**Table 1: Interview type and sociodemographic characteristics of respondents (N=18)**

| Variable | n | % |
|---|---|---|
| **Type of interview** | | |
| KII | 11 | 61.1 |
| IDI | 7 | 38.9 |
| **Professional category** | | |
| Doctor | 4 | 22.2 |
| Nurse | 3 | 16.7 |
| Pharmacist | 1 | 5.6 |
| CHO | 8 | 44.4 |
| CHEW | 2 | 11.1 |
| **Position** | | |
| SLO | 2 | 11.1 |
| TBCO | 4 | 22.2 |
| TBLS | 6 | 33.2 |
| DRTB | 3 | 16.7 |
| INFCHAIR | 1 | 5.6 |
| M&E | 1 | 5.6 |
| DOTS Officer | 1 | 5.6 |
| **Years of experience** | | |
| <10 | 7 | 38.9 |
| ≥10 | 11 | 61.1 |
| Mean years of experience | **9.8±6.5** | |

*CHO-community health officer; CHEW-community health extension worker; SLO-state logistics officer; TBCO- TB program control officer; INFCHAIR-infection committee chairman; M&E- Monitoring and Evaluation officer; TBLS- TB local government supervisors; DRTB- Drug resistant TB focal person*

**Data collection and analysis**

A total of 11 KIIs and seven IDIs were conducted with the study participants to explore the infection control policy and the factors influencing its implementation. Interviews were conducted in English, audio recorded and transcribed. KIIs and IDIs were conducted with the aid of interview guides. The KII explored measures of control, awareness and training of personnel and factors influencing implementation. IDIs were conducted with the personnel to evaluate TB infection control policy implementation.

A broad coding framework was developed based on the research questions. All transcripts were analysed with NVIVO (version 11) software using the thematic framework analysis approach. As themes emerged, they were indexed and compared with themes from subsequent interviews until a sense of attainment of saturation, where no new information was being obtained,[20] was achieved.

**Results**

**Availability of infection control committees**

Infection control committees were found only in secondary and tertiary healthcare facilities and none at the primary healthcare facilities. Among the facilities with the committees, meetings were not held regularly and factors responsible for this include bureaucracy bottlenecks, poor funding, and inadequate number of personnel and unmet needs of the committee leading to less commitment

*There is a problem on this issue. Not every facility has a functioning infection control policy. Some even say they have forgotten that there should be a committee. Only a few facilities still have a functioning committee. Jericho (state hospital) has a standing committee. (KII, Nurse, Male)*

*At the state hospital in Jericho there is an infection control committee because TB is not the only infectious disease. It is a general committee at the state hospital but the state program has none currently. It was dissolved because of shortage of funds. (KII, Doctor, Male)*

**Training in infection control**

Training is an important aspect of the infection control policy as it equips health care workers with knowledge and skills to go about their activities, majority of respondents received some form of training for infection control, some external training and others learnt on the job.

*Yes...infection control is always part of the trainings whenever general healthcare workers are being trained on anything related to TB or even HIV. And even when healthcare workers were being trained on programmatic management of MDR TB, infection control is always part of it. (KII, Doctor, Male)*

*At the state level, there are so many trainings that have been done at various facilities belonging to the state. We have trained them on infection control and each facility has a committee and a plan signed by the facility manager and the WHO representative that attended the training with them. (KII, M&E Officer, Male)*

**Management of HIV and TB co-infection**

HIV and TB co-infection was another component of the administrative part of the TBIC policy discussed by respondents. TB Patients are screened for HIV and linked up with ART clinic if tested positive and patients are followed up to ensure that they adhere to the treatment regime

*There is a policy that all TB patients must be screened for HIV. With this they would be able to identify the dually infected. The patient is given priority. HIV patients are detected in two places at both HIV centres and at TB clinics. When they see them like that they are attended to in time. (KII, Doctor, Male)*

*INH prophylaxis is available in the program. First thing they do is screening of coughing HIV patients by Gene Expert for early detection of TB. Also, TB presumptive patients are all tested for HIV and if positive they are referred to ART clinics. The test for HIV at the TB center is done even when the person is not positive for TB. (KII, CHO, Female)*

**Environmental measures in infection control**

The second component of the TBIC policy is at the environmental level and this includes measures put in place to ensure that facilities are suitable for use and protect against the spread of TB infection.

Environmental measures that was put in place and identified by the respondents include DOTS sites that are well aerated which allowed for proper ventilation, separate area for sputum collection, and use of disinfectants for cleaning of DOTS centres.

*Most of the DOT centres are open and well ventilated to give room for diffusion. (KII, CHO, Female)*

*There is a box meant for sputum collection; from time to time, the box is decontaminated and they are put outside for sun to heat it and we also sprinkle JIK and Morigard on it peradventure there was a spill over of the sputum on them. (IDI, Nurse, Female)*

**Personal protective equipment TBIC implementation**

Respiratory measures are measures to curb the spread of infection among patients and staff. These include the use of gloves, face mask, N95 respirators, covering of mouth with handkerchiefs, hand washing, use of hand sanitizers.

*For drug susceptible (TB), it is the health worker that uses the face mask while the patients use their handkerchief. But for MDR (TB) both the patients and healthcare worker would use the face mask. (IDI, CHO, Female)*

*We only have N95 respirators for MDR (TB) patients. It was available when we were treating MDR patients when they were being treated with injectables but since the adoption of the use of oral medications for MDR at the DOT centres, the supply of the N95 has stopped. (IDI, CHEW, Female)*

**Knowledge and practice of DOTS Officers towards TBIC policy implementation**

Participants regarded infection control measures as the various actions taken to prevent the incidence of TB
among staff in facilities. Respondents identified various things done to prevent the spread of Tuberculosis among staff and patients and are highlighted as follows

**Awareness of TBIC Policy**

There were mixed answers about the awareness of the TBIC policy as not all respondents were aware about the presence of an infection control policy in the program.

*Yes, there is a written policy. There is a unit in charge of it and they go about ensuring its implementation. And the committee does monitoring. (IDI, Nurse, Female)*

*No. If there is anything to correct on infection control, I used to tell them but there is no specific document. (IDI, CHO, Female)*

**Keeping a safe distance**

At the different DOTS Centres, different sitting arrangements was observed when HCW were attending to patients. The respondents also gave insight on how the sitting arrangements were done and they explained it was done in such a way that avoided close face-to-face contact with patients. Open spaces were used, clinics with windows open, sitting arrangements were perpendicular while the flow of air is monitored so the HCW will be backing the flow.

*Patients are not allowed to face us. The patients sit perpendicular to us. (IDI, Nurse, Female)*

*I site my seat in the opposite direction of the wind but most time I attend to them at the shield outside. I don't allow them to come into the office. (IDI, CHO, Male)*

**Eating a Balanced Diet**

Proper diet and consumption of nutritious food was one of the practices the DOTS Officers mentioned on how they were able to implement the TBIC policy.

*We eat good food to build our immunity. We know that everyone has a latent level of TB in their system and their susceptibility to the disease is influenced by the level of immunity. The higher the immunity the less chances one has of coming down with TB. (IDI, CHO, Female)*

*What we were taught then was to ensure Good immunity through good diet to boost*

*our immunity. We usually encourage ourselves during our DOTS workers' meeting, to ensure adequate diet at all times. (IDI, CHO, Male)*

**Staying Informed**

The respondents opined that their knowledge about the disease and its spread empowered them to take necessary precautions against being infected with the disease

*Yes. I worked at the facility level for years and I didn't even come down with cough talk less of TB. This is so because we have measures in place to protect ourselves while on the job. It is very important to take care of yourself while also trying to take care of the patients. Your exposure and knowledge would help. (KII, M&E Officer, Male)*

*As the saying goes 'knowledge is power'. The Knowledge of healthcare workers about TB and its spread enables people to protect themselves. (IDI, CHO, Female).*

**Personal hygiene in TBIC policy implementation**

Personal hygiene measures like washing of hands with soap and water, the use of hand sanitizers were identified by the respondents as part of their practice in TBIC policy implementation.

*We use nose cover to cover our mouth and nose, we also use Izal, JIK to wash hands and clean surroundings, we keep presumptive patients distance away and we ensure the use of handkerchief by all presumptive patients whenever they want to cough... (IDI, CHO, Male)*

*Using of nose mask, washing of hand within Dettol, IZY AND JIK, wearing of gloves and not allowing the patients to produce sputum in the office. (IDI, CHEW, Male)*

*We use hand gloves, hand sanitizers, nose mask, antiseptic lotion for cleaning the ward, apron, wash hand basin for hand washing and we all know how to use them. (IDI, Nurse, Female)*

**Factors influencing the implementation of TBIC policy implementation**

**Several factors affect the implementation of TBIC based on the respondents, while some of them makes the implementation more challenging, there are some factors that aids and ease the implementation of TBIC Policy**

**Factors that affect TBIC Implementation**

Respondents identified several factors affecting the implementation of the infection control policy including, funding, education level, poor supply of commodities, poor monitoring of activities and inadequate support from the government.

***Level of education***

Respondents had varying views on the role of education in practicing infection control, while some believed that higher qualification implies better compliance, some others were of the opinion that knowledge is what really counts, not necessarily the academic qualification

*No doubt, level of education would play its role because if I get infected the first person that would suffer for it is me, therefore even if I am not being supported or encouraged I have a responsibility to make sure that I am not infected no matter what any other person does or is not doing.* ***(KII, Pharmacist, Male)***

*Level of education does not influence it. Once someone can communicate effectively, he or she can comply. Compliance to these infection control measures is not dependent on education. (IDI, CHO, Female)*

***Poor supply of commodities***

According to respondents, commodities needed like PPEs and disinfectants to successfully implement the TBIC policy are always in short supply.

*In the time past when the programme was still vertical, we had disinfectants and other PPEs were readily available but since the government took over, the supply had not been forthcoming. (IDI, CHEW, Male)*

*We are supposed to have N95 respirator but presently even while attending to MDR patients they are not available. Supply had never been made for N95 respirator for attending to MDR patients. (IDI, CHO, Female)*

***Poor funding***

The study participants were of the opinion that funding for infection control activities has been poor as highlighted by respondents. Infection control have not been given priority in program management and government as cited dwindling resources as an impediment to providing financial support and HCWs have resorted to self-funding as a stopgap measure.

*The funders have tried their best. They do not usually provide most of the PPEs except N95.The funders only provide N95 for treating patients at the intensive phase of MDR TB because it takes a long period to treat and costs more money to be treated... Other PPEs are neither supplied by the government nor funders. Therefore, we have healthcare workers who have to provide PPEs for themselves. (IDI, CHO, Female)*

*There was a step-down with the HOD and an official report written but no action has been put in place till date because of funds shortage... No support from government. Government has not focused on infection control... For example, the 200 thousand naira that is supposed to be released by the LGA for TB control is not forthcoming. Even there was no funding for world TB day. (IDI, CHO, Female)*

***Poor monitoring and administrative laxity***

Inconsistency or poor monitoring hinders the success of implementation of infection control activities.

*When we started those committees, what is expected of the facility emanated from the state control office, coordination was from the state office. We go to facilities to ensure that they put in place the infection control policy. When we were doing it that way it was effective but because there was no more monitoring, they all relaxed. Because if there is monitoring everybody would be geared up. That is why they all relaxed. Monitoring of facilities is very, very important. If there is a body monitoring each facility, I believe each facility would be doing it. The issue of monitoring is a factor that needs to be addressed. If there is no body doing it, we are all human beings everybody could forget. And this is responsible for TB amongst healthcare workers in the non-TB setup. (KII, Nurse, Male)*

***Structural Factors***

Structural factors including the design, space, ambience, lighting and water facilities are important considerations in successful implementation of infection control activities as identified by respondents. Respondents also noted the need for involving stakeholders before structures are put in place to ensure that the facility is fully maximized as well as educating other health care workers.

*But here are some that has to with the structure of the hospital. For example, when TB infection control was not considered when building a facility, so for that nobody can change the structure. May be what we can do is to do rearrangement and where they don't agree with you to do rearrangement, there is nothing you can do about it. When a facility is already in existence, it becomes difficult to remodel the structure to suit the TB program standard for infection control. (KII, Doctor, Male)*

*And again, people that design the hospital, they need to involve those to work at the facility which is not currently being done. If you involve us, we will tell them what we need rather than just constructing a building without involving those that would work them. So, they build facilities that are not suitable for use. For example, the current building at Jericho hospital, the state coordinator should have been consulted to ensure that the facility is*

*utilized. (KII, M&E Officer, Male)*
*In 2015, in Ibadan, infection control and the need to establish a team for infection control with stakeholders' participation was discussed. The specification of window construction was discussed. Also, the velocity of air required to control spread. The need to educate other health workers. (IDI, Nurse, Female)*

## Discussion

In this study, we collected qualitative data on tuberculosis infection control policy in Ibadan, Oyo state and also examined factors influencing its implementation. This study revealed that few of the facilities assessed had a written facility-specific infection control plan (that includes TB infection control and a fifth of the facilities have designated person (and committee in larger facilities) responsible for implementing TBIC Policy in the facility and this agrees with the findings of Ekuma and Oridota[21] who reported in their study carried out in Lagos that less than a quarter of the health facilities studied admitted to not having a documented TB policy. Only a third of the facilities had a designated TBIC focal persons that have undergone TBIC training; however, majority of the staff had undergone TB-related training.

There was a general shortfall in the implementation of administrative control measures except for compliance to triaging rules and this complied with the findings of Malangu and Mngomezulu done in South Africa which also discovered that nine of the 10 administrative control measures which fall under the responsibilities of institutional managers were not complied with.

There was however a higher level of implementation of environmental measures as compared with the administrative and managerial measures as revealed by all the facilities having a waiting area that was well ventilated with clear display of messages on cough hygiene in all areas frequented by patients. This however is not in consonance with the findings of Tenna and colleagues[22] in Ethiopia where 76% of the facilities cited lack of adequate infrastructure to isolate suspected/known TB patients. There was also a big difference between this finding and those of Buregyeya *et al*[23] in Uganda which reported that 22 out of 50 facilities did not have adequate ventilated waiting areas based on the proportion of the window to floor area and patients were observed to crowd in narrow and poorly ventilated corridors in outpatient departments.

For the personal protective component of the policy, less than half of the facilities had N95 respirators available for their staff and only a third of the facilities had supplies readily available for coughing patients (tissues, surgical masks and are being used). This is in consonance with the findings of Kanjee and colleagues[16] in a South African study which highlighted inconsistency in the supply and use of N95 respirators by HCWs when around patients regardless of their status, hence, negating the adherence to guidelines and policy implementation in such facilities. This further agrees with the findings of Tenna and colleagues[22] in a study conducted among Ethiopia HCWs which reported that only 8% supports that face masks were regularly available. However, this finding does not align with that of Sissolak *et al*[24] in a South African study in which most N95-respirators were reported to be available on most of wards with TB patients; this might be due to the study including facilities with patients on admission whereas this study involved TB out-patients only.

Awareness of the presence of TBIC policy is key because healthcare workers would only be able to implement the guidelines of a policy they are familiar with. Thus, awareness is the starting point to assess factors influencing the implementation of TBIC policy. A good number of the respondents were aware of the presence of a TB infection policy. Poor funding, inadequate support from the government at all levels, shortage of personnel, inadequate supply of PPE materials were all identified as the major challenges faced in implementing the TBIC policy. Studies have shown that funding and strength of medical infrastructures are critical to the realization of a policy's goals.[25,26]

However, possible limitation of this study should be highlighted. Like any cross-sectional study, a claim of causality cannot be made. Also, since the assessment was done entirely from the respondents' perspectives, subjectivity and social desirability bias were real risk. Nonetheless, these were mitigated by assurances of confidentiality of data and guaranteeing that no identifiers will be use while reporting the data. Despite these limitations, this study provides useful insights into factors

influencing TBIC policy implementation in a resource-constrained setting like Ibadan.

## Conclusion

The findings from this study has shown that although there is a national Tuberculosis Infection Control Policy, awareness of the content as well as the level of implementation still falls short of the WHO recommendation. Furthermore, a lot needs to put in place by local, state and federal governments to strengthen the administrative control measures which has shown to be very effective and efficient in curbing the spread of the disease. The provision of basic personal protective equipment such as N95 facemasks, gloves as well as continuous training of both new and experienced healthcare workers in the Tuberculosis infection control cannot be over emphasized.

Therefore, although the Tuberculosis Infection Control measures have been effective as evident by zero recorded cases of Tuberculosis infection amongst Tuberculosis program staff in Ibadan, Oyo state, more has to be done to strengthen the policy as well as make adjustment to loose ends especially as relating to funding and government support.

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## Authors' contributions

This manuscript was conceived by KTA and OOA. Initial draft was developed by KTA and OOA. The final version of the manuscript was approved by KTA and OOA.

## Ethical considerations

Ethical approval for this study was obtained from the University of Ibadan/University College Hospital (UI/UCH) Ethics Review Committee. Permission to conduct the interview was obtained from the Control Officer of the Oyo state Tuberculosis and Leprosy Control Program. In addition, written and signed informed consent was gotten from all participants of the study before going ahead to interview them. Participants were informed that their responses were anonymous and that their information will remain confidential and will not be shared past the research team without their consent.

## Competing interests

The authors declare that they have no competing interests.

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# PHYSICAL ASSAULT OF HEALTH WORKERS BY MENTALLY ILL PATIENTS IN A TERTIARY HOSPITAL IN NORTH-CENTRAL NIGERIA

**Tagurum YO[1], Nantok BD[2], Okpe ED[2], Okoh EO[1], Okonoda KM[3], Afolaranmi TO[1], Miner CA[1], Babalola-Jacobs A[4], Akosu TJ[1], Banwat ME[1]**

[1]Department of Community Medicine, College of Health Sciences, University of Jos/ Jos University Teaching Hospital, Jos

[2]Department of Medicine, Jos University Teaching Hospital, Jos

[3]Department of Psychiatry, College of Health Sciences, University of Jos, Jos/ Jos University Teaching Hospital, Jos

[4]AIDS Prevention Initiative Nigeria (APIN), Jos University Teaching Hospital, Jos

## AUTHORS

Dr Banwat M.E. (MBBS, MSc, FMCPH, FWACP and Lecturer/Consultant Department of Community Medicine, Faculty of Clinical Sciences, College of Health Sciences, University of Jos, PMB 2084, Jos, Plateau state, Nigeria, mathildabanwat@yahoo.com, +2348036133983)

Dr Akosu T.J. (MBBS, MSc, FWACP and Lecturer/Consultant Department of Community Medicine, Faculty of Clinical Sciences, College of Health Sciences, University of Jos, PMB 2084, Jos, Plateau state, Nigeria, akosu2002@yahoo.co.uk, +2348065813415)

Dr Miner C.A. (MBBS, MPH, FWACP and Lecturer/Consultant, Department of Community Medicine, Faculty of Clinical Sciences, College of Health Sciences, University of Jos, PMB 2084, Jos, Plateau state, Nigeria, chungdungminer@yahoo.com, +2347037000880)

Dr Afolaranmi T.O. (MBBS, MSc, FMCPH, FWACP and Lecturer/Consultant Department of Community Medicine, Faculty of Clinical Sciences, College of Health Sciences, University of Jos, PMB 2084, Jos, Plateau state, Nigeria, toluene42002@yahoo.com, +2348035791234)

Dr Okonoda K.M. (MBBS, MPH, FWACP and Lecturer/Consultant Department of Psychiatry, Faculty of Clinical Sciences, College of Health Sciences, University of Jos, PMB 2084, Jos, Plateau state, Nigeria, mayorking2001@yahoo.com, +2348036770092)

Dr Okoh E.O. (MBBS, MPH, FWACP and Lecturer/Consultant Department of Community Medicine, Faculty of Clinical Sciences, College of Health Sciences, University of Jos, PMB 2084, Jos, Plateau state, Nigeria, nyeche4jc@yahoo.com, +2348065758750)

Mrs Babalola-Jacobs A. (BSc, MSc and Clinical Medical Scholar/Qualitative Health Researcher, APIN, Jos University Teaching Hospital, PMB 2076, Jos, Plateau state, Nigeria, alerobabsjacobs@yahoo.com, +2348039654417)

Dr Nantok B.D. (MBBS and Intern, Department of Surgery, Jos University Teaching Hospital, PMB 2076, Jos, Plateau state, Nigeria, nantokdakwak12@gmail.com, +2347034899686)

Dr Okpe E.D. (MBBS and Intern, Department of Medicine, Jos University Teaching Hospital, PMB 2076, Jos, Plateau state, Nigeria, +2348164596127)

Dr Tagurum Y.O. (MBBS, MPH, FWACP and Lecturer/Consultant, Department of Community Medicine,

Faculty of Clinical Sciences, College of Health Sciences, University of Jos, PMB 2084, Jos, Plateau state, Nigeria, yetundetagurum@yahoo.com, +2348032408132)

**Corresponding author:** Dr Tagurum Y.O., Department of Community Medicine, University of Jos/Jos University Teaching Hospital, PMB 2076, Jos, Plateau state, Nigeria. yetundetagurum@yahoo.com, +2348032408132

## ABSTRACT

### BACKGROUND

Workplace violence occurs globally and it is very common in the health sector especially among mental health workers. A good understanding of the factors associated with physical assault is essential in its prevention and control. This study aimed to assess the prevalence of physical assault and associated factors among mental health workers in the Jos University Teaching Hospital, Jos.

### METHODS

This was a descriptive cross-sectional study conducted among staff of the Psychiatric Department of the Jos University Teaching Hospital, Jos. A self-administered questionnaire was used to collect quantitative data which was cleaned, processed and analysed using Epi Info version 3.5.4. Bivariate analysis was done using Chi square statistical test at 95% confidence interval with a p-value of $< 0.05$ considered statistically significant.

### RESULTS

Among the respondents, 33 (60.0%) had been attacked by a patient before with 21 (38.2%) of the attacks occurring within the last 12 months. The nurses 18 (75.0%) were the health workers mostly assaulted in the department. Respondents with longer duration of work experience were also more likely to be assaulted. Unfortunately, majority of the respondents 37 (67.3%) indicated that they were not aware of any channel available for reporting physical assault and 34 (64.8%) had no knowledge of any support system available to victims of physical assault in the department.

### CONCLUSION

A high proportion of mental health workers of the Jos University Teaching Hospital, Jos had experienced physical assault at work by mentally ill patients. Efforts should be geared towards periodic training of psychiatric health workers on violence prevention and support systems should be made available to health workers when physically assaulted by ill patients.

**Key works:** physical assault, mental health workers, Jos

## Introduction

Workplace violence is global and worrisome especially in the health sector where it is mostly endured, under-reported, or often neglected.[1,2] Health workers commonly accept it as an occupational hazard and a risk considered a consequence of health care delivery.[3,4] The International Labour Organization (ILO) in 2004 defined work-related violence in its Code of Practice on 'workplace violence in services sectors and measures to combat this phenomenon' as "any action, incident or behaviour that departs from reasonable conduct in which a person is assaulted, threatened, harmed, injured in the course of, or as a direct result of, his or her work."[5] Work-related aggression happens through the use of force or threats to a non-consenting victim in the work premises.

Most of the violence at the workplace comprises verbal threats, and assault such as stalking, physical assault, sexual harassment or rape.[3] In a hospital, these violent acts may be perpetrated by either professional colleagues, other hospital employees, patients/clients or their relatives.[6] Physical assault is said to take place when an individual or a group of individuals provokes and attacks a person physically, with or without the use of a weapon, or even threatens to hurt that person. Examples of physical assault include being hit, shaken, struck with an object, kicked, pushed,

attempted strangling, bitten, stabbed with knife or spat on.[7] Prevalence of workplace violence varies with the job description of the care provider, type of training, duration of employment, type and severity of client's disorder. Nurses, doctors, and workers at the emergency and psychiatric departments are at higher risk of any form of violence than other health care staff.[3,4,8,9] Other factors such as female-dominated staff, younger age of staff, and duration of work experience in a psychiatric facility are likewise associated with the experience of violence caused by patients.[10-12]

Violence caused by mentally ill patients against mental health care providers is disturbing, and the prevalence is significantly high.[10-12] According to the World Health Organization (WHO), between 8% and 38% of health workers suffer physical violence at some point in their careers.[13] In a study carried out in Ismailia, Egypt in 2017, the prevalence of violence among health care workers was 59.7%, with verbal violence accounting for 58.2% compared to physical violence (15.7%).[14] Similarly, in a study conducted at Sbrana Psychiatric Hospital, Botswana, 69.8% of respondents had experienced physical violence at one point in their career, while 44.1% experienced the same during the previous 12 months.[15] A study conducted in a tertiary hospital in Abia State, Nigeria in 2012 among health workers reported a high prevalence of violence up to 88%.[16] Similarly, in a study carried out in Federal Neuropsychiatry Hospital, Yaba, Lagos, 49.5% of staff had been physically assaulted, 33.7% at least once over the last 12 months.[17]

Despite the massive burden of diseases in sub-Saharan Africa, there is an acute shortage of specialists particularly in the field of mental health.[18] This situation puts a lot of pressure on mental health institutions and their staff and heightens the risk of occupational hazard and therefore reduces the productivity of these few specialists. As a consequence, physical violence compromises the quality of care and puts health-care provision at risk. It also leads to immense financial loss in the health sector. Unfortunately, a lot of the violence and harassment against mental health workers often goes unreported officially.[19] Work-related violence against health care providers will continue in the absence of data to assist in the formulation of necessary preventive measures.

Health workers in the psychiatric department do their best to provide quality care for patients within their organisational and constitutional frameworks. Despite their compassion and empathy, many psychiatric health workers are the targets of acts of violence and aggression. It is vital that stake holders in the health sector such as the government, communities, organisations and individuals understand that violence is not an acceptable workplace hazard especially among health workers in the psychiatry department where the prevalence of violence is highest. We, therefore, decided to investigate the occurrence of physical violence, related factors and the available sources of support for the victims of workplace violence in the Psychiatric Department of the Jos University Teaching Hospital (JUTH). We believe this would assist in raising awareness of this hazard among all concerned stakeholders, and lead to the development of protocols to combat it.

## Methodology

This was a descriptive cross-sectional study conducted between February and March 2019 among health workers in the psychiatric department of the Jos University Teaching Hospital (JUTH) which is a tertiary health centre located in Jos, Plateau State, north-central Nigeria. The psychiatry department has male and female wards with 26 and 25 bed space capacity respectively. The department has a staff strength of about 60 which includes doctors, nurses, laboratory technicians, health management (administrative, professionals) and support workers (clerical workers, cleaners and ward attendants). Sample size for the study was calculated using the formula;

$n = Z^2pq/d^2$;

where n = minimum sample size,

Z = standard normal deviation at 95% confidence interval which is 1.96.

p = prevalence of physical assault based on similar studies =49.5%[4]=0.495.

q = complementary probability (1-p) = 1-0.495 = 0.505

$$n = \frac{1.96^2 \times 0.495 \times 0.505}{0.05^2} = 384$$

A 5% non-response rate was used, making;

n = 403 (total population of health workers less than 10,000 therefore, correction for finite population was done).

Therefore, $nf = n/1+(n/N)$[20]

Where, n=calculated value of sample size-403, N= estimated available sample size-60

Nf =403/1+(403/60) = 52.27, which was approximated to 53. All consenting workers in the psychiatric department of JUTH were therefore studied.

Permission to conduct the study was obtained from the hospital's Institutional Health Research Ethical Committee. Written informed consent was also obtained from each respondent with assurance of confidentiality. Data was collected using a semi-structured self-administered questionnaire adapted from similar studies; and was divided into the following sections: **SECTION A:** Socio-demographic characteristics; **SECTION B: assessment of the nature** of assault and circumstances surrounding assault; and **SECTION C:** assessment of support systems available to victims of physical assault. The questionnaire was pre-tested in the accident and emergency unit of JUTH, another department with a documented high prevalence of physical assault to ensure a good understanding of the questionnaire.

**Data analysis**

Data collected was cleaned and analyzed using Epi-info software version 3.5.4. Quantitative data were presented using means and standard deviation while qualitative data was presented using frequency tables, percentages and charts. Prevalence, nature and circumstances surrounding physical assault as support systems available to victims of physical assault were assessed. Bivariate analysis was done using Chi square statistical test at 95% confidence interval with a p-value of $\leq 0.05$ considered statistically significant.

**Results**

The questionnaires were administered to 60 respondents. However, only 55 questionnaires were returned giving a 92% response rate.

The age range of respondents was between 21-65 years with a mean age of 39±10 years. Thirty (54.5%) health workers were females. Majority of the staff were married 41 (74.5%) and had a tertiary level of education 49 (89.1%). Thirty (54.5%) workers had work experience of less than 10 years. The largest proportion of health professionals were nurses 24 (43.6%). Only 14 (25.5%) of the staff had ever attended training on violence prevention.

Among the respondents, 33 (60.0%) had ever been attacked by a patient and 21 (38.2%) said the attack occurred

within the last 12 months. The nurses 18 (75.0%) were the health workers mostly assaulted in the department of psychiatry. Out of the 38 persons that were assaulted, only 10 (26.3%) was reported. The study findings showed no statistically significant association between the various socio-demographic factors and prevalence of physical assault among the health workers.


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**Table 1:** Socio-demographic Characteristics of Respondents

| Variables | Assaulted (%) n=33 | Not assaulted (%) n=22 | Total (%) n=55 | $\chi^2$ | df | p |
|---|---|---|---|---|---|---|
| **Age in years** | | | | | | |
| 21-30 | 6 (37.5) | 10 (62.5) | 16 (29.1) | **Fisher's p= 0.193** | | |
| 31-40 | 9 (75.0) | 3 (25.0) | 12 (21.8) | | | |
| 41-50 | 14 (66.7) | 7 (33.3) | 21 (38.2) | | | |
| >50 | 4 (66.7) | 2 (33.3) | 6 (10.9) | | | |
| **Mean age** 39±10 | | | | | | |
| **Gender** | | | | | | |
| Female | 12 (40.0) | 18 (60.0) | 30 (54.5) | 0.205 | 1 | 0.430 |
| Male | 11 (44.0) | 14 (56.0) | 25 (45.5) | | | |
| **Tribe** | | | | | | |
| Plateau indigenous | 18 (60.0) | 12 (40.0) | 30 (54.5) | 0.000 | 1 | 1.000 |
| tribe | 15 (60.0) | 10 (40.0) | 25 (45.5) | | | |
| Others* | | | | | | |
| **Profession** | | | | | | |
| Doctors | 6 (50.0) | 6 (50.0) | 12 (21.8) | 4.013 | 2 | 0.134 |
| Nurses | 18 (75.0) | 6 (25.0) | 24 (43.6) | | | |
| Others** | 9 (47.4) | 10 (52.6) | 19 (34.6) | | | |
| **Marital status** | | | | | | |
| Married | 26 (63.4) | 15 (36.6) | 41 (74.5) | 1.904 | 1 | 0.386 |
| Single & widowed | 7 (50.0) | 7 (50.0) | 14 (25.5) | | | |
| **Level of education** | | | | | | |
| ≤ Secondary | 3 (50.0) | 3 (50.0) | 6 (10.9) | 0.281 | 1 | 0.596 |
| Tertiary | 30 (61.2) | 19 (38.8) | 49 (89.1) | | | |
| **Duration of practice** | | | | | | |
| **(years)** | 15 (50.0) | 15 (50.0) | 30 (54.5) | 2.750 | 1 | 0.097 |
| 1-10 | 18 (72.0) | 7 (28.0) | 25 (45.5) | | | |
| 11-35 | | | | | | |
| **Training on Violence prevention** | | | | | | |
| Yes | 10 (30.3) | 23 (69.7) | 33 (60.0) | 1.022 | 1 | 0.312 |
| No | 4 (18.2) | 18 (81.8) | 22 (40.0)) | | | |

***Igbo, Yoruba**
****social workers, psychologists, pharmacists, attendants, cleaners, records staff**
*****Fisher's exact test**

A high proportion of the victims of physical assault were hit 19 (34.5%) which was closely followed by attempted rape 15 (27.3%), pushing 13 (23.6%) and being spat-on 12 (21.8%). Physical assault occurred mostly at the wards 24 (72.4%) and occurred least at other places 1(1.8%). Most respondents 37(67.3%) indicated that there was no channel available for reporting physical assault. Thirty-five (63.6%) respondents had no knowledge of any support system available to victims of physical assault, however 16 (29.1%) indicated that medical leave was given to victims.

**Table 2:** Pattern of physical assault experienced by respondents

| Variable | Frequency (n=55) | Percentage (%) |
|---|---|---|
| **Type of physical assault*** | | |
| Hit | 19 | 34.5 |
| Sexual assault | 15 | 27.3 |
| Pushed | 13 | 23.6 |
| Spat on | 12 | 21.8 |
| Kicked | 5 | 9.1 |
| Shaken | 5 | 9.1 |
| Beating | 4 | 7.3 |
| Struck with object | 3 | 5.5 |
| Attempted strangling | 2 | 3.6 |
| Others** | 6 | 10.9 |
| **Location where physical assault occurred** | | |
| Ward | 24 | 43.6 |
| Clinic | 6 | 10.9 |
| Emergency unit | 2 | 3.6 |
| Other places | 1 | 1.8 |
| **Availability of a channel for reporting physical assault** | 18 | 32.7 |
| Yes | 37 | 67.3 |
| No | | |
| **Support systems available for victims** | | |
| None | 35 | 63.6 |
| Medical leave | 16 | 29.1 |
| Paid visit to psychologist | 2 | 3.6 |
| Monetary compensation | 2 | 3.6 |

*Multiple responses allowed
**splashed water on, stoned

## Discussion

The current study reveals that physical violence against health workers exists in Jos, Nigeria just like in other parts of the world.[4,8,11,12,15] The lifetime and twelve months prevalence rates obtained in this study are similar to the rates previously reported by the study conducted in Botswana.[15] However, the lifetime and twelve months prevalence rates obtained in this study are respectively higher than the rates previously reported in the study conducted among mental health workers in Lagos, Nigeria.[4] The disparity may be attributed to the fact that, unlike the survey conducted in Lagos which was restricted to professional mental health staff, expectedly more competent in handling potentially aggressive patients, our study included other hospital workers that are not suitably trained for such and may be more at risk of experiencing violence. The high prevalence of violence in this study underscores the need to take critical actions in curtailing the occurrences which have become a public health threat. Various ways have been proposed, and these include raising awareness on the likelihood of the event, frequent incidence reporting and reviewing, adequate staffing, the use of different methods of restraint, and regular training in early identification of potentially violent patient.[3,21]

The results of this study support earlier investigations that nurses are significantly more at risk than other healthcare providers in their lifetime and over the past twelve months to experience

violence and aggression perpetrated by patients.[4,8] Studies have established that, apart from the fact that nurses spend more time with patients, and set rules and limits on the permissible type of behaviour, they are, of all members of the health team, the closest to the patients.[22,23] This finding is useful in guiding the development of protocols in violence prevention programs, as emphasis may need to be directed at this group of highly exposed professionals.

In the present study, there was no difference in gender or the age-groups studied, of those who reported being attacked, both in their period of employment in the hospital and in the past 12 months. There have been conflicting reports on factors that influence the risk of violence against health care providers. Some authors believe that female staff, and older staff are associated with higher risk of violence in health care services[10,22] while some have contrary reports.[8] For example, an Arabian study found a positive relationship between male staff and violence, unlike what has been reported in earlier studies.[8,10] This disparity may be related to the cultural practice in the region which gives extra respect to the female.[8] The disparity in gender association with violence is partly a reflection of cultural influence or other stronger but unexplored factors which could be investigated in future studies.

Longer duration of service was found to be associated with violence in the present study, which is similar to the studies by other researchers.[4, 15] Ukpong and colleagues compared physical assaults by psychiatric patients against the staff of two psychiatric hospitals and found that the staff in the hospital where physical assaults were higher had long years of employment.[4] Longer duration of service by staff of the department perhaps may only translate to more exposure to violence. This means that the number of years spent in service alone does not correlate with a wealth of experience in escaping violence, and frequent sessions of training and retraining of staff may be necessary. It is notable to find that respondents reported receiving little support from the management and that there was no channel for reporting cases of physical assault in the Jos University Teaching Hospital. The consequences of physical attacks or violence on care providers, lack of support from the management and opportunity to seek redress may have an untoward effect on productivity and service delivery if not adequately addressed. Therefore, in addition to reporting assaults, policies on seeking redress should be put in place.

A limitation of this study is the possibility of recall bias on the side of the respondents especially with lifetime prevalence of work place violence.

## Conclusion

A significantly high percentage of staff at the psychiatric department of JUTH had experienced physical violence in their lifetime. Physical violence was highest among the nursing staff and among those with more years of practice. Majority of the staff had received no training on violence prevention and there was little or no support for victims of physical violence. Based on these findings, it is recommended that protocol on handling of cases of physical violence should be developed by the Psychiatric Department, JUTH and there should be periodic training of the staff of the department on violence prevention with specific attention given to the nurses who are often recipients of this physical assault. In addition, support systems such as medical leave, payment of medical bills for any treatment and paid visits to the psychologist should be made available to victims of physical assault by the management of the hospital.

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TYO, NBD, OKM and OED were involved in the conceptualization and development of the research protocol for this study.

NBD and OED were part of the data collection team

TYO, NBD and OED did the data analysis All the authors were involved in drafting of the manuscript

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# JUVENILE OVARIAN GRANULOSA CELL TUMOUR: A CASE REPORT

**Authors: Iornum Hembe Shambe, Jamila Ali.**
Department of Obstetrics and Gynaecology, University of Jos

## ABSTRACT
Granulosa cell tumours of the ovary are rare ovarian tumours but the commonest of the sex cord stromal tumours. They typically have good prognosis. Presentation in premenarchal women or those in their reproductive years is mostly managed by conservative surgery.
We present the clinical characteristics, diagnosis and treatment in an 18year old female who presented with progressive abdominal swelling and pain.

**Key words:** Juvenile, granulosa cell, Tumour, ovary

## INTRODUCTION:
Granulosa cell tumours of the ovary are a rare type of sex cord stromal tumour of the ovary which typically present at early stages with good prognostic outcomes when compared to other epithelial tumours. They are usually hormonally active secreting oestrogen and are predominantly solid lesions with less common cystic, unilocular forms. They account for 1-2% of all ovarian malignancies and 95% of germ cell tumours that originate from sex cord stromal cells.[1,2]

Based on age, this type of tumour is subdivided into Adult (AGCT) and Juvenile types (JGCT) which represent 95% and 5% of cases respectively.[3] The adult types are usually common in the 5th decade of life while the juvenile types are rarely seen with a majority seen before puberty or in females aged less than 30 years. JGCTs are more likely to be hormone secreting tumours as well which may present with irregular vaginal bleeding, pseudo puberty or in virilization some rare instances. Presenting symptoms vary with the stage at diagnosis but abdominal pain and distension are common.[4]
In this case study, the clinical presentation, imaging features, as well as the histopathological features and treatment are discussed with the relevant review of literature.

## CASE REPORT
A.S was an 18 year old female Po+° who was referred to the gynaecological emergency unit of Jos University Teaching Hospital (JUTH) from the General Out Patient Department, with a complaint of progressive, painless abdominal swelling of 8 months duration. The swelling started in the right iliac fossa, gradually increasing in size to involve the whole abdomen. There was associated early satiety, and difficulty in breathing but no cough. There was no history of fever or change in her urinary or bowel habits. She had lost weight and had easy fatigability. She had noted a deepening of her voice since the illness started.
There was no history of abnormal vaginal bleeding, and there was no history of ovarian, endometrial or breast cancer in her family.
On examination, she was a young girl who was chronically ill-looking, pale and jaundiced. She was not dehydrated and no regional lymph nodes were enlarged.
She was tachypnoeic with a respiratory rate of 22 cycles per minute. There were vesicular breath sounds in the chest with no added sounds. The cardiovascular system was essentially normal.
The abdomen was grossly distended, with generalized tenderness but no guarding. The Intra-abdominal organs difficult to palpate due to ascites. There was a huge intra-abdominal mass extending from the right iliac fossa to the epigastrium measuring approximately 35cm x 20cm .The mass was firm with a delineable upper limit but the lower limit could not be appreciated.
Ascites was demonstrable by a fluid thrill
A pelvic examination showed clitoral hypertrophy with an intact hymenal ring intact .There was good perianal hygiene. A digital rectal examination showed good sphincteric tone, the rectal mucosa was freely mobile with fullness felt at anterior rectal wall.

An impression of an ovarian Tumour was made.

**INVESTIGATIONS**: Her Packed Cell Volume (PCV) was 20% and a White blood cell count showed a lymphocytosis of 14.6 x $10^9$ cells accounted for by a neutrophilia of 83%.The urea and electrolytes and Liver function tests were essentially normal.

Abdomino-pelvic Scan showed a huge right adnexal mass with cystic and solid components. An abdominal CT scan showed a huge Intra-abdominal complex cystic mass.

The Bed site clotting time was 6 minutes

Alpha-fetoprotein (AFP) was elevated - 343.5ng/ml, Lactate dehydrogenase was also elevated LDH – 413.0Iu/l while CA 125 levels were normal. The Hepatitis B test and Human immunodeficiency virus assays were non-reactive.

She was transfused with 3 units of blood over 3 days and subsequently had staging laparotomy where a Right total salpingo-oophorectomy and an infracolic omentectomy was performed with the following findings.

- 4 litres of straw coloured ascitic fluid + 1 litre of bloody fluid from a ruptured cyst which also contained some yellowish green gelatinous substance
- Huge Right Ovarian trilobular masses with the largest measuring about 30cm x 22cm x 10cm.Capsule intact
- Grossly normal left tube and ovary with normal sized healthy looking uterus
- Grossly normal liver and spleen. No tumour seedlings, No intra-abdominal nodules palpated.
- Fibrous adhesions between the ovarian tumour, ileum and mesentery
- EBL – 100ml

Her post op condition was satisfactory. She was placed on Intravenous Ceftriaxone and metronidazole and given intramuscular analgesics: Pentazocine and Diclofenac .She had intravenous fluid for 48 hours.

Samples were sent for Cytology and Histology.

Cytology - showed inflammatory cells and histology showed a Granulosa cell tumour

FIGO Stage was ascertained to be IA

She was transfused with 3 more units of blood transfused after a post op PCV of 16%. She was discharged with a post transfusion PCV of 31% to the gynaecological outpatient unit. When reviewed in the clinic 3 weeks post operatively, the deepened nature of her voice had reduced and the clitoral hypertrophy observed before surgery, had resolved.

**Figure 1:** Miss A.S after being anaesthetized shortly before surgery

**Figure 2:** The ovarian tumour after being mobilized from the abdominal cavity

**Figure 3**: Tumour after removal

## DISCUSSION:

Ovarian tumours affect women of all age groups. In Jos University Teaching Hospital, the commonest histological variant of ovarian cancers was reported to be epithelial cancers which accounted for 55% of cases with the age at presentation of between 20-70 years.[5]

A 10 year review of ovarian tumours in Zaria, showed an age range of 8-80 years with granulosa cells such as in the reported case being the second commonest cell tumour accounting for an incidence 23.1% while serous cyst adenocarcinomas were commonest accounting for 41% of cases.[6]

In Nigeria ovarian cancers are the second commonest gynaecological cancers after cervical carcinonoma.[7,8]

The anatomical inaccessibility of the ovary coupled with the absence of a defined premalignant stage has made it difficult to develop a reliable screening technique for early detection of ovarian tumours. Most cases of ovarian tumours therefore present with advanced disease .More than 75% of cases present in advanced stages.[9,10] Generally, nulliparity, age, family history or infertility with the use of ovulation induction agents are risk factors for the development of ovarian malignancies.[11,12]

Juvenile ovarian tumours are ovarian sex cord stromal tumours which have a mean age of occurrence of 13years but 80% occur before the age of 20 and 97% before the age of 30 and rarely secrete androgens.[13] Virilization was evident in the presented patient with the deepening of her voice and clitoral hypertrophy even though there was no assay for androgens, the signs of virilization reduced 3 weeks after salpingo-oophorectomy.

Favorable prognosis is reported especially when the tumour is diagnosed in stage I such as was the case with this patient and conservation of the contralateral ovary and the uterus is sufficient treatment if they appear normal. Presentations at FIGO Stage III and above are however likely to recur and require adjuvant chemotherapy with carboplatin and etoposide.[14]

The primary treatment of JGCTs is surgical but those with advanced or recurrent disease benefit from chemotherapy and/or radiotherapy. The risk of recurrence is addressed post operatively by frequent pelvic examinations and use of tumour markers that will aid detecting recurrent disease early.[15] Optimal management protocols of these tumours have been difficult to ascertain by randomized control trials but a majority of patients with stage I disease have 10 year survival rates of 94.4%.[16]

Complete Surgical staging for this disease requires a thorough examination of pelvic and abdominal organs as was done in this patient and removal of all visible tumour. In younger patients such as the presented case who desire future fertility, unilateral salpingo-oophorectomy is sufficient. A review of 63 of such cases by Zanagnolo showed no recurrence with such conservative management with early tumours with 5 out of 11 patients becoming pregnant.[17]

**CONCLUSION**: A case of an 18 year old with Juvenile Granulosa Cell Tumour is presented. The clinical and surgical management was discussed and literature reviewed.

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# CORRELATION OF HEIGHT WITH ARM SPAN OF ADULT MALES IN JOS, NIGERIA

**Mosugu, O.O.,* Nyam, J.C., Shinku, F. and Mador, E.S.**
Department of Human Anatomy, Faculty of Basic Medical Sciences, University of Jos.
***Corresponding author:** Mosugu Ovayoza Omolara
Email: ovaza@yahoo.com
Phone number: 08035883134

**Abstract**
This research was aimed at ascertaining the existence of a relationship between the standing height of adult males in Jos and his arm span and to derive equations that will be used to predict standing height from arm span measurements and vice versa. With these equations, adult male height can be predicted in conditions where it cannot be easily measured. This descriptive, cross sectional study examined the relationship between standing height measurements and arm span measurements of 226 apparently healthy, randomly selected, consenting adult male students who fit the inclusion criteria. Measurements of standing height and their corresponding arm spans were taken using standardized methods and instruments and data collected was analysed using NCSS/ PASS 2006 Dawson Edition, USA.
Mean age of the subjects was 25± 4 years while mean standing height and mean arm span of males was 172.3± 9.7cm and 186.9 + 9.0cm respectively. Correlation regression analyses done showed that arm span could predict height in males by 98.7% i.e. $R^2 = 0.987$ ($P<0.05$) and height could predict arm span by 98.7% ($R^2 = 0.987$) using simple linear equations derived.

**Key words:** relationship, height, arm span, male, Jos.

## Introduction

Anthropometry is the study of the science of measurement basic to physical/biological anthropology. [1] Generally, variations measured in anthropology are those regulated by multiple genetic factors. Thus, some of the easiest anthropometric parameters to measure include height and weight which vary from community to community in mean values and from tribe to tribe. While there is a wide range of variation in anatomical proportions between people, much reference has been made to body proportions that are intended to be canonical, either in art, measurement or medicine. Average height is vital to the estimation and assessment of health and wellness (standard of living and quality of life) of populations and like other phenotypic traits, it is determined by a combination of genetic and environmental factors. [2] The evidence of the interplay of these determining factors is further elucidated in parts of Europe and especially within the egalitarian populations where proper medical care and adequate nutrition are relatively equally distributed. This could be responsible for the trend of increasing height. [3] On the contrary, under-nutrition and malnutrition as well as inadequate medical care, seen in developing countries are associated with stunted growth.

Arm span (also known as 'reach' or wingspan) refers to the length from one end of an individual's arms (measured at the fingertips) to the other, and it also varies with height. This variation may sometimes be an indicator of a health problem. The measurement of stature is important in many settings. Height measurement is vital for the estimation and evaluation of a number of health indices including growth, development and nutritional indices of children as well as adults, assessment of respiratory, metabolic and muscle function and for proper drug dosage in patients.[4] However, in some situations, the exact height cannot be determined directly because of deformities of the limbs or in patients who have undergone amputations. In such circumstances, an estimate of the height has to be computed based on measurements of other body parts. These estimations are also significant in predicting age-related loss in stature, identifying individuals who

have growth abnormalities as well as conditions that affect the spine such as skeletal dysplasia or height loss secondary to surgical procedures performed on the spine.[5] Another application for the use of estimated height values is in normalizing pulmonary function in scoliosis.[6] Also, indirect measurements of stature via other anthropometric indices help in predicting age-related loss in stature, in identifying individuals with disproportionate growth abnormalities and skeletal dysplasia. It could also be utilized in sport settings in estimating the stature of wheel chair athletes or other athletes with limb disabilities or deformities.[4] This study's goal was to ascertain the existence of a relationship between arm span and height of adult males in Jos, the significance of this relationship as well as to derive equations that can predict height from arm span and vice versa.

## Materials and methods

This was a descriptive cross-sectional study carried out on 266 randomly selected, consenting male students of the university of Jos aged between 18 and 55. Subjects with physical deformities involving the spine and the limbs were excluded from the study. Subjects that were below the age of 18 years were also excluded because they are still growing so also were those above 55 years of age since they are likely to have degenerative disorders of the joints. Every subject was measured and included only once so that a pure cross-sectional set of data was constructed and for each subject, the age (calculated in completed years at the moment of the data collection), sex, measured arm span and standing height were recorded.

The height and hemi span of each subject was measured using standard methods according to **International Society for the Advancement of Kinanthropometry** (ISAK) 2001 guidelines, hemi span measurements were then multiplied by two (2) to obtain the total arm span. Statistical analysis was performed using Number Cruncher Statistical System (NCSS/PASS 2006 Dawson Edition, USA). Means, standard deviations and standard errors of mean were determined and regression analyses were carried out.

## Results

A total of 266 young adult males were studied for estimation of height from arm span measurements. The mean age of the subjects was 25 ± 4 years with minimum age being 18 years and maximum 55 years. Table 1 shows the descriptive statistics of the measured parameters. Mean height of the sampled adult males is 173.3 ± 7.1 centimeters while their mean arm-span is 186.9 ± 9.0 centimeters.

**Table 1**: Distribution of arm span in males showing mean, standard deviation and standard error of mean with corresponding height in centimeter.

| Height (cm) | Frequency | Mean Arm Span (cm) | Standard deviation | Standard Error |
|---|---|---|---|---|
| 155 – 159 | 5 | 174.8 | 5.1 | 2.3 |
| 160 – 164 | 19 | 178.7 | 5.4 | 1.2 |
| 165 – 169 | 58 | 181.6 | 4.6 | 0.6 |
| 170 – 174 | 65 | 185.3 | 8.6 | 1.1 |
| 175 – 179 | 43 | 192.2 | 4.6 | 0.7 |
| 180 – 184 | 22 | 196.1 | 6.6 | 1.4 |
| 185 – 189 | 14 | 201.4 | 2.7 | 0.7 |
| TOTAL | 226 | | | |

Mathematical modelling of male height data plotted against mean arm span demonstrated that the best-fitted regression model (figure 1) to describe the relationship between male arm span and their standing height was the linear equation $y = 1.104x - 34.69$ with a correlation of determination $R^2 = 0.987$ ($P < 0.05$) where y is the height in centimeters and x is the arm span in centimeters. This means that arm span could predict the height of males in Jos by 98.7%.

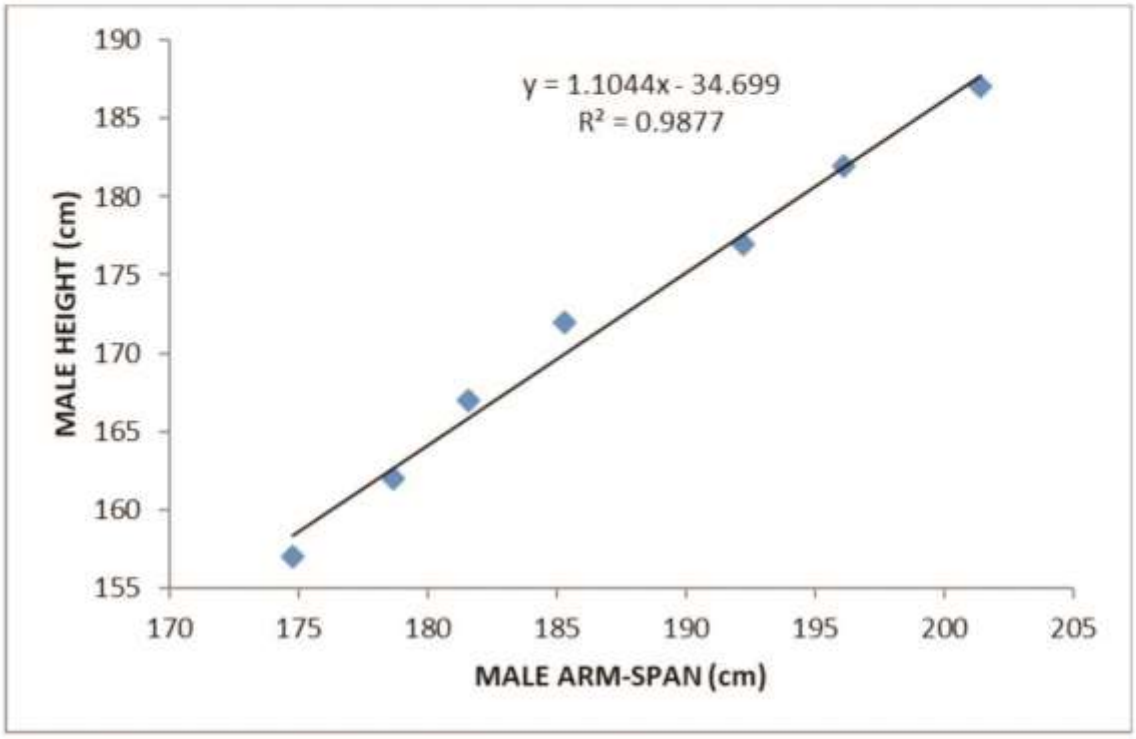


**Figure1:** Correlation and regression graph showing male height plotted against male arm sapn.

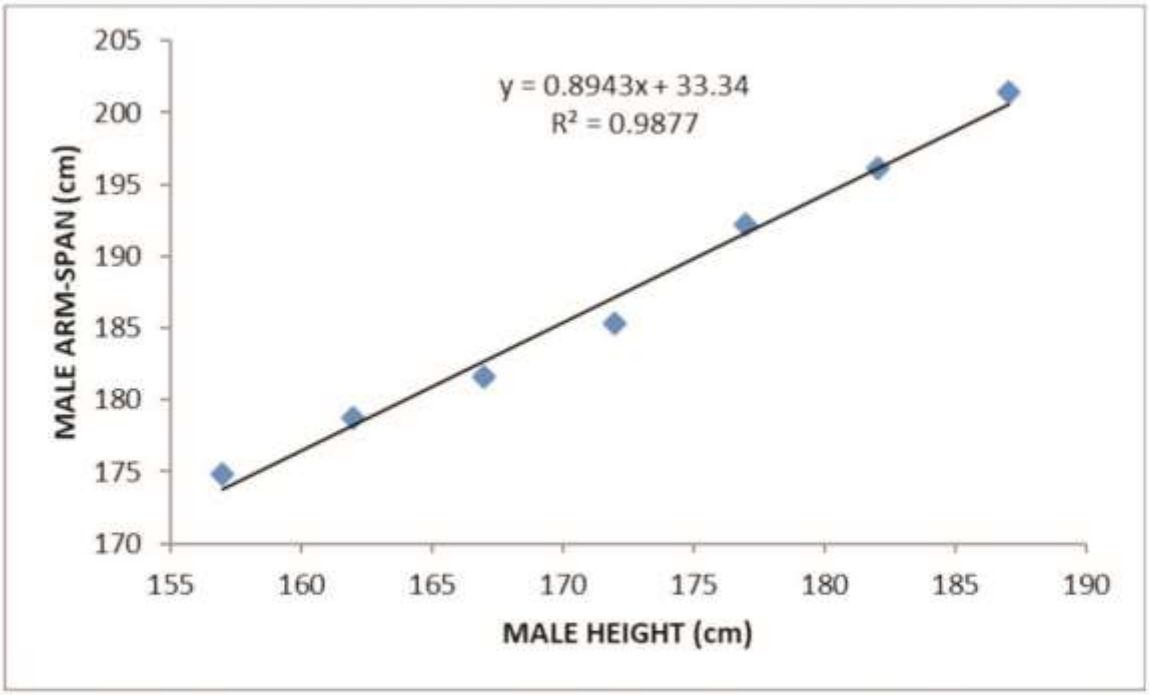


**Figure 2:** Correlation and regression graph showing male arm span plotted against male height.

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The other way around, when arm span is plotted against height (figure 2) the best mathematical model to describe the relationship was the linear equation $y = 0.894x + 33.34$ with a correlation of determination of $R^2 = 0.987$ ($P < 0.05$) where y is the arm span in centimeters and x is the height in centimeters. This means that height could predict the arm span of males in Jos by 98. 7% ($R^2 = 0.987$) in 226 males in this study.

## Discussion

This study was specifically aimed at finding out whether there exists a relationship between the arm span and the height of male adults in Jos, Nigeria and to derive equations that can determine height from arm span and vice versa. Stature and its determination are necessary and valuable tools in art, forensic medicine and more importantly in the health care.

It is useful to health care givers for calculating drug dosage for treatment, as well as for monitoring growth and other health indices. To artists it is useful in determining body proportions. It is also crucial to forensic anatomists and morbid anatomists, to be able to determine height of victims of crime with dismembered body parts or those burnt beyond recognition, for identification when solving crimes. However, sometimes for one reason or another, height cannot be determined and must be estimated using another parameter / body index such as the arm span. This can only be done by use of an equation/formula that relates standing height and arm span. In this study, analyses were done to ascertain the existence of a relationship between standing height and arm span of adult, male Nigerians and the strength of this relationship.

The findings of the present study have confirmed what several other investigators [4,5,7,8] reported, that arm span can be used to predict height confidently. When compared with similar studies done in Benue state Nigeria [4] where stature in the men ranged between 167.2 – 167.8 cm and the mean height 172.7 – 175.8 cm, the values obtained in this study are higher but lower than those obtained from Montenegrins in a similar study. [9] However, there is an assumption that Montenegrins are still the tallest population in Europe [9] and this genetic predisposition for tallness may be responsible for the higher mean values of height in both males and females when compared to those of obtained from this study. Also, European countries are more developed than African ones (such as Nigeria) and have better nutrition and thus better/healthier growth.

In this study, regression equations that can predict the stature of a Nigerian male adult from his arm span ($y = 1.104x - 34.69$ with $R^2 = 0.987$) and arm span from the height ($y = 0.894x + 33.34$ with $R^2 = 0.987$) were derived. It is necessary to emphasize here that although similar work to this one has been done all around the world and documented, there is yet to be any documented report with regression equations that can predict height from arm span and vice versa, in Nigerian males.

## Conclusion

Both standing height and arm span of humans are basic anthropometric indices which vary with age and population and are vital anthropometric tools that are very useful in clinical/health management. This study has demonstrated strong relationships between the standing height of adult males in Jos and their arm span and has yielded equations for the prediction of height from arm span and vice versa. These findings are of great use to the clinicians for effective delivery of health care in Nigeria and other parts of the world, forensic scientists as well as artist. The findings of this study also provide valuable information and contribute to the data base for adult males in Nigeria.

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# BLOOD PRESSURE PATTERN IN HEALTHY NIGERIAN ADOLESCENTS (ADOLESCENT BLOOD PRESSURE IN NORTH CENTRAL NIGERIA)

**TYPE OF MANUSCRIPT:** ORIGINAL SCIENTIFIC COMMUNICATION
**SHORT RUNNING TITLE:** Adolescent BP in Nigeria

**AUTHORS:**

1. **Ajanaku IT**, Consultant Paediatrician, Department of Paediatrics, University of Abuja Teaching Hospital, Gwagwalada, Abuja, Nigeria
2. **Ogunkunle OO**, Reader, Department of Paediatrics, College of Medicine, University of Ibadan, Nigeria
3. **Offiong UM,** Consultant Paediatrician, Department of Paediatrics, University of Abuja Teaching Hospital, Gwagwalada, Abuja, Nigeria

**Corresponding Author:** Dr IT Ajanaku
Department of Paediatrics, University of Abuja Teaching Hospital, Gwagwalada, PMB 228, Abuja, Nigeria
Mobile: +234 803 5903 705 Email: saakwen@yahoo.com

## ABSTRACT

### Background

The rising prevalence of primary hypertension in the paediatric population worldwide presents a worrisome trend, emphasizing the need to determine blood pressure (BP) levels and its correlates in healthy Nigerian adolescents.

### Materials and Methods

A cross-sectional study of 1179 students aged 10-17 years (538 males and 641 females) was conducted in Gwagwalada. BP was measured using the mercury sphygmomanometer.

### Results

Mean (SD) SBP increased significantly from 96.7 (10.8) mm Hg at 10 years, to 116.8 (11.1) mm Hg at 17 years, $p < 0.01$. Mean (SD) DBP also increased significantly from 62.8 (8.3) mm Hg at 10 years, to 74.5 (10.6) mm Hg at 17 years, $p < 0.01$. SBP and DBP correlated positively and significantly with age, weight, and body mass index, $p < 0.01$. Independent predictors of SBP were age ($\beta = 0.154$, $p < 0.01$), and height ($\beta = 0.281$, $p < 0.05$), and age ($\beta = 0.205$, $p < 0.01$), and weight ($\beta = 0.527$, $p < 0.05$) for DBP. There was no significant relationship between blood pressure, and gender, socio-economic class, and place of residence, $p > 0.05$, respectively. The prevalence of systolic and diastolic hypertension was 8.0 and 6.8 percent, respectively.

### Conclusion

The significant correlation of BP with age and body size highlights the need for age and anthropometry based regional BP reference charts.

## INTRODUCTION

Hypertension is one of the most common non-communicable diseases in developing countries, and constitutes a major health problem worldwide.[88] It contributes significantly in itself, and as a major risk factor for cardiovascular disease, to the huge global burden of morbidity and mortality from preventable causes.[88] Childhood blood pressure has been described as the strongest of all known predictors of adult blood pressure.[1] And substantial evidence has established that the

roots of adult hypertension, extend into adolescence and childhood.[1-7] Thus, in the prevention of adult hypertension and its sequelae, it is crucial, not only to ensure normal blood pressure levels, but also to identify early those children at risk, as well as to expedite effective management of elevated blood pressure levels in children and adolescents.[42]

The recognition of these facts, as well as the rising prevalence of essential hypertension in children and adolescents and the long term health risks,[8-10] have emphasized the need to determine the normal blood pressure distribution and its correlates in the paediatric age group, for early identification and management of those found to have elevated blood pressure levels.[11-14] The success of such preventive strategies in any population, requires in-depth knowledge of the blood pressure distribution and its correlates, for standard epidemiologic definitions of normal and abnormal blood pressure levels, for the target population.[2,42]

Blood pressure is affected by several factors, which include age,[1-12,36-39] gender,[10,19] body size,[13,38,40] race or ethnicity,[9,14,30] socioeconomic status,[29,41] and environment or place of residence.[23,25,28] Over the last few decades, studies on paediatric blood pressure pattern and its correlates have been conducted in different populations.[15-30] A number of these have demonstrated some variation in the levels and trends of blood pressure, from one population to another,[19-22] suggesting possible population differences in responses, to some of the factors that influence blood pressure levels, notably growth and maturation patterns.[19-22]

Numerous studies on blood pressure profiles in Nigerian children, have been conducted in different localities of the country, using different methods.[10,25-29,39,41,50,51] However, a greater proportion of these studies have been in the southern part of the country,[10,26,29,39,41,50,51] with fewer documented studies in the north,[25,27,28] and none involving children living in the Federal Capital Territory (FCT) documented. It is noteworthy that this area has an attendant rapid urbanization rate. This study was therefore, undertaken to describe the blood pressure pattern of apparently healthy adolescents aged 10 to 17 years, residing in Gwagwalada Area Council of the FCT, Nigeria.

## SUBJECTS AND METHODS

The study was a prospective, descriptive, and cross-sectional one, carried out in secondary schools in Gwagwalada Area Council, of the Federal Capital Territory of Nigeria (FCT), between January and March, 2012. A multi-stage sampling technique was used to select 1292 subjects for the study. Apparently healthy students aged 10 to 17 years, with informed and written consent from parents/guardians and child, were included in the study.

There were 16 accredited co-educational secondary schools in the area council, with a total population of 24,023 students. Ten schools (6 public, 4 private) were located in the urban areas, and 6 (3 public, 3 private) in the rural areas. Three urban schools (2 public and 1 private) and 2 rural schools (1 public, 1 private), representing 30 percent of schools in the urban and rural areas, respectively,[93] were selected by ballot, with a total number of 9302 students in the sample frame. The sample fraction was then calculated to obtain the number of subjects selected from each school by proportional allocation of the sample size i.e. (number of students in a selected school x calculated sample size) ÷ total number of students in the sample frame. The selected schools were stratified into classes, and subjects were selected from each class using the class registers at the calculated sample interval of 7 (9302 divided by 1292). Students who declined to participate, or failed to meet the inclusion criteria were replaced by the next student on the roll, until recruitment was completed.[94]

## DATA COLLECTION

The selected schools were visited during weekdays, between 8 a.m. and 2p.m. At the first contact, the selected subjects were introduced to the investigator and trained assistants, and the objectives of the study were explained to the subjects. Questionnaires requesting information on socio-demographic characteristics, and consent forms were given to each subject to be completed and signed at home by both the subjects and a parent or guardian. Socio-economic class (SEC) was assigned to subjects using the father's occupation and mother's educational level.[95] Questions on the presence of illnesses suggestive of cardiovascular, respiratory, renal and endocrine disorders, as well as drug history were also included. At the second contact, each questionnaire and consent form was checked for proper

completion and consent. Subjects with a history of illnesses or use of medication known to affect blood pressure, as well as abnormal urinalysis, were excluded from further participation in the study. A thorough physical examination was performed on each subject by the investigator in a screened area of the room, in the presence of a gender-appropriate chaperone, with emphasis on the cardiovascular and respiratory systems, as well as the abdomen. A clinical mercury-in-glass thermometer was used to measure temperature. Students with abnormal examination findings were also excluded from the study and referred to the Teaching Hospital, for further evaluation.

**Anthropometry:**

Height in centimeters (cm) was measured using a portable Shorrboard® stadiometer (Shorr Productions, Olney, Maryland). The subject was barefoot, standing erect with the heels, back and occiput against the vertical scale of the stadiometer. The subject's head was positioned to look forward with the lower border of the eye sockets in the same horizontal plane as the external auditory meati. The horizontal board attached to the vertical scale of the stadiometer was then lowered until it touched the subject's head. The scale was then read to the nearest 0.1cm.[96] Weight in kilograms (kg) was measured using a Seca® 878 electronic personal scale, which had an accuracy of 0.05kg. The subjects were weighed standing barefoot, wearing only their school uniforms with emptied pockets, and the weight was read to the nearest 0.1kg. The accuracy of the scale was confirmed daily using standard weights, before weighing of subjects commenced, and repeated at regular intervals.[96] BMI in $kg/m^2$ was calculated by dividing the weight (kg) by the square of the height (m). Age and gender-specific percentiles for height, weight and BMI were determined using the Centres for Disease Control and Prevention (CDC) clinical growth charts[97] to obtain stature-for-age and weight-for-age percentiles, and BMI-for age percentiles, recommended by the World Health Organization (WHO), for international use.[98] Subjects with BMI percentiles equal to or greater than the 95$^{th}$ percentile for age and gender, were classified as obese.[98]

**Blood pressure:**

All blood pressure measurements were carried out by the principal investigator in accordance with the recommendations of the Task Force on BP Control in Children,[2] using a standard mercury sphygmomanometer (Accoson Dekamet®, A.C. Cossor & Son Surgical Ltd, Accoson Works, Harlow, Essex), and the open bell of a Littmann® stethoscope. Measurements were carried out between 8 a.m. and 12 noon in a quiet classroom. The subject was seated and had rested for at least five minutes, and the right arm was fully exposed, extended and supported on a horizontal surface, at the level of the heart. An appropriate-sized cuff covering at least two-thirds of the arm without obstructing the antecubital fossa was used. The centre of the cuff bladder was placed over the inner aspect of the arm, with the width covering at least forty percent of the circumference of the arm. The open bell of the stethoscope was placed in the antecubital fossa, over the brachial artery. The cuff was then rapidly inflated to about 20-30 mm Hg above the point of disappearance of the palpable impulse of the artery, and then deflated slowly at a rate of 2 mm Hg per second, while listening for the Korotkoff sounds. The point at which the Korotkoff sounds became audible (K1), was taken as SBP, while the point of disappearance (K5), was taken as DBP. Readings were recorded to the nearest 2 mm Hg. Three readings were taken at a minimum of 1-minute intervals, with the cuff bladder completely deflated between readings, and the average recorded as the blood pressure. The height Z score, and SBP and DBP Z scores and percentiles were generated for each subject from data and equations provided by the Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents[2]. Any subject with SBP and or DBP percentile equal to or greater than the 95$^{th}$ percentile, was referred to the Paediatric Outpatient Clinic of the University of Abuja Teaching Hospital for further evaluation. Their blood pressure measurements were repeated twice within a maximum of two weeks, and if elevated values persisted, then he or she was classified as hypertensive and the lowest value recorded used in analysis.[2]

**DATA ANALYSIS**

Data was analysed using the Statistical Package for the Social Sciences (SPSS) version 17, and presented in tables and figures. Measures of central tendency (mean, median) and dispersion (standard

deviation, range) and percentiles, were computed for height, weight, BMI, SBP, and DBP, by age and gender, as well as prevalence rates for systolic and diastolic hypertension. Differences in means between any two groups were compared using the Student's t-test, while analysis of variance (ANOVA) was used to compare the means between greater than two groups. Pearson's Chi-square ($\chi^2$) was used to compare differences in proportions, and to determine the relationship between blood pressure and gender, SEC and place of residence, respectively. Pearson's correlation coefficient (r) and multiple linear regression analysis were used to determine the relationship between blood pressure and age, height, weight and BMI, respectively. A p value of <0.05 was considered to be of statistical significance.

Ethical approval was obtained from the Health Research Ethics Committee of the University of Abuja Teaching Hospital, Gwagwalada, the F.C.T. Universal Basic Education Board, the F.C.T. Secondary Education Board and the F.C.T.A. Education Secretariat, respectively. Parents or guardians of subjects found to have elevated blood pressure levels, as well as those excluded from participating in the study on account of abnormal physical findings and urinalysis, were notified, and their children or wards referred to the Paediatric Outpatient Clinic of the University of Abuja Teaching Hospital, Gwagwalada, for further management.

## RESULTS

### GENERAL CHARACTERISTICS OF THE STUDY POPULATION

A total number of 1,292 apparently healthy students were enrolled into the study. 1,179 (91.2%) subjects completed the study, as 113 (8.8%) withdrew before complete anthropometric and blood pressure measurements could be obtained from them.

Table I shows the age, gender, and socio-economic distribution of the subjects studied by place of residence. Mean (SD) age of the subjects was 13.9 (1.9) years (range: 10-17). Subjects aged 10 and 13 years had the least representation (4.4%) and the highest preponderance (15.8%), respectively, in the study population. There were 538 males and 641 females, with a male to female ratio of 0.8:1, and the difference in the proportion of males to females was statistically significant, $\chi^2 = 8.998$, $p < 0.05$. A significantly greater proportion of the subjects resided in the urban areas (59.1%), $\chi^2 = 39.207$, $p < 0.01$, and were from the lower SEC (42.8%), closely followed by the middle (38.1), and distantly by the upper (19.1%), $\chi^2 = 111.7$, $p < 0.01$.

**Table I:** General characteristics of the study population by place of residence

| Socio-demographic factors | Place of residence<br>Urban<br>n = 697 (59.1)<br>n (%) | Rural<br>n = 482 (40.9)<br>n (%) | Total<br>N = 1179 (100.0)<br>n (%) |
|---|---|---|---|
| **Age, years** | | | |
| 10 | 22 (1.9) | 29 (2.5) | 51 (4.4) |
| 11 | 65 (5.5) | 50 (4.2) | 115 (9.7) |
| 12 | 98 (8.3) | 66 (5.6) | 164 (13.9) |
| 13 | 93 (7.9) | 93 (7.9) | 186 (15.8) |
| 14 | 105 (8.9) | 77 (6.5) | 182 (15.4) |
| 15 | 122 (10.3) | 59 (5.0) | 181 (15.3) |
| 16 | 106 (9.0) | 67 (5.7) | 173 (14.7) |
| 17 | 86 (7.3) | 41 (3.5) | 127 (10.8) |
| **Gender** | | | |
| Male | 306 (25.9) | 232 (19.7) | 538 (45.6) |
| Female | 391 (33.2) | 250 (21.2) | 641 (54.4)g |
| **Socio-economic class** | | | |
| Upper | 165 (14.0) | 60 (5.1) | 225 (19.1) |
| Middle | 265 (22.5) | 184 (15.6) | 449 (38.1) |
| Lower | 267 (22.6) | 238 (20.2) | 505 (42.8) |

**Key:** Figures in parentheses are percentages of the total subjects studied, N – total number of subjects, n – number of subjects in each subgroup.

Table II shows the age, blood pressure, and anthropometric characteristics of the study population. The males were older and taller when compared to the females, while the females had higher blood pressure, weight, and BMI than the males. However, the differences in means were statistically significant only with respect to weight, $p < 0.05$.

**Table II:** Age, blood pressure, and anthropometric characteristics of the study population by gender

| Characteristic | Male n = 538 | Female n = 641 | All N = 1179 | t | p |
|---|---|---|---|---|---|
| **Age (years)** | | | | | |
| Range | 10-17 | 10-17 | 10-17 | | |
| Mean (SD) | 13.9 (1.9) | 13.7 (2.0) | 13.9 (1.9) | -0.542 | 0.588 |
| Median | 14.0 | 14.0 | 14.0 | | |
| **SBP (mmHg)** | | | | | |
| Range | 50-150 | 68-158 | 50-158 | | |
| Mean (SD) | 107.3 (13.5) | 108.5 (12.5) | 107.9 (13.0) | -0.175 | 0.861 |
| Median | 108.0 | 110.0 | 110.0 | | |
| **DBP (mmHg)** | | | | | |
| Range | 40-108 | 40-98 | 40-108 | | |
| Mean (SD) | 66.9 (11.0) | 67.9 (12.5) | 67.5 (10.8) | -0.150 | 0.881 |
| Median | 68.0 | 70.0 | 68.0 | | |
| **Height (cm)** | | | | | |
| Range | 120-190 | 115-175 | 115-190 | | |
| Mean (SD) | 154.2 (11.7) | 152.1 (9.2) | 153.0 (10.5) | 0.128 | 0.898 |
| Median | 154.0 | 153.0 | 154.0 | | |
| **Weight (kg)** | | | | | |
| Range | 26-79 | 22-92 | 22-92 | | |
| Mean (SD) | 45.9 (10.8) | 47.4 (10.3) | 46.7 (10.5) | 2.419 | 0.016* |
| Median | 44.5 | 47.0 | 46.0 | | |
| **BMI ($kg/m^2$)** | | | | | |
| Range | 12.9-39.6 | 11.7-43.9 | 11.7-43.9 | | |
| Mean (SD) | 19.1 (2.9) | 20.4 (3.9) | 19.8 (3.6) | -1.647 | 0.100 |
| Median | 18.7 | 19.9 | 19.3 | | |

**Key:** N – Total number of subjects, n – number of subjects in each subgroup, SD – Standard Deviation, SBP – Systolic blood pressure, DBP – Diastolic blood pressure, BMI – Body mass index, *- Mean (SD) weight of females was significantly higher than males, $p < 0.05$.

## PATTERN OF BLOOD PRESSURE

The mean (SD) blood pressure increased significantly from 96.7 (10.8) mm Hg for SBP and 62.8 (8.3) mm Hg for DBP at 10 years, to 116.8 (11.1) mm Hg and 74.5 (10.6) mm Hg at 17 years, respectively, $p < 0.01$. The mean rate of increase for each year was 2.6 mm Hg for SBP, and 1.5 mm Hg for DBP.

The mean SBP and DBP for age and gender are shown in Figures 3 and 4, respectively. Blood pressure increased with age in both genders, with statistically significant increments limited to the mean SBP of the females, $F = 6.509$, $p < 0.05$. The females had higher mean SBP and DBP values in most age groups. These gender differences were, however, not statistically significant, $p > 0.05$.

In female subjects, mean SBP remained static between 13 and 14 years, a trend which was repeated at the same ages for DBP. Another finding of note was the drop in mean DBP in males between 10 and 11 years, by 6.5 mm Hg with a percentage decline of 5.5%.

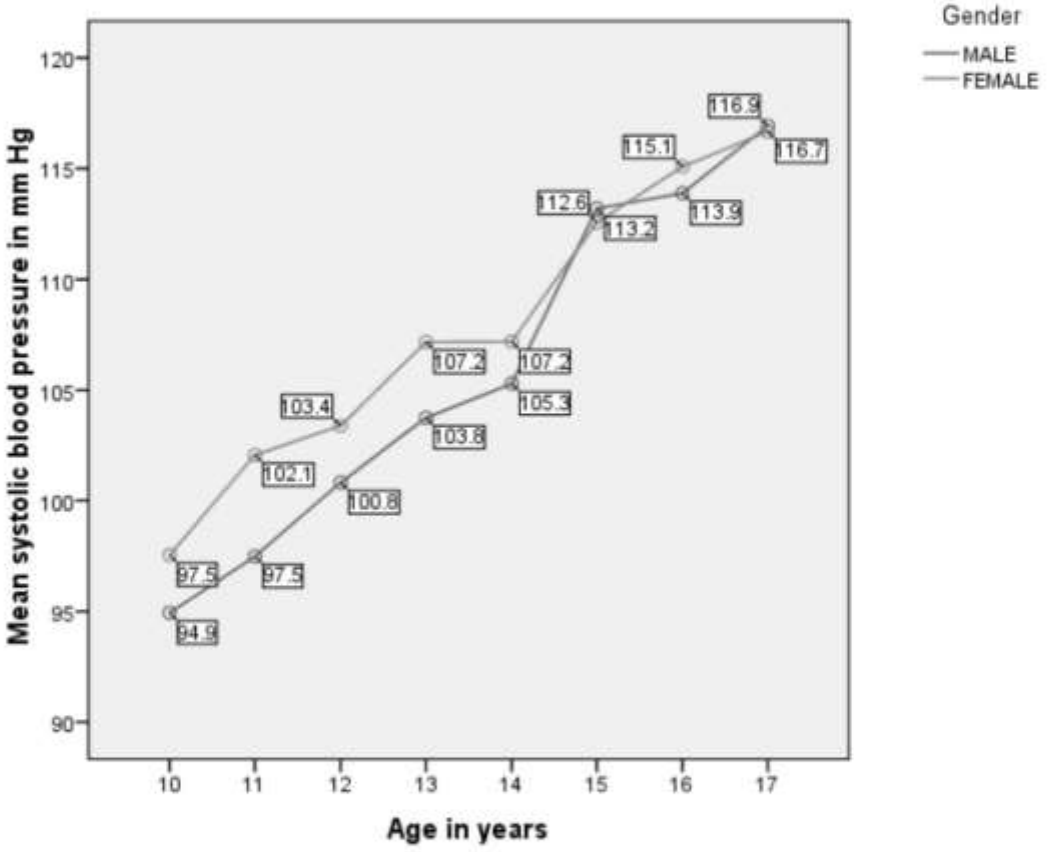


**Figure 1: Mean systolic blood pressure by age and gender**

**Figure 4: Mean diastolic blood pressure by age and gender**

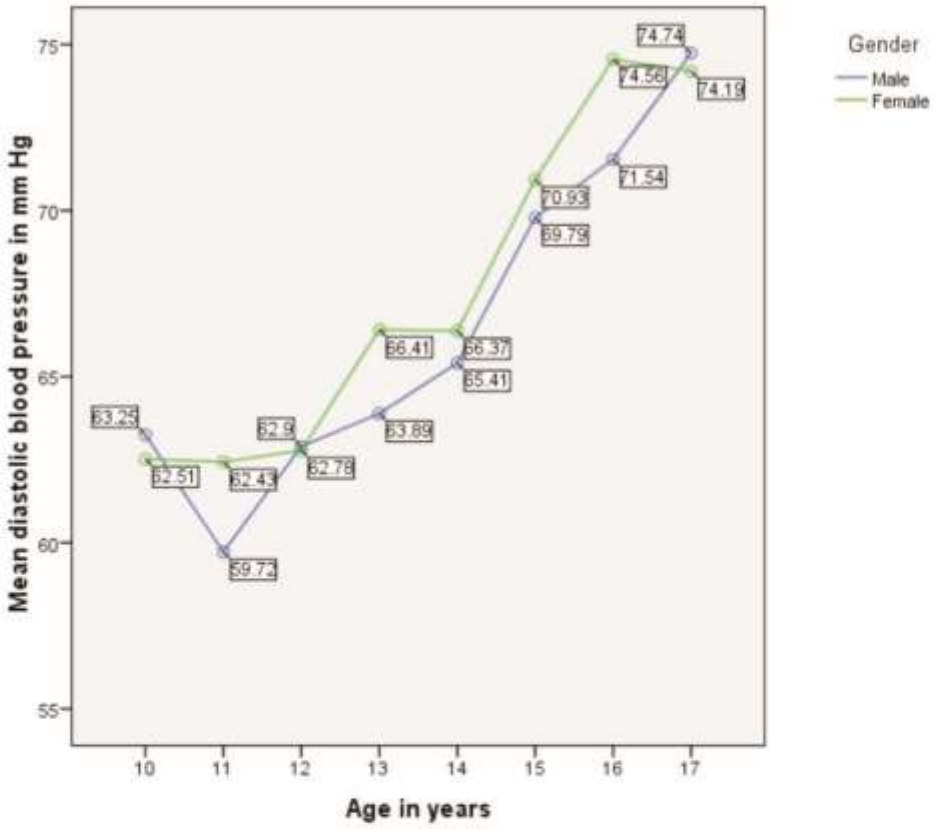


**Figure 2: Mean diastolic blood pressure by age and gender**

## ANTHROPOMETRY

The mean (SD) height, weight, and BMI increased with age in both genders, as shown in Table III. The females were initially taller and heavier, a trend which reversed at 15 and 17 years, respectively, and also had higher mean BMI at all ages. The gender differences in height, weight, and BMI were however not statistically significant, except in the heights of the 12 year olds, and in the BMI at 12, 14, and 15 years. Four point two percent of the subjects had BMI values equal to or above the 95$^{th}$ percentile for age, which categorized them as being obese.

**Table III:** Mean height (cm), weight (kg), and body mass index (kg/m$^2$) of subjects by age and gender

| Age (years) | Height (cm) Male, n=538 Mean (SD) | Female, n=641 Mean (SD) | Weight (kg) Male, n=538 Mean (SD) | Female, n=641 Mean (SD) | BMI (kg/m$^2$) Male, n=538 Mean (SD) | Female, n=641 Mean (SD) |
|---|---|---|---|---|---|---|
| 10 | 137.8 (5.9) | 139.9 (7.3) | 32.2 (3.7) | 34.6 (6.1) | 16.9 (1.4) | 17.6 (2.7) |
| 11 | 142.6 (9.7) | 146.1 (9.5) | 35.4 (6.3) | 40.2 (9.8) | 17.3 (1.9) | 18.9 (5.2) |
| 12 | 147.0 (9.3) | 148.0 (8.4)* | 39.5 (8.3) | 41.3 (8.0) | 18.2 (3.1) | 18.8 (3.1)# |
| 13 | 150.4 (8.4) | 150.9 (7.9) | 43.2 (9.2) | 46.6 (9.5) | 19.1 (3.9) | 20.5 (4.2) |
| 14 | 153.8 (9.1) | 155.2 (7.5) | 44.5 (8.8) | 48.8 (6.5) | 18.6 (2.4) | 20.3 (2.6)# |
| 15 | 158.4 (9.8) | 155.8 (8.0) | 49.7 (9.2) | 51.8 (7.9) | 19.8 (3.2) | 21.4 (3.6)# |
| 16 | 162.3 (9.3) | 155.7 (8.1) | 52.8 (8.5) | 53.2 (7.7) | 19.9 (2.1) | 22.0 (3.3) |
| 17 | 165.1 (7.6) | 157.1 (6.1) | 56.8 (7.4) | 55.3 (11.3) | 20.8 (1.8) | 22.4 (4.2) |

**Key:** SD – Standard deviation, * - Mean (SD) height of females was significantly higher, $p < 0.05$. # - Mean (SD) BMI of females were significantly, $p < 0.05$

## RELATIONSHIP BETWEEN BLOOD PRESSURE, ANTHROPOMETRY AND SOCIO-DEMOGRAPHIC FACTORS

Table IV shows that blood pressure correlated significantly and positively with age, height, weight, and BMI, that is, the older, taller and heavier the subject the higher the blood pressure. Multiple linear regression analysis showed that SBP had a significant positive association with age, β 0.154, $p < 0.01$, and height, β 0.281, $p < 0.05$, while DBP had a significant positive association with age, β 0.205, $p < 0.01$, and weight, β 0.527, $p < 0.05$. Age and height are thus, independent predictors of SBP, while age and weight are

**Table IV:** Correlation of blood pressure with age, height, weight, and body mass index

| Variable | SBP | DBP |
|---|---|---|
| Age | | |
| r | 0.453 | 0.402 |
| p | <0.01# | <0.01# |
| Height | | |
| r | 0.443 | 0.342 |
| p | < 0.01# | < 0.01# |
| Weight | | |
| r | 0.558 | 0.464 |
| p | < 0.01# | < 0.01# |
| BMI | | |
| r | 0.424 | 0.332 |
| p | < 0.01# | < 0.01# |

**Key:** # - SBP and DBP correlated positively and significantly with age, height, weight, and BMI, $p < 0.01$.

Table V, on the other hand, reveals no statistically significant association between blood pressure, and gender, SEC, and place of residence, $p > 0.05$.

**Table V:** Mean blood pressure by gender, socio-economic class, and place of residence

| Socio-demographic variable | N = 1179 n | SBP, mm Hg Mean (SD) | DBP, mm Hg Mean (SD) |
|---|---|---|---|
| Gender | | | |
| Male | 538 | 107.3 (13.5) | 66.9 (11.1) |
| Female | 641 | 108.5 (12.5) | 67.9 (12.5) |
| $\chi^2$, p | | 0.619, 0.203 | 0.019, 0.889 |
| SEC | | | |
| Male - Upper | 97 | 108.9 (13.9) | 70.1 (9.9) |
| Middle | 199 | 107.3 (13.2) | 67.6 (11.2) |
| Lower | 242 | 106.2 (13.6) | 65.1 (11.0) |
| $\chi^2$, p | | 2.377, 0.305 | 2.758, 0.252 |
| Female - Upper | 128 | 108.5 (12.8) | 70.2 (10.6) |
| Middle | 250 | 108.6 (12.7) | 68.4 (10.6) |
| Lower | 263 | 108.6 (12.3) | 67.3 (10.8) |
| $\chi^2$, p | | 0.231, 0.891 | 0.116, 0.994 |
| Residence | | | |
| Male - Urban | 306 | 107.9 (13.6) | 67.2 (11.0) |
| Rural | 232 | 107.2 (13.5) | 67.9 (11.1) |
| $\chi^2$, p | | 0.108, 0.742 | 0.924, 0.336 |
| Female – Urban | 391 | 108.1 (11.1) | 66.8 (10.9) |
| Rural | 250 | 109.1 (11.6) | 70.4 (9.9) |
| $\chi^2$, p | | 0.403, 0.526 | 0.398, 0.528 |

**Key:** N – Total number of subjects, n – number of subjects in each subgroup, SBP – Systolic blood pressure, DBP – Diastolic blood pressure, SD – Standard deviation, SEC – Socio-economic class.

## PREVALENCE OF HYPERTENSION

The total prevalence for systolic hypertension was 8.0 percent, while that for diastolic blood pressure was 6.8 percent. Three point two percent of the male subjects and 4.8% of the females had systolic hypertension, respectively, while diastolic hypertension was recorded in 3.7% and 3.1% of the males and females, respectively. There were no statistically significant gender differences in the prevalence rates for systolic and diastolic hypertension, respectively, $p < 0.05$.

## DISCUSSION

The present study has described normative blood pressure and its correlates, and the prevalence of hypertension, in adolescent school children in Gwagwalada Area Council of the F.C.T.

The mean SBP values obtained in this study were lower than those reported by Nichols and Cadogan[45] in Tobago, Zhong-Qiang *et.al*[43] in China, Awogbemi[10] in Lagos, Hamidu *et.al*[28] as well as Bugaje *et.al*[38] in Zaria, who used similar methods in measuring blood pressure in their respective adolescent populations. They were also lower when compared to reference values established in American children of similar age from the NHBPEP charts.[2] Conversely, mean DBP for the different ages was higher when compared with the American reference values,[2] and the values reported by Awogbemi.[10] However, Nichols and Cadogan,[45] Hamidu *et.al*[28] and Bugaje *et.al*[38] reported higher DBP values in their study populations.

The variations in blood pressure levels observed between the study population and other adolescent populations, was not an isolated finding, as several workers have documented variations in blood

pressure levels amongst different populations.[19-22] Differences in methodology may account for these inter-population variations,[99] which include the degree of accuracy in reporting SBP and DBP,[15] the use of DBP IV or DBP V which may vary by as much as 5-10 mm Hg,[100] and the number of readings taken for each subject with 3 readings per visit on 3 occasions giving better accuracy,[71]. However, other postulations have also been advanced to explain this occurrence.

Differences in the impact of growth and maturational factors on blood pressure from one population to another, is one of such postulations.[19-22] With the onset of puberty, and the accompanying rapid physical growth and marked hormonal changes, these differences tend to be exaggerated.[19-22] This is due to the fact that the ages at which pubertal growth spurts occur, when maximum changes impacting on blood pressure levels are recorded, vary from population to population. And as puberty is completed, the influence of these factors on blood pressure, weakens.[42]Environmental factors such the degree of urbanization and industrialization, with the attendant lifestyle changes in diet and physical activity, could also account for the observed variations in blood pressure levels in the different populations.[45] These factors influence maturation patterns, as well as body size, which impact strongly on blood pressure.[99]

The considerable influence body size exerts on blood pressure is well documented,[2,8,21] and taller, heavier individuals tend to have higher blood pressure levels.[2] The subjects in this study were shorter and lighter than those studied by Nichols and Cadogan,[45] which could account for the lower systolic and diastolic values obtained in them. This is corroborated by the finding that height and weight are independent predictors of SBP and DBP, respectively, in the study population. However, differences in body size alone could not account for the variations observed, when the lower blood pressure values obtained in the taller and heavier subjects of this study, were compared to the higher values obtained in shorter lighter subjects by Hamidu *et al*[28] and Bugaje *et al.*[38] These differences suggest that, in some populations, the influence of body size on blood pressure in relation to other factors such as age, and genetics, may have been overstated.[28]

In the present study, blood pressure increased significantly with age, which is consistent with other reports.[1,2,8] Furthermore, the rate of increase is comparable to values reported in Tobagonian[45] and Punjabi[46] adolescents (1.7 to 2.6 mm Hg per year, and 1 to 3 mm Hg per year, respectively). The rise in SBP and DBP with age was quite steep, especially between the ages of 14 and 17 years, and may be due to hormonal changes and rapid increases in body size occurring during the pubertal growth spurts.[19-22]

Highly significant positive correlations between both SBP and DBP, and age, height, weight, and BMI, were observed in this study, emphasizing the strong relationship between blood pressure, age, and anthropometry.[2,8,21] Increase in any of these variables results in a concomitant significant increase in blood pressure. Multiple linear regression analysis further established age and height as independent predictors of SBP, and age and weight for DBP, in the study population. Therefore, the older, taller and heavier an individual is, the higher the blood pressure. Agyemang *et al*,[23] Adams-Campbell *et* al,[39] and Nichols and Cadogan,[45] found age and BMI to be independent predictors of SBP and DBP, while Bugaje *et al*[38] found weight to be the best predictor of both SBP and DBP. This predictive effect of age, and anthropometry, form the basis for the development of current blood pressure reference values that take into cognizance the height, age, and gender of a child, to ensure appropriate classification of the blood pressure.

Interestingly, a decline in the mean DBP of males aged 11 years was observed. This divergence from the normal pattern could be a function of methodology, which was impressed on the change from child to adult cuff between ages 10 and 11. Studies have described a less well-known cuff size phenomenon, which is due to the relation of arm circumference to blood pressure level.[101] Data obtained from these studies demonstrate that the blood pressure differences between cuffs are largely independent of arm circumference.[101] Thus, at the point where one changes from one cuff size to another to accommodate increasing arm circumference, there is a *step* function, which is demonstrated by a drop in blood pressure when the larger cuff is used.[101] This drop could be significant enough to give noticeably lower values in the affected age group, as seen with the DBP of the 11

year old males. Thus, in an effort to reduce such errors, some workers have suggested the use of a single cuff size when conducting studies on body size and blood pressure levels.[101]

The present study reported no significant gender differences in SBP or DBP. This finding is consistent with some other reports,[28,39,40] but contrasts with others which have reported either significantly higher values in adolescent males,[25,34] or in females.[10,38,41] Differences in body size between genders have been advanced as possible reasons for gender differences in blood pressure levels, with the taller or heavier gender having higher values.[27,30] However, in the present study, the females were significantly heavier, but there were no significant gender differences in blood pressure. This may be due to interplay of other factors such as hormonal changes, genetics, and environmental factors, on blood pressure, which were not controlled for.

There was no statistically significant relationship between blood pressure and socio-economic class, as socio-economic status was not found to influence blood pressure levels in the study population. This differs from reports by Akinkugbe *et.al*,[41] who found that adolescents from the lower socio-economic class had significantly higher DBP. Ogunkunle *et.al*[29] also reported a significant negative correlation between blood pressure and socio-economic class, in children aged 1 to 5 years in Ibadan. These findings imply that the lower the socio-economic status, the higher the blood pressure, which may place such children at risk of developing hypertension later in life. This is further supported by the documented association of poverty and adverse early life conditions with increased risks for early onset of cardiovascular disease.[74]

On the contrary, Akor *et.al*[72] reported significantly higher SBP in 6 to 12 year old children attending private schools in Jos, who were from the upper and middle socio-economic classes, which they attributed to differences in environment, diet and lifestyle between the upper and lower classes. Thus, in their population, the more affluent children would be at higher risk for the development of elevated blood pressure.

Mean SBP and DBP did not differ significantly between subjects from rural or urban areas of Gwagwalada Area Council. These findings were consistent with findings from Calabar,[75] and may indicate a balance in lifestyle by the preservation of traditional ways of life, and the adoption of modern healthy practices, respectively, by the urban and rural populace, which impact positively on blood pressure.

In contrast, findings from Kogi State,[25] were of significantly higher systolic and diastolic values in urban and rural adolescents, respectively. These findings were attributed to the effects of urbanization and the attendant changes such as consumption of high calorie diet, and sedentary lifestyle, which was not limited to urban dwellers, but had encroached on the rural populace who might be mimicking urban ways of life.[25] The higher DBP in the rural subjects, may also be related to the fact that majority of the rural populace were from the lower socio-economic class, in whom the effects of adverse early life conditions on blood pressure levels, have been described.[74]

The prevalence rate of 8.0% for systolic hypertension obtained from this study was similar to the 7.8% reported by Awogbemi[10] in Lagos, while the 6.8% obtained for diastolic hypertension was higher than the 5.3 percent reported in the same study, using the same criteria of SBP and/ or DBP values at/ or above the 95$^{th}$ percentile for age and gender for the population.[2] Lower figures were reported by Bugaje *et al*[38] in Zaria (2.46 and 1.52 percent for systolic and diastolic hypertension, respectively), despite the non-exclusion of renal causes of hypertension by urinalysis, although hypertension was defined as blood pressure values above 2 standard deviations of the mean.

Other Nigerian studies[26,102,103] have also reported lower prevalence rates, ranging from 5.0 to 5.6 percent, using different methods of blood pressure measurement, and different criteria to define hypertension, such as values above 2 standard deviations of the mean, or the use of arbitrary values as cut-off values. The higher prevalence rates reported in the present study could be reflective of lifestyle changes that have occurred over the years.

The prevalence rates obtained in the present study are indicative of the fact that adolescent hypertension is not an uncommon finding in our population. They are comparable with, or even higher than rates obtained in other parts of the world, in developed and developing nations,[9,43-46] using similar criteria, although oscillometric

devices which give values 4 to 5 mm Hg lower than values obtained by auscultation,[104] were used in one of these studies.[9]

In conclusion, blood pressure correlated significantly and positively with age and anthropometry, with age and height, and age and weight found to be independent predictors of SBP and DBP, respectively, amongst adolescent students in Gwagwalada. There were no significant gender differences in systolic and diastolic blood pressure, nor any significant relationship between blood pressure and socio-economic status, and place of residence. The prevalence of systolic hypertension was 8.0 percent, and 6.8 percent for diastolic hypertension. Thus, it is recommended that routine measurement of blood pressure in adolescents should be encouraged, both at clinic visits and as part of the School Health Programme, for early identification of those with and at risk of hypertension. A coordinated and standardized multi-centre study could also be carried out for the development of a national database for normative blood pressure reference values.

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# KNOWLEDGE OF SEXUALLY TRANSMITTED INFECTIONS AMONG SENIOR SECONDARY SCHOOL STUDENTS IN JOS NORTH LOCAL GOVERNMENT AREA OF PLATEAU STATE

**Elizabeth O. Okoh,[1,2*] Mathilda E. Banwat,[1,2] Adakole F. Okoh,[3] Chikaike Ogbonna[1,2]**

1. Department of Community Medicine, College of Health Sciences, University of Jos, Plateau State, Nigeria.
2. Department of Community Medicine, Jos University Teaching Hospital, Plateau State, Nigeria.
3. Department of Internal Medicine, Jos University Teaching Hospital, Plateau State, Nigeria.

***Corresponding Author:** Elizabeth O. Okoh
nyeche4jc@gmail.com

**Abstract**

**Background**

Young people are particularly vulnerable to sexually transmitted infections. Most senior secondary students fall within this age group and their knowledge base is an important precursor in the reduction of risky sexual behavior among them. This study was conducted in Jos North LGA, Plateau State, with the aim of assessing the knowledge of senior secondary school students on sexually transmitted infections.

**Methods**

A descriptive cross-sectional study was carried out among 200 senior secondary students selected from three private and three public schools. A self-administered questionnaire was used to collect information. Knowledge was scored and graded as poor, fair and good. Analysis was carried out using SPSS 20 and statistical significance set at a p value 0.05 and a confidence level of 95%.

**Results**

Mean age of respondents was 16.2 ± 1.6 years. Eleven percent of respondents had never heard of sexually transmitted infections and among those who have, HIV/AIDS was the most commonly mentioned infection. A mean knowledge score of 13.91 ± 6.25 out of a total of 42 was found. Specifically, 56.8% had poor knowledge, 41.6% had fair knowledge and 1.6% had good knowledge of sexually transmitted infections. Knowledge was found to be statistically associated with the type of school ($p<0.001$) and student type ($p<0.001$). The major sources of knowledge were school and mass/social media.

**Conclusion**

Senior secondary school students in Jos North LGA were found to have poor knowledge of sexually transmitted infections. There is need to adopt strategies of delivering correct STI information to this group of young people which is an essential starting point in their behavior change process.

**Key words**: Sexually Transmitted Infections, secondary schools, knowledge

## INTRODUCTION

Sexually Transmitted Infections (STIs) are among the most common causes of illness globally and remain endemic in all societies. The public health, social and economic consequences of STIs are extensive, both for the acute infection and its long-term sequelae. There has been a steady rise in the incidence of STIs in recent times. These increased numbers may reflect recent public health campaigns promoting STI screening and the use of increasingly sensitive diagnostic tests. Substantial rises in Human Immunodeficiency Virus (HIV) infection have further heightened awareness of STIs.[1] STIs are the most important causes of loss of

healthy productive life in developing countries. Many of the STIs can cause long-term morbidity. If untreated, some infections can lead to infertility or cause miscarriage, premature birth, infection of the newborn and many other complications. Prompt diagnosis and appropriate management are crucial in reducing these complications. This may be difficult as some infections such as *Chlamydia trachomatis,* are often asymptomatic until complications arise.[2,3]

The World Health Organization (WHO) estimated that 333 million curable STIs occur each year with more than two thirds occurring in the developing world and affecting mainly young people.[4] Many young people engage in sexual risk behaviors that can result in unintended health outcomes and these sexual risk behaviors place adolescents at risk of STIs.[5] By age 24, one in three sexually active people will have contracted an STI. Though the WHO describes 'young people' as 10 to 24 years old, the youths which make up the 15 to 24 age group represents the largest risk category in contracting STIs.[6,7] Despite these facts, young people are less likely to access STI services. Youths account for half of the 20 million STI cases that are reported every year worldwide.[5] It is estimated that 2,500 new infections of STIs occur each day among youths, 79% of which occur in sub-Saharan Africa.[8] In Nigeria, STIs have constituted a silent epidemic and a major health problem as documented in some reports in the country.[7,9]

Young people are particularly vulnerable to STIs and consequent health problems for a number of reasons, one of which includes lack of information about the disease.[6] Most secondary students fall into the age group of those at risk of STI. This study involved this group because their knowledge base is an important precursor to the reduction of risky sexual behavior among them. Generally, knowledge of STIs has always been very low, even in high prevalence areas. To reduce risky sexual behaviors and STIs among youths, it is important that they are properly informed and knowledgeable about the causes, types and prevention of the disease. The main aim of this study is therefore to determine the knowledge of sexually transmitted infections among senior secondary school students in Jos North Local Government Area (LGA).

## METHODOLOGY

### Study Area

The study was carried out in Jos North Local Government area (LGA), one of the 17 LGAs in Plateau State, Nigeria. Jos North LGA covers a land area of 291km² (112.4sqm) and a population of 474,817 for the year 2017. *Jos North has 79 registered secondary schools (both public and private), each having t*he Junior Secondary (JS) 1 to 3 and the Senior Secondary (SS) 1 to 3 classes.

### Study design and study population

This was a descriptive cross-sectional study that was conducted among senior secondary students (SS1 to SS3) of selected secondary schools in Jos North LGA. All students (both boys and girls) in the SS classes who gave consent or assent were included the study.

### Sampling Technique

A multistage sampling technique was used to select respondents. A total of 6 secondary schools were selected after stratifying into public/private. Three schools were selected from each category using simple random sampling technique (by computer generated random numbers). The number of students to be selected from each school and from each arm within the school was determined using proportion to size allocation. Participants were eventually selected from the student list of each arm using the computer-generated random numbering technique. All the students that gave consent/assent were included in the study.

### Sample Size

The following formula was used to determine sample size: $n = z^2 p q / d^2$

A minimum sample size of 181 was calculated which was rounded up to 200 after including a 10% non-response rate.

### Study instrument

A self-administered semi-structured questionnaire was used to collect data. The questionnaire covered the following sections: Socio-demographics of respondents, knowledge of STIs (definition, types/examples, risk factors and prevention) and factors affecting knowledge of STIs.

### Data Collection methods

Permission was obtained from the school principals and form misters/mistresses before the

study was conducted. The participants in the selected classes were given explanations on the objectives of the study and how to fill the questionnaires. Consent (for those who were 18 years and above) and assent (for those less than 18 years) were obtained before data was collected. Data collection was done in the classrooms with the participants seated comfortably and far apart from one another.

**Data analysis**

Knowledge was graded thus: Each correct response earned one mark and maximum obtainable score was 42. Students who scored 0-14 points were designated as having poor knowledge, 15-28 as fair knowledge and 29-42 as having good knowledge. Analysis was carried out using *Statistical Package for Social Sciences* (SPSS) version 21. Chi square test was used to test associations. Statistical significance was set at a p-value of 0.05 with a confidence level of 95%.

**Ethical Considerations**

Permission was obtained from the school authorities and all respondents gave informed consent/assent before data was collected. Confidentiality was assured and the guidelines for human rights protection were followed strictly.

**Limitations of Study**

Since some of the questions were sensitive in nature, this could have prevented the respondents from answering confidently. However, the use of the self-administered questionnaire and assurance of confidentiality should have minimized this limitation.

**RESULTS**

A total of 200 students from SS1, 2 and 3 were surveyed. The responses of 190 participants were valid and the rest of 10 survey forms were rejected because they were not completely filled by the participants making a response rate of 95%.

**Socio-demographic characteristics of the students**

The mean age of the respondents was 16.2 ± 1.6 years which ranged from 12 to 23 years. There were more males (61.1%) than females, more Arts (41.6%) than Science or Social Science students and more respondents in SS2 (40%) than the other arms as depicted in table 1.

*Table 1:* Socio-demographic characteristics of respondents

| Characteristics | Frequency | % |
|---|---|---|
| **Age group** | | |
| <15 years | 62 | 32.6 |
| 16-20 years | 126 | 66.3 |
| >20 years | 2 | 1.1 |
| **Gender** | | |
| Female | 116 | 61.1 |
| Male | 74 | 38.9 |
| **Ethnicity** | | |
| Plateau | 82 | 43.2 |
| Indigenous | 108 | 56.8 |
| Non-Indigenous | | |
| **Marital status** | | |
| Single | 189 | 99.5 |
| Married | 1 | 0.5 |
| **Type of school** | | |
| Public | 96 | 50.5 |
| Private | 94 | 49.5 |
| **Type of student** | | |
| Day student | 112 | 58.9 |
| Boarding student | 78 | 41.1 |
| **Class** | | |
| SS1 | 49 | 25.8 |
| SS2 | 76 | 40.0 |
| SS3 | 65 | 34.2 |
| **Course stream** | | |
| Science | 56 | 29.5 |
| Arts | 79 | 41.6 |
| Social science | 55 | 28.9 |

**Knowledge of STIs**

A total of 11 of the participants (5.8%) had never heard about STIs and HIV/AIDS was found to be the most commonly mentioned STI among the students who have heard of STIs. The overall knowledge scores of the students showed that over half of them (56.8%) had poor knowledge. The mean knowledge score of the students was found to be 13.91 ± 6.25 out of 42 points which showed a generally poor knowledge level (Table 2).

**Table 2:** Respondents' knowledge of STIs

| Parameter | Frequency | % |
|---|---|---|
| **Ever heard of STI** | | |
| Yes | 179 | 94.2 |
| No | 11 | 5.8 |
| **Definition of STI** | | |
| Correct | 141 | 74.2 |
| Wrong | 49 | 25.8 |
| **Number of STIs mentioned** | | |
| None or 1 | 74 | 38.9 |
| 2-5 | 108 | 56.8 |
| > 5 | 8 | 4.2 |
| **Overall knowledge level** | | |
| Poor | 108 | 56.8 |
| Fair | 79 | 41.6 |
| Good | 3 | 1.6 |

**Factors associated with knowledge of STIs among respondents**

The relationship between type of school and student type with knowledge level were found to be statistically significant as shown in table 3.

**Table 3:** Factors affecting knowledge level of respondents

| Factors | Poor knowledge n=108 freq (%) | Fair/Good knowledge n=82 freq (%) | $x^2$ | df | *p*-value |
|---|---|---|---|---|---|
| **Age group** | | | | | |
| <15 years | 30 (48.4) | 32 (51.6) | | | |
| 16-20 years | 76 (60.3) | 60 (39.7) | 3.94 | 2 | 0.139 |
| >20 years | 2 (100.0) | 0 (0.0) | | | |
| **Sex** | | | | | |
| Female | 64 (53.8) | 55 (46.2) | | | |
| Male | 44 (62.0) | 37 (38.0) | 1.22 | 1 | 0.270 |
| **Ethnicity** | | | | | |
| Plateau Indigenous | 50 (61.0) | 32 (39.0) | | | |
| Non-Indigenous | 58 (53.7) | 50 (46.3) | 1.01 | 1 | 0.316 |
| **Type of school** | | | | | |
| Public | 78 (81.3) | 18 (18.7) | | | |
| Private | 30 (31.9) | 64 (68.1) | 47.12 | 1 | <0.001* |
| **Type of student** | | | | | |
| Day student | 87 (77.7) | 25 (22.3) | | | |
| Boarding student | 21 (26.9) | 57 (73.1) | 48.28 | 1 | <0.001* |
| **Class** | | | | | |
| SS1 | 32 (65.3) | 17 (34.7) | | | |
| SS2 | 73 (48.7) | 39 (51.3) | 3.76 | 2 | 0.153 |
| SS3 | 39 (60.0) | 26 (40.0) | | | |
| **Course stream** | | | | | |
| Science | 26 (46.4) | 30 (53.6) | | | |
| Arts | 50 (63.3) | 29 (36.7) | 3.86 | 2 | 0.146 |
| Social science | 32 (58.2) | 23 (41.8) | | | |

***Significant**

**Sources and of knowledge**

A shown in Fig 1, the main source of STI knowledge was school followed by mass and social media.

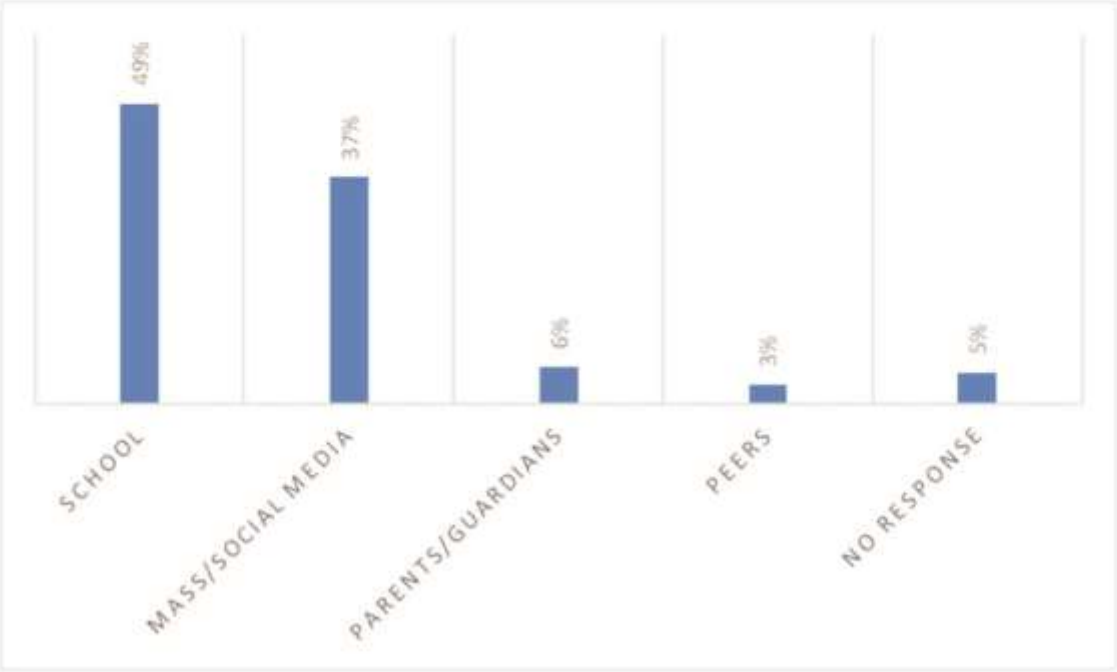


Fig.1: Sources of STI knowledge among respondents

## DISCUSSION

The aim of this study was to assess the knowledge of secondary school students in Jos North LGA on STIs. Up to 89% of the students had heard of STIs compared to studies conducted in South Africa where 44% of secondary school students had never heard of STIs.[10] In other studies conducted in Edo-Ekiti, Nigeria,[11] Tanzania[12] and Germany[13] majority of the students were aware of STIs. It is possible that some schools are yet to adopt the syllabus or that some students may have missed the lecture series when they were being taught at school. Many of the respondents mentioned only HIV/AIDS as the only STI they knew, which is similar to what has been observed among many adolescents within and outside Nigeria.[11,13,14] This could be explained by the existence of numerous HIV awareness campaigns especially on the Mass media and social networks which young people have easy access to. Emphasizing that STIs increase the likelihood of HIV transmission may increase people's concern about STIs and lead to better knowledge and less risky behavior.

The overall mean score of 13.91 ± 6.25 (out of a total of 42) on knowledge shows that respondents generally have poor knowledge of STIs and less than 2% had good knowledge. The reason for this finding may be due to lack of proper education on STIs in schools and other educational outlets for young people and adolescents. Comparison could be made to a study conducted in Edo state where most of the students had poor knowledge of STIs[15] and to another in Ado-Ekiti where only 6.9% had good knowledge.[11] These findings show that secondary school students across the country need to be better educated on STIs if considerable progress in combating this menace is to be achieved. Similarly. a review of studies carried out among school-attending adolescents in a European country showed that they had low levels of awareness and knowledge of STIs with the exception of HIV/AIDS.[16] Considering the difference in youth literacy levels between regions (72% in Sub-Sahara Africa compared to 100% in Europe),[17] this is quite alarming. But the similarity in findings may have resulted from similarity in

methodologies used. Contrary to our finding however, a Malaysian study demonstrated that secondary school students had a moderate level of knowledge, and a survey of high school students in an urban United States school district found that the mean knowledge score was 3.65 (range: 0 to 6; median: 4.00).[3,18] The difference may be due to the fact that these countries have better standards of education, and their scales of measuring knowledge may also be different from that used in this study.

The type of school (public or private) and student type (boarding or day) were factors found to be associated with the knowledge level of STIs. The boarding students and private schools had better knowledge level than day and public schools respectively. This may be because boarding students are likely to be more studious and less distracted from studies, and private schools have better standards of education than public schools in this environment.[19] Although not statistically significant, more science students had better knowledge than students from other course streams in this study. This is not surprising as the topic of STIs is more of science-related. A study conducted among secondary school students in Malaysia also showed that education level and course stream were important factors to determine the knowledge level, with the science group having the higher knowledge level.[3] Another study carried out in India also showed higher knowledge of STIs among science students.[14] However, knowledge score among high school students in the United states was significantly associated with female gender and higher educational level[18] But gender and class/educational level were not statistically significant in this study.

Many students had multiple sources of information on STIs with majority indicating their school, followed by the mass and social media as the major sources of information. Few students were informed by their parents. A study conducted in Zaria similarly demonstrated that school lessons, mass media and social media were the main sources of information.[20] Whereas in another study in South Africa, the major sources of information were health care workers, the media, the school and friends.[10] These studies showed that parents or guardians contributed little or nothing in educating their children/wards on STIs. Probably, many parents also lack knowledge on STIs. Health workers also play a major role in educating young people about STIs and this role needs to be encouraged in this community.

## CONCLUSION AND RECOMMENDATIONS

The findings of this study show that senior secondary school students in Jos North LGA of Plateau State are poorly informed about STIs. Boarding students and students in private schools are better informed about STIs. Since the school plays a major part in adolescent education, all secondary schools whether day or boarding, public or private, should adopt methods of educating these students on STIs. Parents, public health practitioners, adolescent-friendly organizations and the government should ensure that this group of young people receive the right information as they constitute a major part of those at risk of STIs.

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# CARDIAC AMYLOIDOSIS IN A PATIENT WITH MULTIPLE MYELOMA IN A LOW RESOURCE SETTING: A CASE REPORT AND REVIEW OF LITERATURE

**Shut GZ, Awunah DD, Onuche O, Nweke S, Oriolowo DB, Gomerep V, Amusa GA.**
Cardiology Unit, Department of Internal Medicine, Jos University Teaching Hospital, P.M.B 2076, Jos, Nigeria.
***Correspondence*: Ganiyu A. Amusa**
E-mail: drganiamusa@gmail.com

## ABSTRACT
This is a case of a 43-year-old man presenting with features of congestive heart failure and confirmed multiple myeloma that has been on chemotherapy. Electrocardiogram and transthoracic echocardiography (TTE) were oriented towards diagnosing cardiac amyloidosis, showing mild pericardial effusion, restrictive cardiomyopathy and low voltage QRS criteria on electrocardiogram. Lymph node and bone marrow biopsies had confirmed the diagnosis of multiple myeloma. Patient had diuretics and other supportive medications, did well and was discharged home on oral medications.

**Key words:** AA= secondary amyloidosis AL= primary amyloidosis TTE= transthoracic echocardiography

## INTRODUCTION
Amyloid cardiomyopathy happens as a result of extracellular deposition of insoluble fibrils resistant to proteases and is a rare disease. It may be secondary to chronic inflammatory conditions, hereditary diseases or to the production of a light chain of monoclonal immunoglobulin. It usually leads to infiltrative cardiomyopathy that has a restrictive pathophysiology, conventionally associated with significant poor prognosis and morbidity. It has 30% survival at 2years with a life expectancy of 6 months without treatment.[1]

Some case reports have earlier described and association between multiple myeloma and cardiac amyloidosis. But the interest of our observation is because of the rarity of this association, the diagnostic difficulty cardiac amyloidosis and a bit more to find its aetiology.[2]

## CASE REPORT
Our patient is a 43-year-old man, diagnosed with multiple myeloma via lymph node and bone marrow biopsies for which he has been placed on chemotherapy and follow up about 5 years prior to presentation. He presented with complaints of recurrent breathlessness associated with orthopnea, paroxysmal nocturnal dyspnea and cough productive of frothy sputum with. There was also a history of leg swelling and roughness of skin.

When we examined him, he was not febrile and lying supine position with a blood pressure of 119/77mmHg. He had a regular heart rate of 110 beats per minute with no features of hypotension postural hypotension. He had a respiratory rate of 22 cycles per minute with oxygen saturation of 90% at room air. The rest of the clinical examination had found Bilateral crackles on lung auscultation, bilateral lower extremity edema and jugular venous distension. Electrocardiogram revealed a rate of 110 beats per minute, in sinus rhythm and low voltage complexes. (Figure 1)

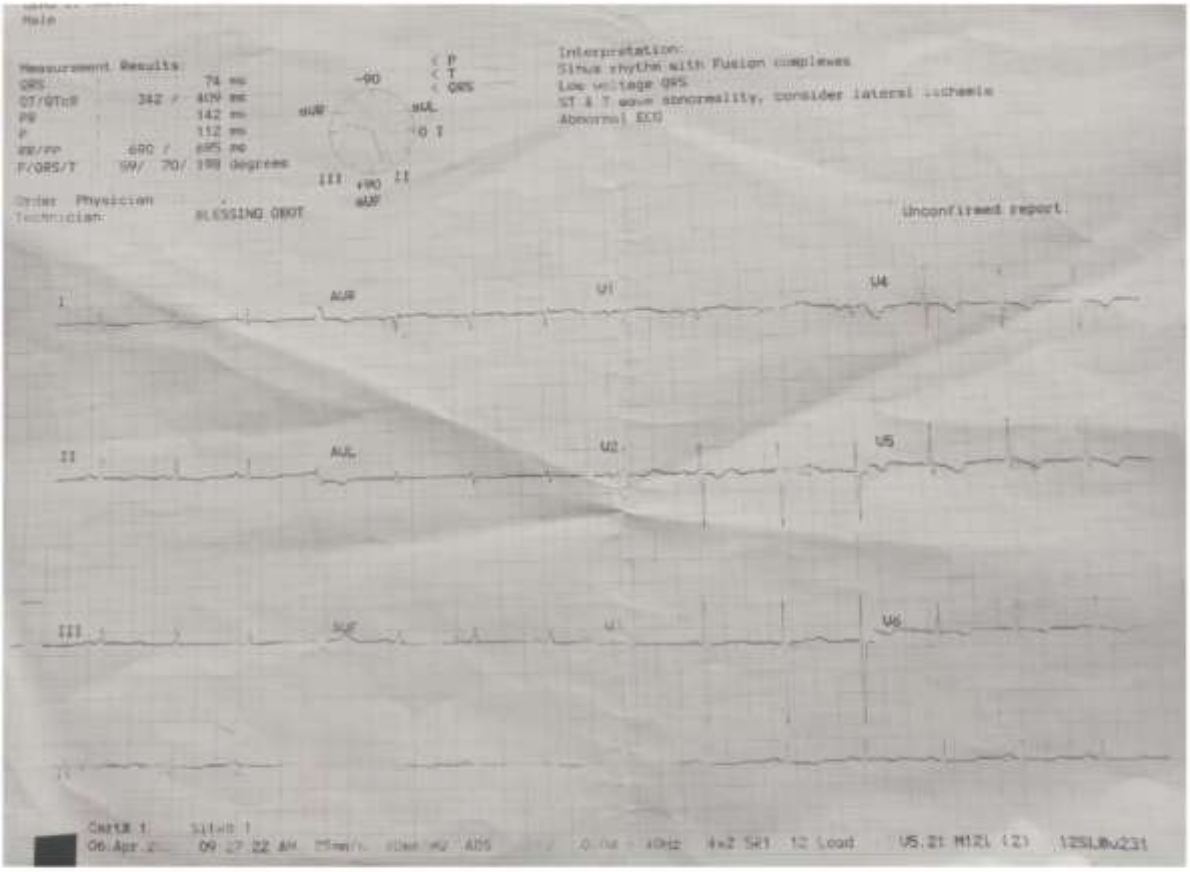


Figure 1: Patients ECG

When the trans-thoracic echocardiography was done early in the assessment of the patient, it showed a restrictive cardiomyopathy with asymmetrical septal hypertrophy and pericardial effusion and no features of cardiac transplant. There was abnormal texture of the myocardial tissue showing a "granular sparkling" appearance, a restrictive mitral profile with a good systolic function (Left Ventricular Ejection fraction of 63%), bi-atrial enlargement, thickened cardiac valves (mitral, tricuspid, aortic and pulmonary). There was pulmonary hypertension of above 2.5m/s and pressure of 25mm Hg (Figure 2).

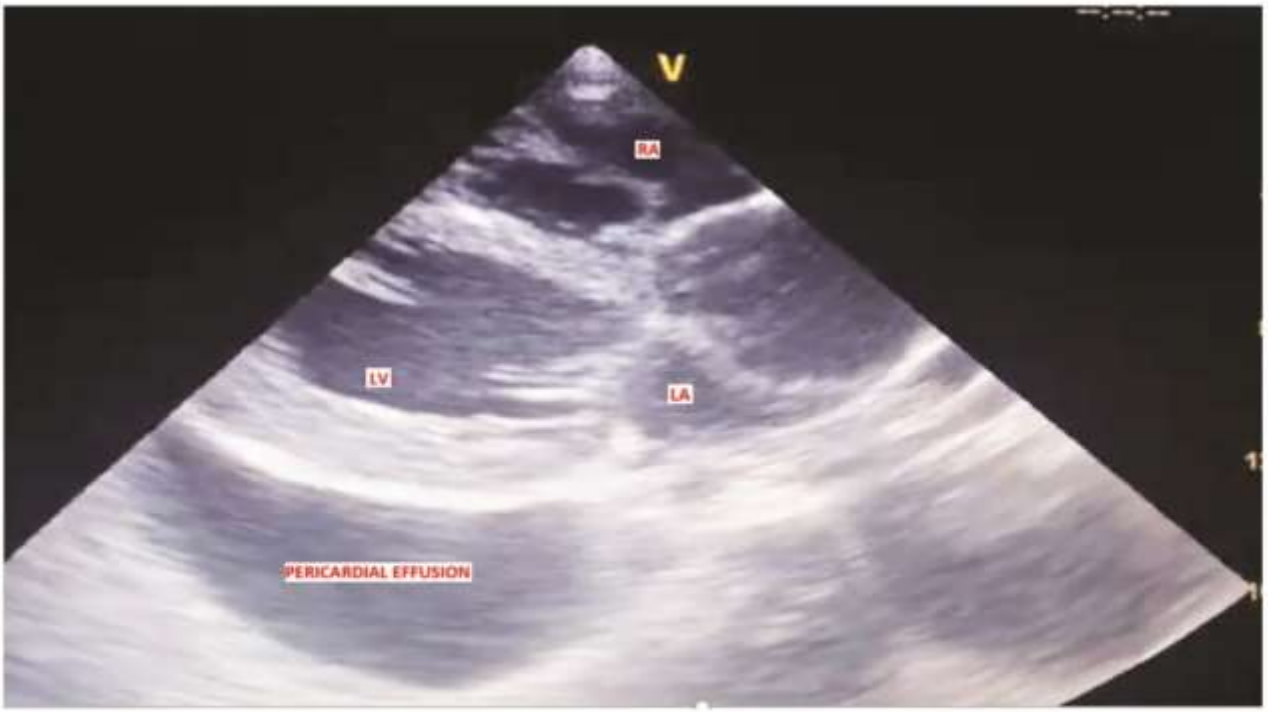


Figure 2: Patient's Echocardiography

Chest X-ray showed cardiomegaly, right sided pleural effusion and pulmonary edema (Figure 3).

Before thoracentesis after thoracentesis

Figure 3: chest X-ray- pre and post thoracocentesis

Before thoracentesis after thoracentesis Figure 3: chest X-ray- pre and post thoracocentesis A complete blood cell count revealed mild normocytic anemia at 8.7g/dl, an Erythrocyte Sedimentation Rate at 70 mm/hr with albumin level of 29 g/l (low). The patient received standard therapy for heart failure- iv torsemide 40mg BD, tab metolazone 5mg daily, tab spironolactone 25mg daily, tab clopidogrel 75mg daily, subcutaneous enoxaparin 40mg daily including ACE inhibitors, he also had thoracocentesis done. Patient's condition improved and was discharged home on oral anti-failure/supportive medications to see at medical outpatient clinic for follow up.

## DISCUSSION

Amyloidosis is a systemic organ-limited disease in which insoluble homomeric amyloid fibrils that are composed of a variety of serum proteins gradually replace normal tissue in various body organs.3 Major forms of amyloidosis are grouped into 6 subtypes: (1) AL or primary amyloidosis, (2) AA or secondary amyloidosis, (3) familial (Hereditary) amyloidosis, (4) senile systemic amyloidosis, (5) isolated atrial amyloidosis and (6) hemodialysis related amyloidosis resulting from accumulation of beta-2 microglobulin.[4] cardiac involvement becomes clinically evident in up to 50% of those that have AL amyloidosis but only 10% of individuals with AA amyloidosis with less than 5% having familial syndrome.[5]

Importantly, only 10% of patients with multiple myeloma develop systemic light chain amyloid disease with a poor prognosis especially in the presence of cardiac amyloidosis. [6,7] The mean age of diagnosis in patients withal amyloidosis is 64 years.[1] Amyloid depositions occur mainly in the interstitium of contractile myocardium but may also involve the pericardium, the endocardium and the conduction system.[8] the epicardial arteries in cardiac amyloidosis are usually spared but amyloid fibrils are deposited in the small intramural vessels and coronary angiography when done is normal. [9,10] Few similar cases have been described, the first discovered in postmortem after rapidly progressive heart failure[6], the second revealed by a congestive heart failure associated with ventricular tachycardia, efficiently treated with Bortezomib[11], and the third discovered following an asymmetric hypertrophic cardiomyopathy and unexplained heart failure.[12] Possibly because of elevated ventricular filling pressures and direct myocyte damage caused by amyloid deposition, B-natriuretic peptides are elevated in the plasma.[13] Increase in ventricular thickness is brought about by accumulation of electrically inert amyloid protein in the extracellular matrix of the myocardium giving a false impression of ventricular hypertrophy on sonography.

Electrocardiography shows low voltages with no features of ventricular hypertrophy. Sonographic images shows "snow storm" or "sparkling" appearance.[14] A thickened interatrial septum, which is rarely present even in the later disease stages have 100% specificity.[15] Cardiac amyloidosis diagnosis can be ascertained by either (1) a positive biopsy from a non-cardiac tissue in addition to sonographic evidence of amyloidosis, which includes a mean LV wall thickness of greater than 12mm in the absence of other causes of LV hypertrophy, or (2) an endomyocardial biopsy illustrating amyloid deposition in addition to laboratory and clinical evidence of organ involvement.

Biopsy specimen from the involved organ, such as the heart or from the abdominal fat pad, exhibits a red or pink color under light microscopy after chemical staining with Congo red and a dramatic apple-green birefringence under polarized light.[16] The primary manifestation of amyloid cardiomyopathy is congestive heart failure with preserved systolic and abnormal diastolic function. Because of the so called restrictive mitral inflow pattern of Doppler imaging, cardiac amyloidosis was classically described as a restrictive cardiomyopathy.

But this severe form of left ventricular diastolic dysfunction is only present in the late stage of the disease. In the earlier stage of the disease process, diastolic dysfunction is only mild and is characterized by the Doppler pattern of abnormal relaxation. Cardiac magnetic resonance imaging will show diffuse myocardial amyloid deposits lead to decreased tissue signal intensity along with a specific pattern of global late subendocardial tissue enhancement.[6] Cardiac MRI in amyloidosis patients usually demonstrates global and late subendothelial gadolinium enhancement in the myocardium.

However, gadolinium-based MRI should be used with extreme caution and preferably avoidance in those individuals with moderate to severe renal disease, due to the risk of nephrogenic systemic fibrosis.[17] Aside from the management of the underlying cause of amyloid deposition, the treatment of symptomatic cardiac amyloidosis is primarily supportive. Preload and afterload reduction using diuretics alone or in combination with vasodilators, or long-acting nitroglycerin preparations, may be helpful.

The symptoms of heart failure may be reduced by digitalis glycosides but the dysrhythmia and sudden death have been reported following their use.[6] patients with heart failure and AL amyloidosis who are not treated have a median survival of 6 to 9 months.1 Patients who are not candidates for hematopoietic stem cell transplantation, the preferred regimen is melphalan plus dexamethasone[18] or cyclophosphamide plus thalidomide and dexamethasone[19], which prevents further amyloid deposition, gradual amyloid regression and marked improvement in New York Heart Association (NYHA) class.[20] Sustained improvement in cardiac function with persistent amyloid deposition is provided in a patient with multiple myeloma-associated cardiac amyloidosis treated with Bortezomib.[11] Cardiac transplantation may be a lifesaving measure for those patients with preserved extra cardiac organ function who are also fit to undergo subsequent chemotherapy.

Post-transplant successful for 2 months has been shown to increase survival of patients possibly for up to 10 years.[21]

## CONCLUSION

In conclusion, cardiac screening in patients with multiple myeloma should include at least an electrocardiogram and complete echocardiography. Conversely, all patients with cardiac amyloidosis, multiple myeloma should be sought for its poor prognosis. Even though there is no single noninvasive test that can accurately diagnose cardiac amyloidosis, the consolation of heart failure symptoms, sonographic findings, and low-voltage complexes at the electrocardiogram are highly suggestive of disease.

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# ANTHROPOMETRIC INDICES OF ADOLESCENTS IN PRIVATE AND GOVERNMENT SCHOOLS IN JOS NORTH LGA, PLATEAU STATE

**Chingle MP[1,2], Bello DA[1,2], Ozoilo JU[2], Bimba JS[2], Adah GU[2], Noel Nb[2], Maigamo NY[2], Zoakah AI[1,2]**

[1]Department of Community Medicine, University of Jos, Plateau State, Nigeria

[2]Department of Community Medicine, Jos University Teaching Hospital, Plateau State, Nigeria

**Abstract**

**Background:** Adolescence is a period of transition between childhood and adulthood. Nutritional status assessment using anthropometry is a simple and extremely useful initial approach to assess adolescents' nutrition. This study aims to compare the anthropometry of adolescents in private and government schools, using Body Mass Index (BMI).

**Methods:** Seven hundred and seventeen (717) adolescents between the ages of 10 and 19 years were studied. Anthropometric data were collected to determine their nutritional status using BMI and comparisons made between private and government-owned secondary schools. BMI was categorized as either normal or abnormal (obesity, overweight, thinness and severe thinness).

**Results:** Overall, 16% of the respondents had abnormal BMI; obesity-1%, overweight-7.8%, thinness-5.7%, and severe thinness-1.5%, and a statistically significant difference was found between the proportions of abnormal BMI in Private (19.5%) and Government (12.4%) schools (p-value: 0.025). Seventy-seven percent (77%) of the respondents had unhealthy eating habits and no statistically significant difference was found between the eating habits of adolescents in private and government schools (p-value: 0.82). Also, 87.2% of all the respondents reported engaging in physical exercise and a significantly higher proportion was reported in government schools than in private schools (91% vs. 83%, p-value: 0.002). BMI category was found to be significantly associated with school type; those in private schools had a lesser proportion of individuals with a normal BMI (p-value: 0.025).

**Conclusions:** A large proportion of adolescents in public and government schools in Jos North LGA had normal BMI and engaged in physical activity. Private schools had a higher proportion of adolescents with a poor nutritional status and there is a dual burden of malnutrition in both school types albeit a low proportion. However, the majority of in-school adolescents have an unhealthy eating habit and therefore, nutrition education should be up-scaled in secondary schools to promote healthier eating habits among adolescents.

**Keywords**: Anthropometric indices, Body Mass Index, Adolescents, Secondary schools.

## INTRODUCTION

Adolescence is a period of transition between childhood and adulthood. Adolescence provides a valuable window of opportunity to prepare children for healthy lives in adulthood. The United Nations defined adolescents as individuals between the ages of 10-19 years.[1] In 2016, the United Nations estimated that there were approximately 1.2 billion adolescents in the world, which constitutes 16% of the world's population. In Sub-Saharan Africa, adolescents constitute 23% of the region's population.[1]

Adolescence is considered a nutritionally critical period of life second to infancy because of the rapid increase in physical growth and development. This period is also characterized by changes in lifestyle and eating habits which could negatively impact their health in the future.[2] Adolescents are a vulnerable group whose needs are often unaddressed. There is usually a dearth of services responding to their distinctive needs. Nutritional interventions often focus on children of younger ages and also these adolescents are unreached by health programmes targeted at adults.[3]

The use of anthropometric measurements has been identified as a standard tool in the assessment of the nutritional status of adolescents. These indices are equally predictors of the development of Non-Communicable Diseases (NCDs) in adulthood.[4]

Dual burden of malnutrition (under and over-nutrition) has been observed in adolescents. In North India, 41.3% of a cross-section of adolescents were malnourished (33% underweight, 7.3% overweight and 1.3% obese).[5] Meanwhile in Nigeria, 29% and 7.6% of in-school adolescents were found to be underweight and overweight/obese respectively.[6] Similarly, another study in Abuja found a double burden of malnutrition; undernutrition (wasting and stunting) and over-nutrition (overweight and obesity), among adolescents at a prevalence of 13% and 15.8% for undernutrition and overnutrition respectively.[7]

In 2015, the population of adolescents worldwide was estimated to be 1.8 billion and this gives them importance with regards to the future economic development of nations.[8] This is based on the assumption that they eventually become healthy adults who will be economically productive. The school environment provides an effective and efficient opportunity for reaching large populations of adolescents.

Nutritional status in adolescence is better assessed using anthropometry.[4] Nutritional status assessment using anthropometry is a simple and extremely useful initial approach to assess adolescent nutrition. Assessment of nutritional related problems and risks in adolescents is valuable for screening, surveillance, programme planning and evaluation purposes. BMI is the anthropometric tool used to assess nutritional status in health care settings.[4]

This study could provide baseline data which may stimulate a prospective study that would seek to validate the reliability of anthropometric indices of adolescents in predicting concurrent and future adverse health outcomes (especially non-communicable diseases) in our environment. Also, it would add to the existing body of knowledge on the nutritional status of adolescents in this area. Findings from the study could also be used to engage school administrators in initiating (where it is lacking) and consolidating nutrition education, screening and surveillance in the school health context.

This study aims to determine the anthropometric indices of adolescents in private and government schools in Jos North Local Government Area (LGA) Plateau State. Specifically, the study will look to assess the eating habits, levels of physical activity and anthropometric indices of in-school adolescents in Jos North LGA.

## METHODOLOGY

Plateau state is located in the North Central Zone of Nigeria. It has 17 Local Government Areas (LGAs) which are further divided into North, Central and Southern Senatorial zones. The study was conducted in state-owned government secondary schools and private secondary schools in Jos North LGA of Plateau State. There are a total of 154 registered secondary schools in Jos North LGA. Jos North LGA is an urban city with an area of 291 $km^2$ (112.4sqm) and an estimated population of 429,300 people.[9]

The study was carried out among students aged 10-19 years attending private and government-owned secondary schools in Jos North LGA of Plateau State. However, eligible students with a physical disability which may affect anthropometric measurements were excluded. It was a cross-sectional comparative study design.

The minimum sample size was determined using the formula for a comparative study:

$$N = \frac{Z\alpha^2 . 2 . p(1-p)}{(p_1 - p_2)^2}$$

N= minimum sample size for each study group (government or private school)

$Z\alpha$= z value for alpha level desired (confidence level: 95%): 1.96

P: average proportion of malnutrition

$$= \frac{P_1 + P_2}{2} = \frac{0.3122 + 0.307}{2} = 0.4631$$

$P_1$= proportion of malnutrition (under and over nutrition) among adolescents in government secondary schools from a previous study = 31.22%

$P_2$= proportion of malnutrition (under and over nutrition) among adolescents in private secondary schools from a previous study = 30.70%

A non-response rate of 10% was considered and added to the total sample size calculated.

The minimum sample size was 632 (316 each for the Private and Government-owned schools).

A multistage sampling technique was used to select schools and respondents:

**Stage One:** Co-educational day schools were purposively chosen because students in day schools are more exposed to trending lifestyles and food habits and can make food choices with little restriction than students in boarding schools.

**Stage Two**: From the list of government-owned and private day co-educational schools, 6 schools were selected randomly from each group using a table of random numbers. This made a total of 12 schools.

**Stage Three**: To select study participants, equal allocation of the minimum sample size for each type (316) was done across the 6 schools in each group; 54 per school. In each school, the allocated sample size was spread equally across the 6 sets (JSS1-SS3). In each set, participants were then selected by using systematic sampling technique, where the total number of students in each set served as the sampling frame, while the sampling interval (K) was determined by dividing the sampling frame by the allocated sample size. From the list of all students in a set, the first participant was selected within the sampling interval by balloting. Subsequent participants were recruited by using the interval until the allocated size was reached.

*The data collection tool was an adapted semi-structured, self-administered questionnaire. Information collected from respondents included their socio-demographic characteristics, eating habits and physical activity. Anthropometric measurements (height and weight) were also obtained* using a calibrated weighing scale and standard stadiometer. Both measurements were taken using standard procedures. Two readings of weight and height were taken for each study participant and the average reading calculated to eliminate intra-observer bias.

Ethical clearance was sought from the Jos University Teaching Hospital Health Research Ethical Committee. Permission was also sought from the respective school authorities. Informed consent (verbal and written) was obtained from the study participants who were 18 years and above and parents/ guardians of those who could not give consent (below 18years).

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 22.0. Qualitative variables such as socio-demographics, eating habits categories, and BMI categories were presented as frequencies and proportions. Chi-squared test was used to test for associations between the qualitative variables and difference between proportions in the two school types. All p-values 0.05 were considered to be statistically significant.

## RESULTS

A total of 717 adolescents aged 10-19 years, from 12 co-educational day secondary schools (6 schools each from private and government-owned secondary schools), responded to the questionnaires.

**Table 1** shows the socio-demographic characteristics of the respondents in public and private schools. Majority of the respondents in both types of schools were females. The age-groups, ethnic groups, parents' educational attainment, the family of origin sizes and types showed a statistically significant difference between private and government-owned schools.

**Table 2** shows the eating habits of in-school adolescents, majority of the participants (77.1%) had unhealthy behaviours (excessive consumption of energy-dense high-calorie foods and inadequate intake of the recommended servings of the different food groups).

**Table 3** shows the physical activity levels among the respondents**.** Majority of them (87.2%) engaged in physical exercise at least twice in a week.

**Table 4** shows the anthropometric indices of Adolescents in the Selected Secondary Schools**.** The indices were categorized using the WHO reference values for BMI-for-age for individuals aged 5-19 years. Overall, 16% of the study participants had BMIs that fell outside the normal range (Obesity, overweight, thinness and severe thinness).

## DISCUSSION

Adolescents' eating habits have come to the limelight because of unconventional meals, fast-food intake, and snacking.[9] Assessment of the eating habits of the participants in this study showed that a significant majority (77%) had unhealthy eating habits and there was no statistically significant difference between the proportions of respondents with unhealthy eating habits in private and government-owned schools. Similarly, a study carried out in Mauritius that assessed eating habits among adolescents showed that 68% of study participants skipped breakfast and a higher percentage (84%) of them consumed high calorie-containing snacks in-between meals.[9] Also, more three-fifths (69%) of adolescents in Sokoto, Nigeria reported skipping meals.[11] Meal skipping is an unhealthy eating habit and skipping

of breakfast has been associated with lower nutritional status and the risk of cardiovascular diseases[12]. It has also been reported that less adequate breakfast habits may contribute to the appearance and further development of obesity.[13] Both studies have similar findings with this study because they show the poor eating habits practiced by adolescents.

Accurate assessment of physical activity in children and adolescents is a challenge. At least six categories of techniques have been used to assess physical activity among children and adolescents; these include self-report, electronic or mechanical monitoring, direct observation, indirect and direct calorimetry. Each method has some strengths and weaknesses.[14] In this study, self-reported participation in physical exercise was used and an overwhelming proportion (87.2%) reported that they engaged in physical activity at least twice a week. A statistically significant difference (p-value: 0.002) was found between the proportions of physical exercise, more adolescents in government schools engaged in physical exercise than those in private schools (91% vs. 83%). Similarly, In Brazil, nearly 84% of the adolescent respondents reported practising physical activity weekly.[15] In contrast, a study in Nepal revealed a lower proportion of physical activity among in-school adolescents (69%), however, physical activity was assessed as adequate or inadequate based on WHO recommendation and not simply as engaging in physical exercise or not.[16]

Using WHO reference for BMI z-scores (BAZ) for individuals aged 5-19 years, abnormal BMI is any value greater than +1 Standard Deviation (SD) or less than -2SD from the reference value.[17] In this study, 16% of the respondents had abnormal BMI (obesity-1%, overweight-7.8%, thinness-5.7% and severe thinness-1.5%) and there was a statistically significant difference in the proportions of individuals with abnormal BMI between the private and government schools (19.5% vs. 12.4%, p-value:0.025). For all the subcategories of abnormal BMI, private schools had higher proportions than the government schools. Conversely, a similar study carried out in Ibadan Nigeria, revealed that around 41% were either underweight, overweight or obese.[18] This proportion of abnormal BMI may perhaps be explained by the relatively higher proportions of unhealthy eating patterns and habits among the respondents.

Additionally, BMI category was found to be significantly associated with school type (p-value=0.025), the private schools had a lower proportion of individuals with a normal BMI (80.5% vs. 87.4%) and a higher proportion of respondents with abnormal BMI. This is likely due to the finding that the proportion of physical exercise was significantly higher in government-owned schools.

## CONCLUSION

Majority of the respondents in both school types engaged in physical exercise and have BMIs that fall within the normal range, however, unhealthy eating habits was seen among the majority of the respondents. Private and government secondary schools significantly differ in their magnitude of abnormal BMI and physical activity levels among adolescents.

## RECOMMENDATION

Nutrition education should be up-scaled in secondary schools to describe more, emphasize and promote healthier eating habits among adolescents.

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# TRANSMESENTERIC INTERNAL HERNIA WITH GANGRENE

[1] DUNG ED, [1,2] SHITTA AH, [3] ODUNZE N, [1] RIKIN C, [1,2] CHIRDAN LB

[1] Division of Paediatric Surgery, Surgery Department, Jos University Teaching Hospital, Jos. Plateau State. Nigeria

[2] Department of Surgery, College of Health Sciences, University of Jos. Jos. Plateau State. Nigeria/Division of Paediatric Surgery, Surgery Department, Jos University Teaching Hospital, Jos. Plateau State. Nigeria

[3] Dalhatu Araf Teaching Hospital Lafia, Lafia. Nassarawa State. Nigeria

**Corresponding Author:**

Dr. Dung, Ezekiel Dido Division of Paediatric Surgery, Surgery Department, Jos University Teaching Hospital, Jos. Plateau State. Nigeria

**E-mail**: didodung@yahoo.com, **Phone**: +2348035923638

**Abstract**

Transmesenteric internal hernia are rare cause of intestinal obstruction in children. Simple cases have myriad of non-specific symptoms. Preoperative clinical and radiological diagnosis is challenging. Complications of volvolus, strangulation and gangrene are poor prognostic factors. High index of suspicion, prompt and appropriate surgical intervention in simple and complicated cases improve management outcome. We present a 3years old girl with a transmesenteric hernia complicated with volvulus and gangrene who did well with segmental bowel resection and end to end anastomosis.

**Keywords:** Transmesenteric, Internal hernia, Intestinal, obstruction, Gangrene

## INTRODUCTION

Transmesenteric hernias are rare forms of congenital internal hernias.[1,2,3,4] Previously, they account for 5-10% of all internal hernias in children. The recent increase in Roux-en-Y reconstruction in children has now made them account for 35% of all internal hernias in children.[1,2,5,6,7] Chronic abdominal pain and intestinal obstruction are often the commonest symptoms. Non-specific clinical and radiological signs have made pre-operative clinical and radiological diagnosis most challenging .Most of the diagnosis are made intra-operatively.[1,2,3,5,6,8] Complications of volvulus, strangulation, bowel gangrene and perforation occur in 30-40% of cases [2,5,6,9]. Simple transmesenteric hernias treated surgically have a general mortality of 15% while complicated cases often have 50% mortality. The mortality is 100% when complicated with gangrene with no surgical intervention instituted.[4,6,8,10,11,12,13] Clinical suspicion, adequate resuscitation and prompt surgical intervention will improve the overall outcome in children.[1,2]

## CASE REPORT

A 3years old girl was referred to our facility with a 3 day history of colicky periumbilical abdominal pain, bilous vomiting, progressive abdominal distension and constipation. Clinical examination revealed a febrile dehydrated child, a grossly distended abdomen with generalized tenderness and an umbilical hernia with a 2cmx 2cm fascial defect. There were associated hypoactive bowel sounds and tender rectum filled with brownish non-mucoid non-blood stained stool. Plain abdominal X-ray showed multiple air-fluid levels, centrally located dilated loops of small intestine. Abdominal ultrasound showed dilated bowel loops with low peristalsis. Laboratory findings showed anaemia, leukocytosis and acidosis. The patient was adequately resuscitated and exploratory laparotomy was done 22 hours post admission through a long midline abdominal incision. Intraoperatively, a 4cm by 2cm mesenteric defect 48cm from the ileocaecal junction was observed. There was a viable herniated segment of ileum and a 20cm of gangrenous adjacent ileum as seen in figures 1, 2, 3& 4.

**Figure 1**

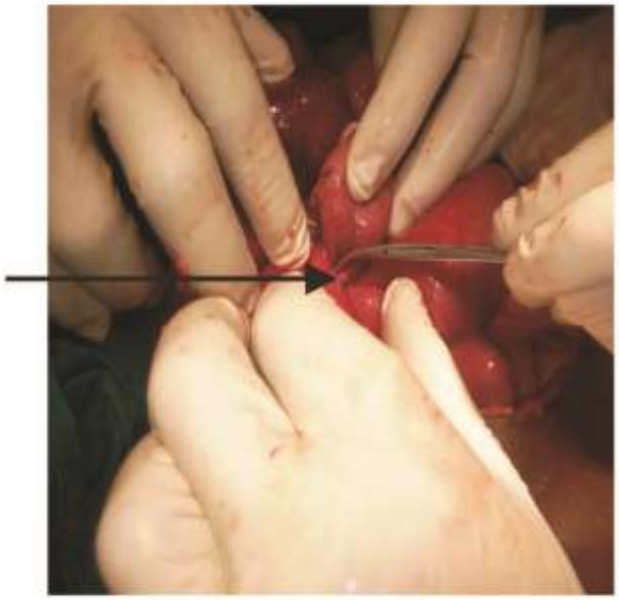


**Figure 3**

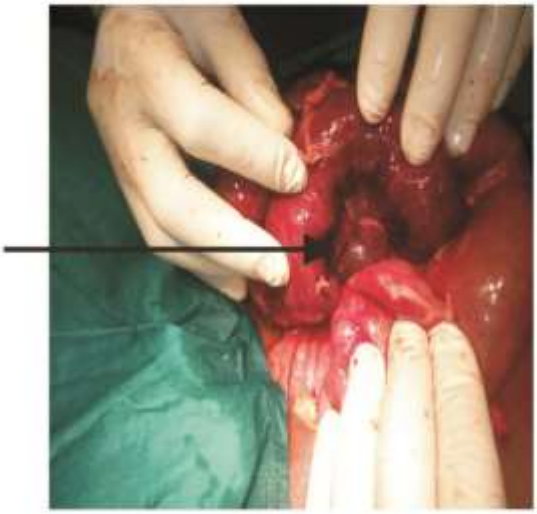
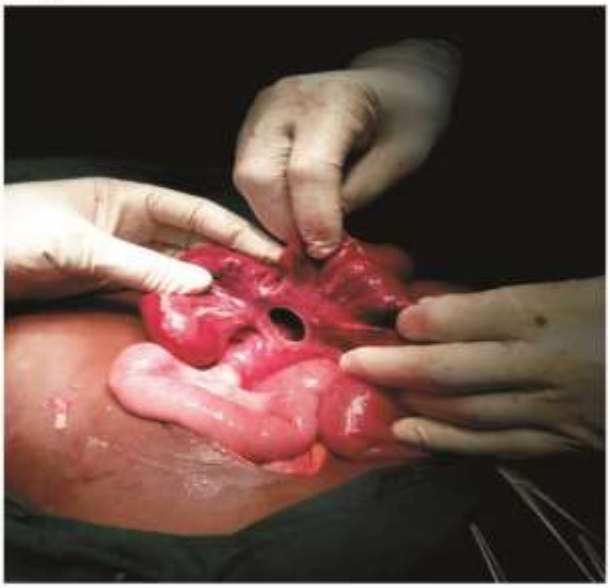


**Figure 4**



A segmental resection of the gangrenous bowel and the mesenteric defect with an end to end anastomosis were done. The peritoneal cavity was copiously irrigated with saline. The patient did well and was discharged home 7 days post operatively.

## DISCUSION

Acute intestinal obstruction is encountered daily in our practice. Congenital internal hernias are rare and occur in less than 1% of children.[6,7,11,14] They cause 5.8% of all small bowel obstruction in children,[1,4] are often neglected but can have devastating consequences. Transmesenteric hernias were first described by Rokitansky in 1836.[1,4,10,13,15] Meyers traditionally classified internal hernias into paraduodenal (53%); pericecal (13%); foramen of Winslow (8%); transmesenteric and transmesocolic (5-10%); intersigmoid (6%) and retroanastomotic (5%).[1,2,3,4] The recent increase in procedures requiring roux-en-Y reconstruction in children has now made transmesenteric hernias the commonest(35%) internal hernias in children.[1,2,5,6,7] These hernias characteristically do not have sacs and the defects often have 2-5cm width gaps.[5,7] They can either be congenital or acquired (postsurgical, traumatic or post-inflammatory).[1,4] The congenital defects result embryologically from either regression of the dorsal mesentery, development of a hypoavascular area, rapid lengthening of a segment of mesentery or mesenteric compression by colon during fetal midgut herniation into the yolk sac . They may be syndromic with associated atresia, malrotation, bowel duplication, Hirschsprung's disease or cystic fibrosis.[1,4] Three main types of transmesenteric hernias are commonly seen. These include the transmesenteric, the transmesocolic and the Peterson's type of hernia which herniates behind a Roux-en-Y loop.[1] These hernias can either remain asymptomatic or cause chronic intermittent abdominal pain especially in older children and bowel obstruction in neonates amongst other symptoms. The most important complications of volvulus, strangulation with possible resultant bowel gangrene and perforation occur in 30-40% of symptomatic cases.[2,5,6,9] The non-specific symptoms and signs coupled with spontaneous reduction make pre-operative clinical diagnosis difficult. Radiological signs with modern imaging techniques such as Computed Tomogaraphy (CT) scan are not always apparent even when done at the appropriate time.[1,2,3,5,8] This has often lead to gross mismanagement with catastrophic consequences. Most of the cases are accidentally diagnosed intraoperatively during emergency exploratory laparotomy.[3,7,16] Surgically treated children with simple transmesenteric hernias have a general mortality of 15% while those complicated with volvulus, incarceration and gangrene have a mortality of 50%. All the complicated

transmesenteric hernias not surgically treated have a 100% mortality.[4,6,8,10,11,12,13] Children with transmesenteric internal hernias suffer significant morbidity and even death when diagnosis is late and prompt appropriate treatment are not instituted.[17] Therefore, heightened awareness of the possibility of transmesenteric hernias and high index of suspicion of clinical cases coupled with understanding of the pathology will limit misdiagnosis despite imaging results.[1,2]

## CONCLUSION

Transmesenteric internal hernias are rare cause of intestinal obstruction in children. The incidence is increasing with increase Roux-en-Y procedures. Pre-operative clinical and radiological diagnosis is still a major challenge. Complicated cases are often associated with catastrophic outcome. High index of suspicion, adequate resuscitation and prompt appropriate surgical intervention in suspected cases result in better management outcome.

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# OSTEOCHONDROMA: A 15 YEAR REVIEW OF ITS DEMOGRAPHICS AT THE JOS UNIVERSITY TEACHING HOSPITAL IN NORTH CENTRAL NIGERIA

**Akpa PO (MBBS, FMCPath)[1, 2*], Kwaghe BV (MBBS, FMCPath) 1, Innocent E (MBBS, FMCPath, FWACP-Lab Med) [1, 2], Dallang BC (MBBS)[1]**

**Affiliations**

[1]Department Of Histopathology, Jos University Teaching Hospital, P.M.B 2076, Jos Plateau State, Nigeria.

[2]Department Of Histopathology, University Of Jos, P.M.B 2084, Jos Plateau State Nigeria.

**Correspondence: Akpa Philip Ojile,**

Department Of Histopathology, Jos University Teaching Hospital, Jos Plateau State Nigeria. P.M.B 2076. akpaphilip@yahoo.com. 07035128504

**Abstract**

**Background/Aims:** Osteochondroma is the most common bone tumour worldwide, most cases present as a painless bony protrusion that poses minimal risk to the patient with very few undergoing malignant transformation. This study is aimed at documenting the demographics of Osteochondroma in a tertiary health care Centre in North Central Nigeria. The gender distribution, age distribution and site of diagnosis were documented.

**Methods:** This is a hospital based retrospective study which assesses all cases of osteochondroma diagnosed at the Department of Histopathology, Jos University Teaching Hospital, Jos Plateau State North-Central Nigeria between 1st January 2005 to 31st December 2019.Records of all cases of primary bone tumour within the period of the study were reviewed and percentages were calculated for osteochondroma. The Age, Sex and Anatomical site of osteochondroma diagnosis were recorded. Slides were reviewed to confirm the diagnosis.

**Results:** A total 165 primary bone tumours were documented in the period of review of which 103 were benign and 62 malignant. There were **28 cases of Osteochondroma** (which accounted for 17% of primary bone tumours and 27% of benign bone tumours). Forty six percent of cases occurred in the second decade and it had a male to female ratio of (M:F) 0.86:1. Sixty percent (60%) of cases occurred in the femur, tibia and humerus combined.

**Conclusion:** The demographics of osteochondroma at the Jos University Teaching Hospital correlates with reports from similar institutions in other parts of Nigeria and other parts of the world.

**keywords:** Osteochondroma; Primary bone tumour; Benign bone tumour; Jos, Nigeria

## INTRODUCTION

Osteochondroma is the most frequently occurring benign bone tumour globally.[1-4] Its reported frequency of occurrence varies from place to place. It is estimated to account for between one-third to a half of primary bone tumors diagnosed in some studies.[4] Osteochondroma is commonly diagnosed in young individuals.[1,2] The long bones of the upper and lower limbs are the commonest sites of its diagnosis.[1] Osteochondroma can occur as a solitary lesion and in the setting of a hereditary syndrome with multiple osteochondromas.[4,5] Histologically these tumours consist of a bony projection with a cartilage cap.[1,2]Osteochondromas have a predominant bony portion, but their growth occurs in the cartilaginous portion hence its classification as a chondrogenic tumour.[5]

## MATERIALS AND METHODS

This study is a retrospective review of all cases of osteochondroma diagnosed at the Jos university Teaching Hospital (JUTH) department of

Histopathology between 1st January 2005 to 31st December 2019. Materials utilized for this research consisted of Archival slides, paraffin wax tissue blocks, surgical pathology register and case files of all cases of osteochondroma diagnosed during this period. The patient age at diagnosis, gender and anatomical site/bone affected by the tumour were documented for each case. All cases of primary bone tumour were reviewed and relevant percentages for osteochondroma were calculated. All cases were reviewed by the authors of this article, this was done by reviewing archival slides and fresh sections from paraffin wax tissue blocks in cases of missing or poor quality slides. Data obtained was analyzed utilizing Epi info 7 (version 3.5.4) and presented in tables and charts.

## RESULTS

A total 165 primary bone tumours were documented in the period of review of which 103

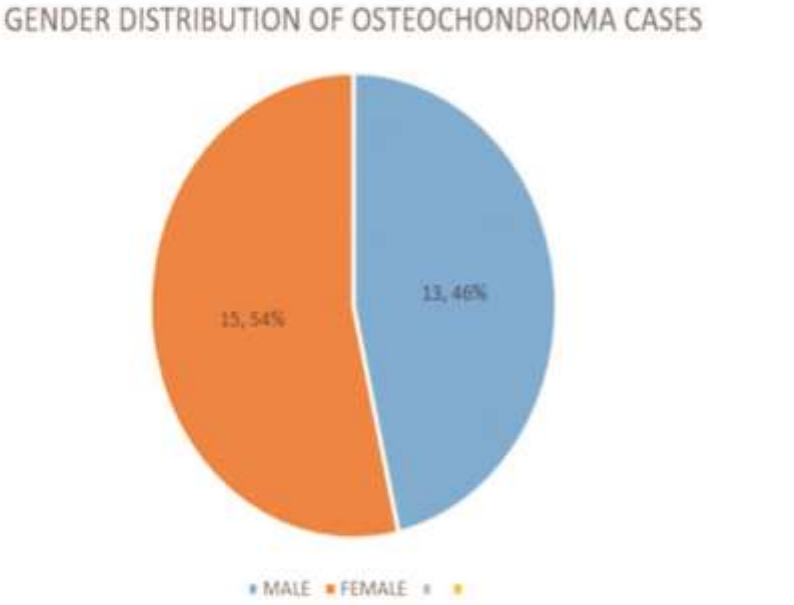


Figure 1. Chart showing gender distribution of osteochondroma

**Table 1.** Table showing distribution of osteochondroma cases according toage (stratified into decades)

| S/N | AGE RANGE | Frequency | Percentage |
|---|---|---|---|
| 1 | 0-10 | 4 | 14.3 |
| 2 | 11-20 | 13 | 46.4 |
| 3 | 21-30 | 6 | 21.4 |
| 4 | 31-40 | 1 | 3.6 |
| 5 | 41-50 | 1 | 3.6 |
| 6 | 51-60 | 2 | 7.1 |
| 7 | >60 | 1 | 3.6 |
| TOTAL | | 28 | 100 |

**Table 2**. Table showing distribution of osteochondroma according to anatomical site of diagnosis

| S/N | SITE OF TUMOUR | Frequency | Percentage |
|---|---|---|---|
| 1 | Femur | 4 | 14.3 |
| 2 | Fibula | 1 | 3.6 |
| 3 | Foot | 3 | 10.7 |
| 4 | Hand | 2 | 7.1 |
| 5 | Humerus | 6 | 21.4 |
| 6 | Radius | 1 | 3.6 |
| 7 | Rib | 1 | 3.6 |
| 8 | Scapula | 2 | 7.1 |
| 9 | Tibia | 7 | 25 |
| 10 | Ulna | 1 | 3.6 |
| | TOTAL | 28 | 100 |

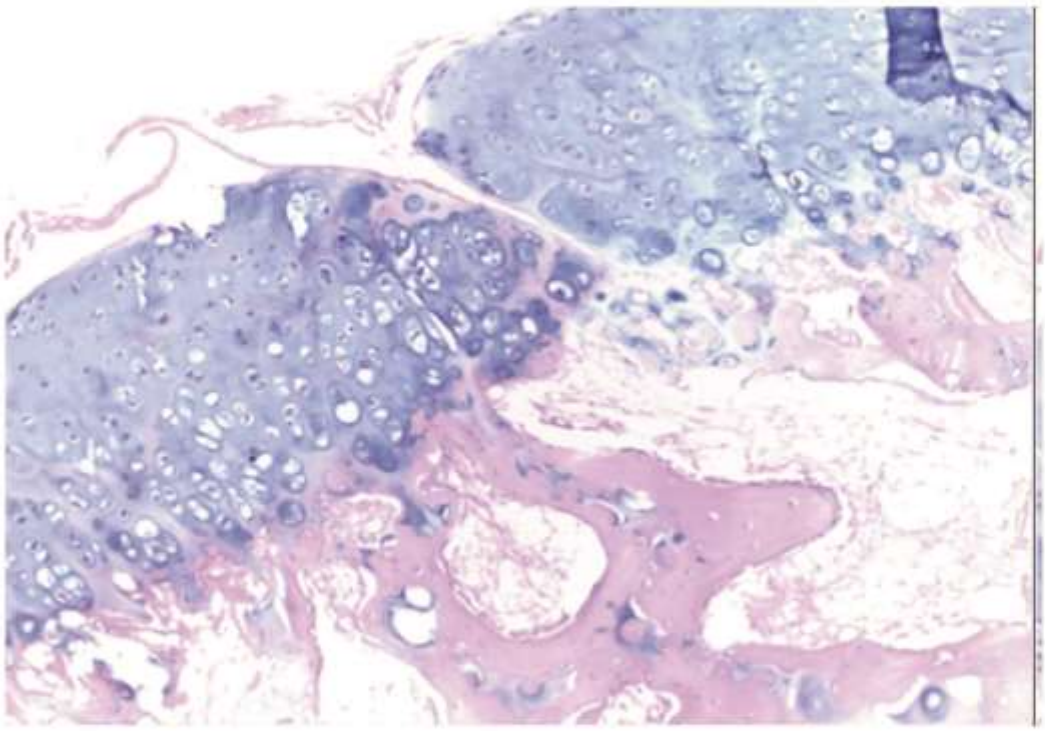

**Figure 2**. Photomicrograph (**Haematoxylin and eosin x 100**) Osteochondroma of the tibia in an 11-year-old male. Perichondrium, cartilage and bone are clearly demonstrated.

## DISCUSSION

Authors opined in the past that osteochondroma is not a true neoplasm but rather a skeletal dysplasia,[4,5] however molecular studies suggest osteochondroma is a neoplastic process.[4] Cytogenetic studies have revealed that abnormalities involving loci 8q24.1,11p11.2-12 and 19p are involved in the pathogenesis of solitary and multiple osteochondromas and the genes involved are denoted as EXT1(8q24.1), EXT2(11p11.2-12) and EXT3(19p) respectively.[4] Eighty five percent (85%) of all osteochondromas occur in the solitary form with 15% occurring in the setting of multiple osteochondromas.[3,5] Cases of hereditary osteochondromas appear to be more common in Caucasians than other races.[3] We did not document any case of multiple osteochondromas in our study.

Osteochondroma accounted for 17% of primary bone tumours and 27% of benign bone tumours in this study. It is the second most common primary bone tumour after osteosarcoma and the most common benign bone tumour (along with fibrous dysplasia). Our findings correlate closely with the report by Mohammed et al in Zaria North-western Nigeria, in which osteochondroma accounted for 26% of benign bone tumours.[6] Abdulkareem et.al in Lagos South-western Nigeria and Lasebikan et al in Enugu South-eastern Nigeria also documented osteochondroma as the commonest benign bone tumour but reported significantly higher percentages of 55.7% and 44.7% respectively.[7,8] Osteochondroma was also documented as the commonest benign bone tumour in reports from diverse geographical locations such as Ethiopia (41%), Cameroon (20%), India (40.5%), Mexico (43.7%) and Portugal (45.3%) with varying percentages.[9-13] The relatively low documented percentage of osteochondroma in our study compared to widely reported literature may be attributed to sociodemographic factors in the local population leading to a lower percentage of cases detected and resected.[1,14,15]

Osteochondroma was slightly more common in the female gender in this study with a male to female ratio (M:F) of 0.86:1, Lasebikan et al in Enugu south-eastern Nigeria also documented a female predominance (M:F 0.9:1).[8] A male predominance of osteochondromas appears to be the norm in most local and international publications.[1,2,6,7,9] Some authors have however argued that a gender bias of this tumour does not exist.[5] Reasons for a higher incidence in females in this study can only be speculative. A difference in health seeking behavior among the genders in the local population or less likely biological factor may be responsible but cannot be substantiated from this study.

Osteochondroma is a tumour of children and adolescents.[3,5] A majority of cases of osteochondroma in this study occurred in the first three decades with the peak period of diagnosis in the second decade (46% of cases occurred between 11-20 years). Reports from other parts of Nigeria also documented a peak in the second decade, with 44%, 66% and 75% diagnosed in the second decade in Lagos, Enugu and Zaria respectively.[6,7,8] Elsewhere Bamanikar et al in India documented 60.7% of cases in the second decade.[9] Globally most cases are diagnosed in the first three decades of life.[1]

Osteochondroma can affect any bone in the body but commonly affects long bones of the appendicular skeleton such as the femur, tibia and humerus, it less commonly affects flat bones such as the scapular and hip bones.[3,5] The commonest sites of osteochondroma diagnosis in this study were the long bones, tibia (25%), humerus (21.4%) and femur (14.3%). Studies from Lagos and Enugu in Nigeria also documented similar sites of osteochondroma diagnosis.[7,8] In Zaria North-western Nigeria the face was the most common site of osteochondroma diagnosis, this is however an unusual finding.[6,16] Globally the commonest bones of osteochondroma diagnosis are the femur, humerus, tibia and fibula.[1]

Many cases of osteochondroma are asymptomatic and are detected incidentally[1] however a feared complication is the rare malignant transformation to chondrosarcoma, other complications include formation of vascular pseudoaneuryms and nerve compression arising from an osteochondroma impinging on the aforementioned structures.[5] Indicators of malignant transformation include rapidly increasing size, pain in a previously painless lesion and continued growth of an osteochondroma after skeletal maturity.[5] Osteochondroma (especially the hereditary multiple osteochondromas) is the commonest precursor lesion for secondary chondrosarcoma, it occurs at a younger age than in patients with primary chondrosarcoma.[3] The risk of chondrosarcoma transformation is highest in pelvic bone osteochondromas and those with a thick cartilage cap.[3] Treatment of osteochondroma is simple surgical excision and is dependent on the presence and type of symptoms.

## CONCLUSION

The demographics of osteochondroma seen at the Jos University Teaching Hospital is similar to findings in other local and international published data.

## CONSENT

Is not applicable (no patient identifiers)

## ETHICALAPPROVAL

Not applicable

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**COMPETING INTERESTS**
Authors of this article declare that there are no competing interests

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