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Presentation and Outcome of Treatment of Chronic Osteomyelitis at the Rivers State University Teaching Hospital, Port Harcourt, Nigeria

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Abstract
Background: *The management of chronic osteomyelitis remains a challenge to the orthopaedic surgeon, often requiring multiple procedures. The aim of this study was to determine the pattern of presentation and the outcome of treatment of chronic osteomyelitis of the long bones in a teaching hospital in South-South region of Nigeria.*
Materials and Methods*: A retrospective descriptive study was conducted among patients who had chronic osteomyelitis over a five-year period, using hospital records. The obtained data was analysed and formed into tables and figures.*
Results*: Forty-two patients were recruited into the study. The mean age at presentation was 25.69 years (range 3-74 years) with male: female ratio of 2.2:1. The highest number of cases was recorded in the age bracket 11-20 years (31%), while the least was noted in the age group 51-60 years (2.4%). Fifty percent of the patients presented after 6 months of onset of symptoms. Trauma was the most implicated aetiological factor (42.9%) with open fractures responsible for bulk of the post-traumatic cases (26.2%). Staphylococcus aureus was the most implicated pathogen (26.2%). Majority (64.3%) of the patients had sequestrectomy, with symptom resolution within one year in 85.7% of the patients.*
Conclusion*: Our study revealed that chronic osteomyelitis of long bone affected the tibia more, and trauma was the most common aetiological factor. The most common pathogen isolated was Staphylococcus aureus. Following adequate surgical treatment and antibiotic therapy, majority of the patients had arrest of their symptoms within one year.*

Keywords*: Chronic osteomyelitis, long bones, Port Harcourt, Nigeria.*

Introduction

Chronic osteomyelitis is commonly encountered in orthopedic practice. It presents the need for prolonged hospitalization, multiple procedures and financial burden.[1] The term, osteomyelitis is credited to Nelaton who first used the term in 1844.[2] Osteomyelitis is defined as infection of bone and bone marrow caused by pathogenic microorganisms. As for any infection, it could be acute, subacute or chronic.[3] The literature is devoid of a uniform definition for chronic osteomyelitis. A minimum symptom duration of 6 to 12 weeks is commonly accepted.[4] However, the presence of sequestrum and compromised soft tissue are the hallmark of chronic osteomyelitis. Several surgical classifications for chronic osteomyelitis have been proposed. Among them, the Cierny-Mader classification is the most popular because of its role in patient management and prognosis.[5]

The predisposing factors include untreated acute hematogenous osteomyelitis, local trauma (soft tissue or bone), diabetes mellitus, peripheral vascular diseases, skin infection, malnutrition, immunosuppression, sickle cell anemia and intravenous drug abuse. The infection is predominantly bacterial in origin. Fungi are less involved, but are not unusual in intravenous drug abusers[6] or skull osteomyelitis[7.] Parasites (e.g. *echinococcosis*) are less implicated. Amongst the bacteria, *Staphylococcus aureus* is the commonest,[1] followed by *Streptococci* and gram-negative pathogens.[8] *Salmonella spp* are not uncommon in sicklers.[1] Anaerobes are rare,[9] and coagulase-negative staphylococi are seen mainly in implant –related osteomyelitis.[10] The infection is usually polymicrobial in trauma and long-standing ulcers.[11,12]

Clinical features and standard radiographs are helpful in diagnosis of chronic osteomyelitis. However, no noninvasive test can definitely exclude osteomyelitis.[13] Proof of bone infection requires culture of the same pathogen(s) in at least two bone samples.[10] Wound or bone swabs are unreliable.[14, 15] Many radiologic features have been described, however only few are suggestive of chronic osteomyelitis –sinus tract or radiologic evidence of sequestrum and involucrum. Treatment is individualized. In general, the principle involves eradication of infection via surgical debridement and antibiotic administration; dead space management, soft tissue cover, and skeletal stabilization if required.

Chronic osteomyelitis has a worldwide distribution. The incidence varies from region to region as well as in different hospitals in same region. The incidence arising from contiguous focus of infection has increased, especially in the developed world. This may be due to ageing of the population, the increased prevalence of trauma, more cases of diabetic foot infections and improved diagnostic gadgets. Traumatic causes of osteomyelitis has been reported to be the most common with infection rates in open long bone fractures ranging between 4% to 64%.[16,17]

Despite pharmaceutical advancement in antibiotics and surgical techniques, chronic osteomyelitis constitutes a significant morbidity in orthopedic practice. The treatment is quite challenging and often associated with multiple procedures and prolonged hospitalization. In our environment, the challenge is further aggravated by poverty and patronage of traditional bonesetters. Though the choice of surgical treatment for chronic osteomyelitis is individualized. However, it may be

influenced by available resources and expertise. Therefore, it is necessary to evaluate the results of treatment of chronic osteomyelitis in Port Harcourt, where the options of the attending orthopedic surgeon may be restricted by cost, and availability among other challenges of the developing world. This study determined the pattern of presentation and outcome of treatment of chronic osteomyelitis at Rivers State University Teaching Hospital.

Materials and Methods

Research Design: The study is a retrospective descriptive study.
Study Area: The study was carried out at the Rivers State University Teaching Hospital (RSUTH), Port Harcourt, Rivers State, Nigeria.
Study Setting: The study sites were the orthopedic clinics, wards and theatre of RSUTH.
Study Population: Records of patients of all ages who presented to the orthopedic department between June 2018 to June 2023 and met the inclusion criteria constituted the study population.
Inclusion Criteria and Exclusion Criteria: The study included records of patients with chronic osteomyelitis of long bones, who presented to and managed by the orthopedic surgeons at RSUTH between June 2018 to June 2023, had surgery and followed up for at least one year. The diagnosis was made based on clinical presentation, laboratory parameters (white blood cell count, erythrocyte sedimentation rate, C-reactive protein), plain radiograph of affected long bone(s), microscopy, culture and sensitivity of sequestrum or bone biopsy (where there was no definite sequestrum). The hospital records of patients with complete information on age at presentation, gender, long bone(s) affected, duration of symptoms prior to presentation, aetiological factors, plain radiographic finding, organism cultured, surgical treatment given, duration of antibiotics post-surgery, time of arrest/suppression of infection after surgery and complications post-treatment were selected. These data were collected manually using a proforma validated by the authors. The medical records of 67 patients with chronic osteomyelitis were initially retrieved. Excluded from this study were patients with incomplete medical records, as well as patients who had conservative treatment. Only 42 patients met the inclusion criteria and hence recruited into the study.
Sample Size Determination: Patients who presented to the orthopaedic units during the period under review and met the above inclusion criteria constituted the sample size.
Study Variables: The variables of interest were the redisposing factors, the long bones commonly affected, the common causative organism, and the outcome of treatment.
Ethical Consideration: Ethical approval was obtained from ethics committee of the hospital. Consent from the patients were waived due to retrospective nature of the study. However, their personal information was kept anonymous.
Validity/Reliability of Instrument: The data were scrutinized by all the authors for authenticity or otherwise before usage.
Data Analysis: Data collated were analysed using Statistical Package for Social Sciences (SPSS) version 26. The results were presented with tables and bar charts and variables expressed as mean, proportion, and standard deviation.

Results

Only 42 patients met the inclusion criteria and hence recruited into the study.

Table 1: Age distribution of patients with chronic osteomyelitis of the long bones (n = 42)

Variables	Frequency	Percentage
Age category		
≤10 years	7	16.7
11 – 20 years	13	31.0
21 – 30 years	8	19.0
31 – 40 years	4	9.5
41 – 50 years	7	16.7
51 – 60 years	1	2.4
>60 years	2	4.8
Total	42	100
Mean ± SD; Median (range)	*25.69±17.60years;*	*21.5 (3 – 74) years*

Table 1 shows the age distribution of patients with chronic osteomyelitis of the long bones. There were 29 (69%) males and 13 females (31%). The male to female ratio was 2.2:1. The mean age was 25.69±17.60years, with a range of 3-74years. The highest number of cases were recorded in the age bracket 11-20 years (13 cases, 31%) followed by 21-30 years (8 cases, 19%). The least number was seen in the age group 51-60years (1 case, 2.4%). Twenty-one patients (50%) had their symptoms 3-6 months prior to presentation, while 7 (16.7%) presented after 12months.

Table 2 showing duration of symptoms before presentation (n = 42)

3 – 6 months	21	50.0
7 – 12 months	14	33.3
>12 months	7	16.7
Total	42	100

Table 2 shows the duration of symptoms before presentation. Of the 42 patients, 37 (88.1%) had single bone infection, while 5 (11.9%) had multiple bone involvement. The tibia was the most affected long bone (18 cases; 42.9%), while the ulna, metatarsal, and finger phalanx were the least affected (1 case each; 2.4%). These were shown in figure 1.

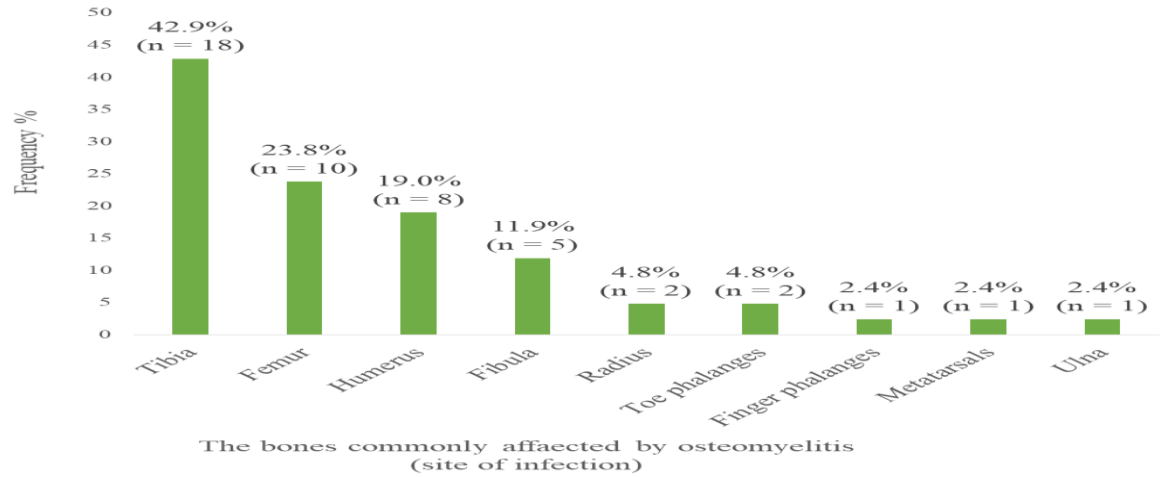

Figure 1: Bar chart showing the proportion of affectation of long bones

Figure 1 shows a bar chart highlighting the proportion of affectation of long bones. The tibia was involved in 18 (42.9%) patients, femur (n = 10, 23.8%), humerus (n = 8, 19%), fibula (n = 5, 11.9%), radius and toe phalanges each had 2 cases (4.8%), while finger phalanges, metatarsals and ulna each had 1 case (2.4%).

Table 3: The aetiological factors of chronic osteomyelitis identified in this study

Variables (N = 42)	Frequency	Percentage
Aetiological Factor **		
Trauma	18	42.9
Open fracture	*11*	*26.2*
Closed fracture converted to open by TBS	*5*	*11.9*
Blunt trauma	*1*	*2.4*
Burns	*1*	*2.4*
Previous implant surgery	5	11.9
Previous acute osteomyelitis	8	19.0
Diabetes Mellitus (DM)	5	11.9
Sickle cell anaemia (SCA)	4	9.5
IV drug abuse	1	2.4
Contiguous spread of focus infection	1	2.4
Haematogenous spread of focus infection	1	2.4

**Multiple responses apply TBS – Traditional bone setters IV- Intravenous

Table 3 shows the aetiological factors of chronic osteomyelitis identified in the study. Trauma was the commonest (18 cases; 42.9%), followed by previous acute osteomyelitis (8 cases; 19%). Intravenous drug abuse and contiguous spread of focus of infection constitute the least (1case each;

2.4%). Amongst the post-traumatic cases, open fractures were responsible for majority (11 cases; 26.2%) while burns and blunt trauma accounted for the least (1 case each; 2.4%).

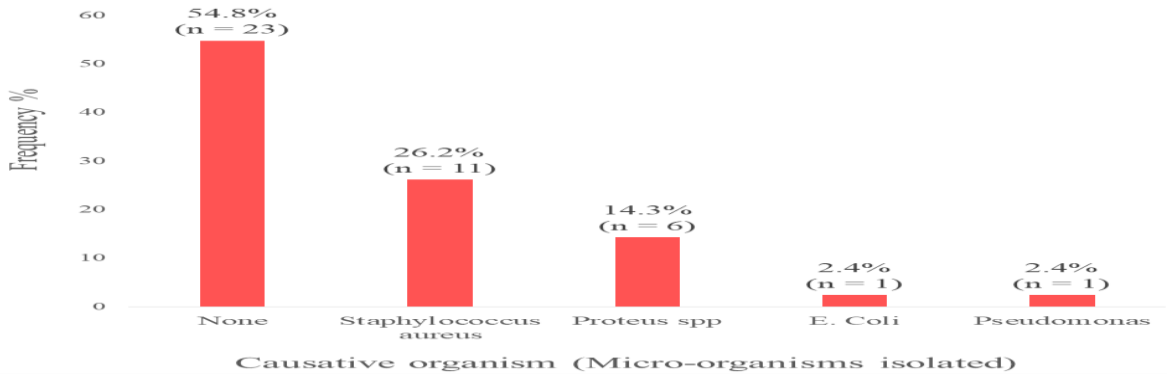

Figure 2: Bar chart showing micro-organism isolated

Figure 2 shows a bar chart showing micro-organism isolated. There were 11 cases in which *Staphylococcus aureus* was isolated (26.2%), followed by *Proteus species* (n = 6, 14.3%), *Escherichia coli* (n = 1, 2.4%), and *Pseudomonas* (n = 1, 2.4%). No micro-organism was isolated in 23 cases (54.8%).

Table 4 showing treatment given

Variables (N = 42)	Frequency	Percentage
Type of surgical procedure done or treatment given**		
Sequestrectomy	27	64.3
Amputation	8	19.0
External fixation	4	9.5
Implant removal	4	9.5
Insertion of antibiotics beads	4	9.5
Wound irrigation with antibiotics containing infusion	4	9.5
Wound debridement	3	7.1
Flap cover	2	4.8
Incision and drainage	2	4.8
Saucerization/curettage	1	2.4
Skin grafting	1	2.4

**Multiple responses apply

Table 4 shows the treatment given to the patients. Out of the 42 patients, 29 (69%) had single procedure while 13 (30.1%) had multiple procedures giving a total of 60 surgical procedures. Sequestrectomy (27 cases; 64.3%) was the commonest procedure, while curettage and skin grafting were the least (1 case each; 2.4%).

Table 5 showing the duration of intravenous and oral antibiotics administered post-surgery

Duration of IV antibiotics post-surgery		
<7 days	5	11.9
7 – 14 days	36	85.7
>14 days	1	2.4
Median; range	*14 days*	*5 – 21 days*
Duration of oral antibiotics post-surgery		
<14 days	3	7.1
14 – 21 days	7	16.7
>21 days	32	76.2
Median; range	*28 days*	*7 – 28 days*

Table 5 shows the duration of intravenous and Oral antibiotics given post-surgery. The average duration of intravenous (IV) antibiotics post-surgery was 14 days, while average duration oral antibiotics were 28 days (table 5).

Table 6 showing the time of arrest/suppression of infection

Time of arrest/suppression of infection		
<6months after surgery	12	28.6
6 – 12 months after surgery	24	57.1
Unresolved (>12 months)	6	14.3
Total	42	100

Table 6 show the time of arrest/suppression of infection. Majority of the patients (36 cases; 85.7%) had resolution their symptoms within period of study without relapse, while 6 (14.3%) had persisted infection or recurrence. Table 6 showed the time of arrest of infection.

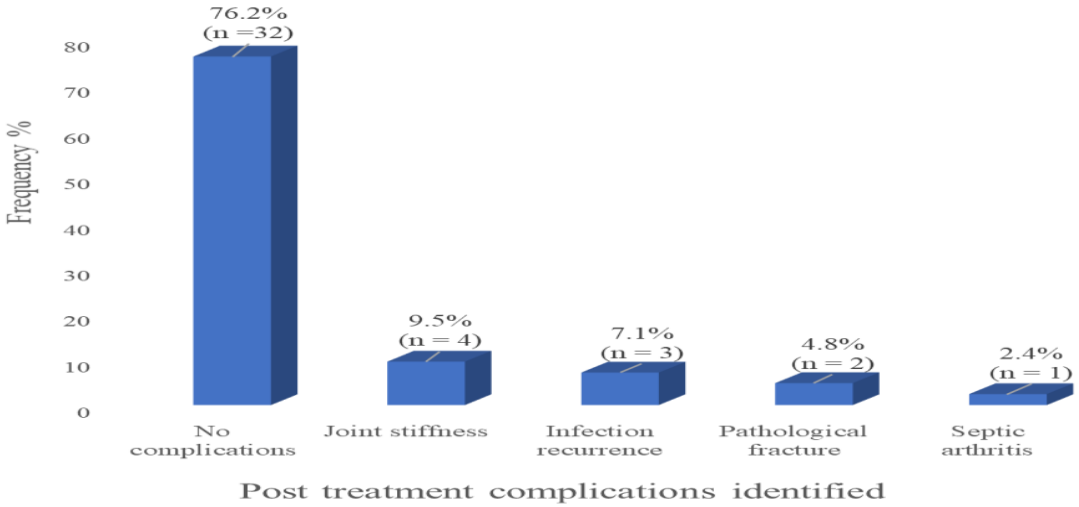

Figure 3: Complications among patients with chronic osteomyelitis that underwent surgery

Figure 3 shows the post treatment complications among patients with chronic osteomyelitis that underwent surgery. Thirty-two patients (76.2%) had no complication within the period of the study. Four (9.5%) had joint stiffness, while 1 (2.4%) had septic arthritis.

Discussion

The management of chronic osteomyelitis poses a challenge to the orthopaedic surgeon. Hence, treatment options continue to evolve and evaluation of outcome of treatment remains relevant. In this study, the highest number of cases were recorded in young people aged 11-20 years (31%) and 21-30 years (19%). This is active age group and hence more prone to trauma. This finding compares favourably with the results of similar studies in Nigeria.[18.19,20] The high preponderance of males in this study is similar to the finding of Nwagbara and Opara.[18] Fifty percent of our patients presented within 3-6months of onset of their symptoms. In earlier report by Eyichukwu and Anyaehie,[19] at the National Orthopaedic Hospital, Enugu, Nigeria most of their patients presented after 6 months. This difference may be due to greater awareness and improved health seeking behaviour.

The commonest long bone affected was the tibia. This is similar to the findings of some studies in our environment,[18,19] but the femur was the most commonly affected bone in earlier studies in Nigeria.[21,22] This difference may be due to changing trend in aetiological factor of chronic osteomyelitis from acute haematogenous spread to post-traumatic. The tibia is largely subcutaneous and hence prone to trauma and infection. Reports from some studies in America and Europe also agree that the tibia is the most commonly affected bone.[23,24] Trauma was the most implicated aetiological factor in our study. This is similar to the finding of Nwagbara and Opara, but differs from earlier studies by Onumiya and Onobowale,[21] as well as that of Eyichukwu and Anyaehia who found high preponderance of acute haematogenous spread.[19] The higher proportion

of post-traumatic osteomyelitis in our study may be due to increasing incidence of motor vehicle crash, gunshot wounds and industrial accidents. Kremers et al in the United States of America reported that contiguous focus of infection due to diabetic mellitus is the commonest aetiological factor.[24] This may be due to difference in lifestyle, environmental factors as well as difference in the availability and quality of healthcare delivery between developed and developing nations.

The most common pathogen isolated was *Staphylococcus aureus* (26.2%). This is similar to the findings in other studies.[1,18,19,25] However, majority (54.8%) of the cases in our study, yielded negative culture. Although our study did not investigate the reason for the high preponderance of the negative cultures, it might be due to abuse of antibiotics by most the patients as half of them presented late and may have tried self-medication at home including consultation of quacks prior to presentation. High rate of negative culture results has been reported in similar studies.[18] When negative culture is obtained, the culture environment should take into consideration the possibility of fungi or Mycobacterium as possible causative organism.[26] Our study did not investigate if this was considered.

Surgery for our patients involved surgical debridement, antibiotic therapy and wound cover. Sequestrectomy accounted for majority of the cases (64.3%). Some patients had combination of procedures. Our patients had mean duration of intravenous antibiotics for 14 days, and 28 days of oral antibiotics in line with the hospital protocol. Some patients did not complete the recommended duration of antibiotics due to financial constraint as payment is predominantly out-of-pocket. The duration of antibiotic therapy in chronic osteomyelitis is subject to debate. Traditionally, 4-6 weeks of antibiotic therapy is recommended.[13] However, study has shown that similar results can be achieved by either oral or parenteral route, provided the organism isolated is sensitive to the antibiotic used.[27] Eyichukwu and Anyaehie had good result with 72 hours of intravenous antibiotics and 4-8 weeks of orals. In this study, 85% of patients had resolution of their symptoms within one year of follow up. Any attempt to interpret this as cure is not yet justified as recurrence is known to occur years after initial arrest/resolution of symptoms. Some studies have reported recurrence rate of 20-30%.[17,28]

Conclusion

This study revealed that chronic osteomyelitis is common in second and third decades of life with male gender more predisposed. Trauma is the most common aetiological factor, with open fractures responsible for bulk of the post-traumatic cases. *Staphylococcus aureus* was the most commonly isolated pathogen. The infection resolved in majority of the patients, after one year of follow up.

References

1. Lew DP, Waldvogel FA. Osteomyelitis. Lancet. 2004; 364:369-70.
2. Schmitt SK. Osteomyelitis. Infect Dis Clin North Am. 2017; 31 (2): 325-338.
3. Klenerman L. A history of osteomyelitis from the Journal of Bone and Joint Surgery: 1948 to 2006. J Bone Joint Surg [Br]. 2007; 89:667-70.

4. Uckay I, Jungun K, Gamulin A, Wagener J. Chronic osteomyelitis. Current Infectious Disease Reports. 2012; 14 (5): 566-75.
5. Cierny 3rd G, Mader JT, Pennick JJ. A clinical staging system for adult osteomyelitis. Clin Orthop Relat Res. 2003; 414:7-24.
6. Legout L, Assal M, Rohner P, et al. Successful treatment of *Candida parapsilosis* (fluconazole-resistant) osteomyelitis with caspofungin in a HIV patient. Scand J Infect Dis. 2006; 38:728-30
7. Blyth CC, Gomes L, Sorrel TC, et al. Skull –base osteomyelitis: fungal vs. bacterial infection. Clin Microbiol Infect. 2011; 17:306-11.
8. Karamanis EM, Matthaiou DK, Moraitis LI, Falagas ME. Fluoroquinolones versus beta-lactam based regimens for the treatment of osteomyelitis: a meta-analysis of randomized controlled trials. Spine. 2008; 33:297-304.
9. Beals RK, Bryant RE. The treatment of chronic open osteomyelitis of the tibia in adults. Clin Orthop Relat Res. 2005; 433:212-38.
10. Uckay I, Pittet D, Vaudaux P, et al. Foreign body infections due to Staphylococcus epidermidis. Ann Med. 2009; 41:109-19.
11. Haider R, Der Boghosian A, Atiyeh B. Duration of post-surgical antibiotics in chronic osteomyelitis: empiric or evidence-based? Int J Infect Dis. 2010; 14:725-8.
12. Lipsky BA, Berendt AR, Deery HG, et al. Diagnosis and treatment of diabetic foot infections. Plast Reconstr Surg. 2006; 117:212-38.
13. Calhoun JH, Manring MM. Adult Osteomyelitis. Infect Dis Clin North Am. 2005; 19(4):765-86.
14. Benard L, Uckay I, Vuagnat A, et al. Two consecutive deep sinus cultures predict the pathogen of osteomyelitis. Int J Infect Dis. 2009; 14: 390-3.
15. Mackowiak PA, Jones SR, Smith JW. Diagnostic value of sinus-tract cultures in chronic osteomyelitis. JAMA. 1978; 239:2772-5.
16. McGregory JE, Pritchard DJ, Unni KK, Ilstrup D, Rowland CM. Malignant Lesions Arising in Chronic Osteomyelitis. Clin Orthop Relat Res. 1999; (362): 181-9.
17. Mathews JA, Ward J, Chapman TW, Khan UM, Kelly MB. Single-stage Orthoplastic Reconstruction of Gustilo-Anderson Grade III Open Tibial Fractures Greatly Reduces Infection Rates. Injury. 2015; 46:2263-6.
18. Nwagbara IC, Opara KO. Chronic Osteomyelitis of the Long Bones. Orient Journal of Medicine 2017; 29(3-4): 91-97.
19. Eyichukwu GO, Anyaehie UE. Outcome of Management of Chronic Osteomyelitis at National Orthopaedic Hospital, Enugu. Niger J Med. 2009; 18(2): 194-198.
20. Alonge TO, Ogunlade SO, Omololu AB. The Belfast Technique for the Treatment of Chronic Osteomyelitis in a Tropical Teaching Hospital. International Orthopaedics (SICOT). 2003; 27:125-128.
21. Onumiya JE, Onobowale BO. Outcome of Chronic Osteomyelitis in Nigeria. Journal of Applied Basic Sciences. 2003; 1(1&2): 27-30.
22. Katchy NA, Agu CT, Nwankwo EO. Chronic Osteomyelitis in 110 patients. Niger Postgrad Med J. 2000; 7(2): 49-53.

23. Solomon I, Warwick D, Nayagam S, editors. Apley's Systems of Orthopaedics and Fractures, 8th ed. London: Arnold; 2001. p27-48.
24. Kremers HM, Nwojo ME, Ransom JE, et al. Trends in the Epidemiology of Osteomyelitis: A population-based study, 1969- 2009. J Bone Joint Surg Am. 2015 20; 97(10): 837- 845.
25. Wordsworth P. Diseases of Bone and Joints: In Infections. In: Russel RCG, Williams NS, Bulstrode CJK, editors. Bailey and Love's Short Practice of Surgery, 24th ed. London: Arnold; 2004. p. 479-430
26, Zhou J, Li Y, Wang QK, et al, Status of Road Safety and Injury Burden in China. J Orthop Trauma. 2014; 28 Suppl 1: S41-S42.
27. Conterno LO, Turchi MD. Antibiotics for Treating Chronic Osteomyelitis in Adults. Cochrane Database Syst Rev. 2013; 9: Cd004439.
28. Lazzarini L, Mader JT, Calhoun JH. Osteomyelitis in Long Bones. J Bone Joint Surg [Am]. 2004; 86-A:2305-18.