ONE YEAR PROSPECTIVE ASSESSEMENT OF ETIOLOGY AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF MUSCULOSKELETAL INFECTION AT JIMMA UNIVERSITY MEDICAL CENTER , JIMMA, SOUTH WEST ETHIOPIA.

BY DIRIBA GEBEYEHU (MD, SURGERY RESIDENT)

A RESAERCH THESIS TO BE SUBMITTED TO JIMMA UNIVERCTY MEDICAL CENTER, DEPARTMENT OF SURGERY IN PARTIAL FULFILLMENT FOR REQUERIMENT IN GENERAL SURGERY SPECIALITY.

JANUARY, 2022 G.C
JIMMA, OROMIA, ETHIOPIA

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INVESTIGATOR: DIRIBA GEBEYEHU (MD, Surgery resident**).**

ADVISORS: DR. Lidia Gemechu (MD, Assistant professor of Surgery)

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Abstract

***Background**: Musculoskeletal infection is spectrum of illnesses which includes Osteomyelitis (infection/inflammation of bones), Septic arthritis (bacterial infection of joints), pyomyositis (suppurative infection of the muscles) and cellulites (infection/inflammation of the subcutaneous tissues).Now a days, community associated MRSA isolates are significantly increasing as causative agent. However, little is known about the etiology and antibiotics susceptibility pattern of musculoskeletal infection in Ethiopia particularly in Jimma medical center where empirical therapy practiced.*

***Objective**: The aim of this study was to assess the etiology and anti-microbial susceptibility pattern of musculoskeletal infection in adult age >=14years old admitted to orthopedics ward, Jimma University medical center.*

***Result**: In one year prospective study a total of 60 patient with musculoskeletal infection which includes spectrum of isolated Pyomyositis 41 (68.3%) patients, Septic arthritis 9(15%) and osteomyelitis 10(16.7%) were admitted to Jimma University Orthopedic ward. Majority of participants about 23.3% were between ages of 30-40 years. About 70 % (28) patients had gram positive cocci and 27.5 %(11) had gram negative. From 42 bacteria isolated the common bacteria were S.aureus 52.3% (22/42) followed by E.coli14.3%(6/42), Acinetobacter account for 9.5 %(4/42).The resistant pattern of S.aureus were for Ceftriaxone (87.5%), for Ampicillin (94.4%), for vancomycin 53.8 %(7/13) but less resistant to ciprofloxacin 17.6%(3/17) , gentamycin 36.4%(4/15) and oxacillin 28.6(4/14).E.coli resistant pattern for ceftriaxone and ampicillin was 66.7 %(4/6), for gentamycin and ciprofloxacin 75 %(3/4) and clindamycin 80 %(4/5).*

***Conclusion:** The most common identified bacteria were S.aureus and E.coli with higher drugs resistant to commonly used antibiotic like ceftriaxone (87.5%, 66.7%) and vancomycin resistant with S.aureus was 53.8%.*

Key wards: osteomyelitis, septic arthritis, pyomyositis antibiotics sensitivity, antibiotics resistant.

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ACRONYMS AND ABBREVIATION

ATCC: American Type Culture Collection.

CLSI: Clinical and Laboratory Standard Institute.

CDC: Communicable Diseases Control.

CRP: C-reactive protein.

ED: Emergency Department.

ESBL: Extended-Spectrum Beta-Lactamase.

ESR: Erythrocyte Sedimentation Rate.

GAS: Group A. streptococcal.

GNB: gram-negative bacilli.

HIV/AIDS: Human Immune virus/Acquires Immune deficiency diseases.

JUMC: Jimma University Medical Center.

MRSA: Methicillin-resistant staphylococcus aureus.

MSSA: Methicillin-Sensitive t staphylococcus aureus.

MHA: Mueller Hinton Agar.

MDR: Multidrug-resistant.

MSKI: Musculoskeletal Infection, Musculoskeletal infections.

SSTI: Skin and soft tissue infection

SA: Septic Arthritis

UK: United Kingdom.

USA: united States of America

CHAPTER ONE: INTRODUCTION

1. 1 BACKGROUND

Musculoskeletal infection is a spectrum of illnesses which includes Osteomyelitis (infection/inflammation of bones), Septic arthritis (bacterial infection of joints), pyomyositis (suppurative infection of the muscles) and cellulites (infection/inflammation of the subcutaneous tissues) that cause a major of short and long term disability. These different forms `of infections could occur as separate disease entities, as a continuation of one another or even as a component of systemic/distant illnesses or as a focus for systemic/distant illnesses (1).

Pyomyositis, also known as Myositis tropicans, is a bacterial infection of the skeletal muscle that typically results in the formation of an abscess. It was first described in 1885 as an endemic infection in the tropics and referred to as "myositis tropicans(2) which accounting for 2.2%–4% of surgical admissions(3). It mainly affected young adult males or pediatric patients (4). Staphylococcus *aureus* is the most frequent pathogens account for approximately half of all pyomyositis group A streptococcus or other streptococcal species are occasionally isolated, and Fungal pathogens preferentially affect immune compromised hosts (5,6). Other bacteria (streptococci, Pseudomonas *aeruginosa*, Escherichia *coli*, *Klebsiella* species., Candida species., Mycobacterium species) have been reported(7). The common incriminated risk factors were minor closed traumas in 30% , penetrating injury, open fractures and immunodeficiency disorders(4).

Osteomyelitis is an inflammatory reaction of the bone due to infection, most often caused by bacterial which involve the bone marrow, cortex, periosteal, or surrounding soft tissues that leading to destruction of these anatomic structures(8). Acute osteomyelitis progresses over days to weeks or months to chronic osteomyelitis with the formation of sequestrum in the setting of recurrent or refractory infection (1).

Suppurative arthritis, also known as septic arthritis, is an infectious disease that causes joint inflammation and is a medical emergency that can result in considerable mortality (10-15%) and morbidity (25-50%) if not treated promptly. When septic arthritis is suspected, the gold standard is arthrocentesis and synovial fluid culture. Fever, rigors, leukocytosis, or an increased erythrocyte sedimentation rate do not rule out septic arthritis as a diagnosis(9).

Incidence of septic arthritis of native joints in a general population is around two cases/100,000 people per year(10). However, significant geographical variability in incidence, varying from 4 to 10 cases/100,000 population per year in Western Europe up to 29 cases/100,000 population per year among the aboriginal Australian population(11). In developing countries, like in sub-Saharan Africa is as high as 200/100,000 patient, where as in developed countries it varies between 1 and 13 per 100,000 population(12). The risk factors are Joint prostheses , Intravenous drug abuse, Alcoholism, Diabetes ,Previous intra-articular corticosteroid injection and Cutaneous ulcers(13).

The most common causative agents of musculoskeletal infection are staphylococcus aureus, Group A streptococci, Streptococcus pneumonia, Haemophilus influenzae type b and pseudomonas aurogenosa(14) and Kingellakingae (a gram-negative bacillus) has been identified as a common cause of osteoarticular infection which requires special culture techniques for diagnosis(15). H. influenza has become rare following worldwide vaccination programs(14) but Methicillin-resistant staphylococcus aureus (MRSA) is recently increasingly reported as causative pathogen in up to 40% of musculoskeletal infections (16),according to studies conducted in Mexico and the United States of America, (17)(18).

Antimicrobial resistance is one of the greatest threats to human health worldwide which dramatically reduces effectiveness of treating infections and increases the morbidity and mortality of bacterial diseases since the discovery of penicillin in 1928G.C. Antimicrobial resistance has been linked to antibiotic use and it is complex ecological phenomenon depends on individuals, bacterial strains, and resistance mechanisms. Recurrently Bacterial strains resistant to newly developed antibiotics have emerged (19).

1.2 Statement of the problem.

According to International Consensus Meeting on Musculoskeletal Infection, Musculoskeletal infections (MSKI) remain a devastating complication of orthopedic surgery, in which majority are caused by Staphylococcus aurous(20) and in some regions over 50% of cases involve methicillin resistant S. aurous (MRSA) strains(21). Bone and joint infections may cause serious morbidity like permanent disability, paralysis and, rarely, death and pose significant management challenges for many doctors, mainly due to unfamiliarity and a poor evidence on etiology and antibiotics susceptibility patterns(22).

When treatment is delayed or poor, irreversible joint deterioration occurs in septic arthritis. MRSA infection has become more common in many health-care systems, and MRSA strains have been detected in community-associated illnesses, which have become a severe problem in the globe(23).

Antimicrobial resistance has become more widespread and global in both Gram-positive and Gram-negative bacteria, such as methicillin-resistant Staphylococcus aureus (MRSA) and extended-spectrum beta-lactamase (ESBL) positive Enterobacteriacea of septic arthritis(24).

Over the last decades, study showed S. aurous reduced susceptibility to vancomycin has been reported in study done in Boston medical center, United states (25).

The diagnosis of musculoskeletal infections microbiology is crucial in identifying the exact etiology and administering the appropriate therapy. Even though this is difficult in developing country like us where the treatment is empirical based on the data from other settings which could lead to ineffective treatments and increases antibiotic resistance pattern.

Thus, this research gave better understanding of the causative bacteria and commonly in use drug susceptibility patterns of the bacteria in adult.

CHAPTER TWO: LITERATURE REVIEW.

Septic arthritis

Musculoskeletal infection is a spectrum of illnesses which includes osteomyelitis (infection/inflammation of bones), Septic arthritis (bacterial infection of joints), pyomyositis (suppurative infection of the muscles) and cellulites (infection/inflammation of the subcutaneous tissues)(1).The incidence of proven and probable septic arthritis in Western Europe is 4–10 per 100 000 patient-years per year, northern Europe and in Australia is 29 cases per 100 000 of the aboriginal Australian population, with a relative risk of 6·6 compared with the white Northern Territory Australian population (23).A prospective study from Amsterdam found that age above 80 years, diabetes, rheumatoid arthritis, and recent joint surgery were all risk factors for the development of septic arthritis over the course of three years, with in 37 incident septic cases. Raised hemodialysis prevalence has also been estimated to be over 500 cases per 100 000 patients, and post-arthroscopic septic arthritis has a prevalence of around 14 cases per 10,000 treatments 0.14 percent) (23). In study done in UK, blood cultures were positive in 24% of cases in whom organisms were identified in the synovial fluid, and in a further 9% of patients blood cultures were the only source of a positive microbiological diagnosis and gram staining of synovial fluid identified the causative organism in 50% of cases, rising to 67% after culture(26).

Between 2006 and 2017, a study was conducted in India to evaluate the clinical and microbiological profiles of 70 adult patients admitted with for septic arthritis diagnosis. Males were more likely to develop septic arthritis (83 percent), and roughly 75 percent of patients had a history of fever. The knee joint was the most commonly affected joint (71 percent), followed by the hip joint. C-reactive protein levels were regularly above 75, total blood white blood cell (WBC) counts were not indicative of infection, with a mean WBC count of 13,561/cu.mm and Gram stain examination sensitivity of 47%. Staphylococcus aurous (42.85%) and streptococcus (30%) were the most commonly isolated infectious agents. One-third of the patients had multi-resistant organisms, 70% of the patients had a significant residual disability at 6 months follow-

up and had 4.25% mortality (11). Even though septic arthritis mortality varies between studies, it appears to be around 11% for mono articular sepsis. In one study, 24 percent of participants had a poor functional result, while another 8% had osteomyelitis (23).

A retrospective study performed for 1465 of adults (age ≥ 18 years) with septic arthritis who received care between 1990 and 2018 at 3 teaching hospitals in Boston, Massachusetts, showed an average patient age was 55.4 years, and 65.9% of patients were male and mortality within 30 days of hospital discharge fell from 10% in 1990–2008 to 6.8% in 2009–2018. Etiologic pathogen identified were Staphylococci in 60.6%, methicillin sensitive Staphylococcus aureus (MSSA) in 41.5% and methicillin-resistant Staphylococcus aureus (MRSA) in 17.9%. Streptococci in 17.1%, Coagulase-negative staphylococci 1.2%, Pseudomonas aeruginosa 2.0%, Escherichia coli 1.7%, Serratia species.0.9%, Mycobacterium tuberculosis 9 (0.6%), Neisseria gonorrhoeae (gonococcus) 9 (0.6%), Pasteurella multicoda 11 (0.8%), Anaerobes 8 (0.5%) Polymicrobial 120 (8.2%) and Miscellaneous like Antinomies, Aerococcus urinae, Bacillus, Corynebacterium accolens, Corynebacterium striatum, Gemella hemolysans, and Haemophilus influenza 20(1.4%). The commonly involved joints are the knee (25.7%), shoulder (11.7%), hip (10.5%), and sterno-clavicular joint (8.3%), Wrist 5.9%, ankle joint 5.7%, and elbow joint 2%. In 712 patients with Culture-Positive, initial Synovial WBC Counts showed: <25 000 134 (18.8%), 25 000–49 999 128 (18.0%), 50 000–74 999 128 (18.0%) 75 000–99 999 93 (13.1%) ≥100K 229 (32.2%). Major Clinical Risk Factors, Comorbidities, and Concomitant Sites of Infection in 1465 Patients with Septic Arthritis were: joint strain or no penetrating injury (17.1%), diabetes mellitus (16.8%), IDU (15.3%), immunosuppressive medication (9.6%), and gout (7.1%)(27).

Over the course of 15 years at Boston Medical Center, a retrospective chart review of 128 inpatient cases of septic arthritis with positive synovial cultures revealed that Staphylococcal infections were the etiologic pathogen in 73 percent (93 of 128 cases), MRSA in 22 percent (20 of 92 cases) of native joint infection, and 11 percent (4 of 36 cases) of prosthetic joint infection. In the second period, there were three cases of MRSA septic arthritis (native joint infection) with

a vancomycin minimum inhibitory concentration of 1.5 g/ml and one case of MDR GNB (Escherichia coli) (native joint infection)(28).

Osteomyelitis.

Osteomyelitis or inflammation of bone most commonly caused by invasion of bacterial pathogens into the skeleton which currently notoriously difficult to treat because of the widespread antimicrobial resistance in preeminent etiologic agent like Gram-positive bacterium Staphylococcus *aureus*(29).

A study conducted in South Africa to assess the microbiology of osteomyelitis in poor countries included 60 patients with osteomyelitis, ranging in age from 14 to 59 years, with 47 males and 13 females. 45 percent (n=27) of the 108 bacteria discovered were multiple organisms, 22 percent were single Gram-positive organisms, 26 percent were single Gram negative organisms in 26 percent of patients, and four instances (7%) had no organism cultivated. The Enterobacteriaceae family (Citrobacter, Enterobacter, Escherichia, Klebsiella, Morganella, Pantoea, Proteus, and Serratia spp.; 34 percent, n=37) was the most prevalent organism, followed by Staphylococcus spp. (29 percent, n=31), Pseudomonas aeruginosa (11 percent, n=12) .S. aureus was the most prevalent isolate (n=23) in terms of individual organisms. Seventy percent of Enterobacteriaceae were resistant to cefuroxime and/or ampicillin-clavulanic acid, whereas 29 percent and 34 percent were resistant to piperacillin-tazobactam and cefepime, respectively. It was 71 percent sensitive to ciprofloxacin, gentamycin, and meropenem, and 81 percent sensitive to gentamycin(30).

Fourteen (77%) of Staphylococcus aureus were susceptible to cloxacillin and erythromycin (84%), clindamycin (84%) and trimethoprim-sulfamethoxazole (68%). Five (23%) of the S. aureus and six (86%) of the other Staphylococcus spp. was MRSA (31).

Pyomositis**.**

Retrospective study done at three institutions in two cities of Ohio, US on 60 cases of pyomyositis and identified pathogens were: S. aureus pyomyositis (29) which is MSSA or MRSA, Non-S. Aureus pomposities (31), either Streptococcus pyogenes or Streptococcus agalactiae (4), while milleri group Streptococcus (2), Bacteroides fragilis bacteremia (1) and remaining eight patients had polymicrobial infections of 3 pathogens or more that were a mixture of gram positive and gram negative organisms. The lower extremity (27) was the most frequent location of pyomyositis followed by the abdomen and pelvis (23) then Upper Extremity (10) and chest (5) respectively. Risk factor identified were: DM(27%), trauma(23%), ,malignancy(8%), immune compromised(8%), medical procedure(18%) and Iv drug users(12%)(2).

Another Single-Center Retrospective Study in USA, on 43 cases of pyomyositis and 18 cases of infectious myositis treated between January 2012 and May 2020, showed, mean age was 48 years, and 66% account male. Diabetes mellitus affected 35%, and 16% had immune compromising comorbidities. Body regions involved were lower extremity 37.9%, upper extremity, 18.9%, abdominal and back 13.2%, chest 4.9 and neck and face 4.9% 1.6% respectively. Staphylococcal species accounted for 46% of all infections, followed by streptococcus (14%), culture-negative bacteria (6%), and others (30%). In 28% of the cases, blood cultures were positive. The majority of culture-positive cases (62%) were caused by Staphylococcal species, with methicillin-sensitive S aurous (MSSA) accounting for 61 percent and methicillin-resistant S aurous (MRSA) accounting for 29 percent of Staphylococcal aurous cases. The length of symptoms prior to presentation ranged from 1 to 30 days, with a median of 5 days, and around 67 percent of these individuals were treated with empiric antibiotics before blood, wound, and/or bodily fluid cultures tokens. Two of the five polymicrobial cases were caused by a mix of staphylococcal and streptococcal species, one was caused by Gram-negative bacteria (Escherichia coli), one was caused by a fungal (Cryptococcus neoformans), and one was caused by a virus (influenza A). The median hospital stay was 9 days (range: 0–57 days), while

antimicrobial treatment lasted 18 days (range: 2–221 days). The median hospital stay (13 days) and treatment duration (32 days) for staphylococcal infections are the longest(32).

Antibiotics such as beta-lactams and vancomycin were often utilized, and half of the patients (30 of 61) received more than one kind of antibiotic. Vancomycin was included in 88% of empiric treatment regimens for culture-negative cases, and 31% of culture-negative patients got vancomycin and an anti-pseudomonas beta-lactam within 24 hours of visited. Outpatient non-adherence was observed in 8% of patients, and 8% of patients departed the hospital during their treatment. All cases of pyomyositis and infectious myositis were successfully treated in 84 percent of patients. Three of the seven cases classified as treatment failures resulted in death, and two of the seven patients with treatment failure were lost to follow-up shortly after discharge due to persistent osteomyelitis. Actinomyces spp., C neoformans, E coli, influenza A, and Nocardia farcinica were found in 5 of the 10 cases, with the remaining pathogens being Actinomyces spp., C neoformans, E coli, influenza A, and Nocardia farcinica. The bulk of the cases (8 out of 10) necessitated surgical intervention. Five patients had effective treatment courses, three patients died, and two patients were lost to follow-up shortly after discharge(6).

Antibiotics profiles

A retrospective analysis of 94 patients with septic arthritis was conducted in Jerusalem. There were 89 microbial isolates from 85 patients, 82 monomicrobial cultures, and three cases of polymicrobial growth (adding up to 7 isolates). S. aurous was the most common isolate, accounting for 45 percent (n=38) of all SA cases, with MRSA being identified in seven of them (18.4 percent). A total of 14 Gram-negative pathogens were discovered (16.5 percent) (33).

Staphylococcal infections accounted for 73 percent (93 of 128 cases) of septic arthritis cases, while MRSA accounted for 22 percent (20 of 92 cases) of native joint infection and 11 percent (4 of 36 cases) of prosthetic joint infection in a retrospective chart review of all incident inpatient cases of septic arthritis with positive synovial cultures in Boston medical center. MRSA susceptibility to vancomycin was lowered in three of the cases.(34).A study done on total of 93

patients with S. aurous arthritis, in Taiwan hospitals, MRSA arthritis was found in 38 (40.9%) cases about (92.5%) were classified as community-acquired infections(35) .

On 109 synovial cultures, a retrospective cross-sectional review was conducted in two metropolitan university emergency departments in northern California. In 10 of the 12 septic arthritis patients, S.aureus isolates were found, 6 of which were MRSA and 4 of which were MSSA. Vancomycin, trimethoprim-sulfamethoxazole, and doxycycline were all effective against MRSA isolates from septic arthritis; clindamycin, levofloxacin, and levofloxacin were all effective against MRSA isolates from septic arthritis. Streptococcus pneumonie, Enterococcus faecalis, and Pseudomonas aeruginosa were found in one of the 12 true culture positive septic arthritis cases. (36).

Another retrospective research in the UK found 58 cases with haematogenous S.aureus, 15 patients with MRSA, and 43 individuals with MSSA among all adult patients presenting with septic arthritis. MRSA patients, on the other hand, were substantially more likely than MSSA patients to be prescribed inappropriate empirical antimicrobials (93 percent vs. 0%, P 0.05). Vancomycin was used in 100% of MRSA patients, Xucloxacillin in 97%, and vancomycin in 3% of MSSA patients who received sensitivity specific IV antimicrobials. Oral antimicrobials used in MRSA patients included rifampicin alone in 50% of cases, fucidin alone in 33% of cases, and rifampicin and fucidin combined in 17% of cases. Oral antimicrobials in MSSA patients consisted solely of Xucloxacillin(37).

Tibia is most commonly involved bone in Osteomyelitis and Staphylococcus Aureus is causative agent in 60-80% of the cases showed in study done for sub- Saharan county in Rwanda(38).

A cross-sectional meta-analysis study done in Ethiopia teaching and specialized Hospital on a total of 21 studies with 4284 wound samples with 3012(70%) positive wound cultures and 3598 bacterial isolates. Gram positive cocci were the most commonly isolated bacteria with

prevalence of S.aureus 36%. The most commonly isolates gram negative bacteria were E.coli 13%, P.areuginosa 9, and K. pneumonia 9%, P.mirabili 9%.

Antibiotic resistance profiles of the isolated gram positive S.aureus bacteria's were, MRSA strain isolated in 49% and Augmentin resistant in 42%, Ampicillin resistant 72%, Amoxicillin resistant 62%, ceftriaxone resistant 73% and it has lower resistant to Gentamycin and ciprofloxacin 13%,12% respectively. The most resistant Antibiotics to E.coli were Ampicillin 84%, Penicillin 73%, Cotrimoxazole 53%, ceftriaxone 45% and the lowest resistant antibiotic were Augmentin 16%, Ciprofloxacin 27%, and Gentamycin 33% respectively. The most resistant antibiotic to P.areuginosa ware Amoxicillin 87%, Cotrimoxazole 76%, Ceftriaxone 58% and the lowest resistant were to Augmentin 7% and Ciprofloxacin 16%. P.*mirabilis* resistant pattern were to Ampicillin 95%, Amoxicillin 87%, Augmentin 77%, and has lowest resistant to Gentamycin, Ciprofloxacin 18% and 16% respectively(39).

A survey of 137 study participants conducted at the University of Gonder in Northern Ethiopia revealed that 81 (59.1%) males, 56 (40.9%) females, with a mean age of 31.63 15.39 years, and 86 (62.8%) lived in rural regions, with 65 (47.4%) unable to read and write.

Bacterial isolation rate was 115 (83.9%) with Gram-negative bacterial spp. of 77 (56.6%), followed by Gram-positive bacterial spp.59 (43.4%). From total 136 bacterial pathogens recovered, 21(18.3%) cultures showed mixed growth, 94 (81.7%) showed single bacterial growth and 22 (16.1%) no bacterial growth. Most frequently isolated bacteria was *S. aureus* 39 (28.7%) followed by *Klebsiella* spp. (17; 12.5%), CoNS (16; 11.8%), *Citrobacter* spp. (5; 11%), *Enterobacter* spp. (13; 9.6%), *P. aeruginosa* and *E. coli* (each 8; 5.9%), and *Proteus* spp. (6; 4.4%). S.*aureus*, was resistance to amoxicillin 34 (87.2%), penicillin 33 (84.6%), Oxacillin 30 (76.9%), tetracycline 25 (64.1%), and erythromycin 24 (61.5%); but sensitive to gentamicin 32 (82.1%), ciprofloxacin and ceftriaxone, each 31 (81.2%), chloramphenicol 30 (76.9%), cloxacillin 27 (69.2%), trimethoprim-sulfamethoxazole 24 (61.5%). All of S. aureus were

sensitive to vancomycin 39 (100%) and One isolate of Enterococcus spp. was found to be resistant to vancomycin.

Klebsiella spp., the second most common Gram-negative isolate, was resistant to ampicillin 16 (94.1 percent), chloramphenicol 12 (70.6 percent), trimethoprimsulfamethoxazole 11 (64.7 percent), ciprofloxacin 12 (58.8 percent), and ceftriaxone 9 (52.9 percent), but sensitive to gentamicin 12 (70.6 percent), while E. coli was resistant to ampicillin 6 (75 percent) (62.5 percent). Gentamycin (62.5% sensitivity) and ciprofloxacin (50%) were both effective against Pseudomonas aeruginosa. The second common Gram-negative isolate, *Klebsiella* spp. resistance to ampicillin 16 (94.1%), chloramphenicol 12 (70.6%), trimethoprimsulfamethoxazole 11 (64.7%), ciprofloxacin 12 (58.8%), and ceftriaxone 9 (52.9%), but sensitive to gentamicin 12 (70.6%) while *E. coli* were resistant to ampicillin 6 (75%) and tetracycline 5 (62.5%), whereas E. *coli* were sensitive to gentamicin 7 (87.5%), ceftriaxone 7 (87.5%), chloramphenicol 6 (75%), and ciprofloxacin 5 (62.5%). *Pseudomonas aeruginosa* was sensitive to gentamycin (62.5%) and ciprofloxacin(40).

A study done in Tikur Ambessaa teaching Hospital, on 200 patient with open wound fracture showed, 61 (30.5%) gram stain were positive, 82 (41%) were culture positive. From 162 bacteria were isolated 42/82(51.2%) showed mono-microbial growth and 40/82 (48.8%) polymicrobial (more than one bacterial type) growth. *S. aureus* accounted for 14.8%, *Acinetobacter* spp. (*A. calcoaceticus-baumannii* complex) (11.4%), *E. coli* (10.5%), *Pseudomonas* spp. (*9.9%). S. aureus* accounted for 14.8% followed by *Acinetobacter* spp. (*A. calcoaceticus-baumannii* complex) (11.4%), *E. coli* (10.5%), *Pseudomonas* spp. (*P. aeruginosa* and *P. fluorescens/putida*) (9.9%), *Enterobacter* spp. (*E. cloacae, E. aerogens, E. sakazaki* and *E. amnigenus*) (9.3%.), CoNs and *Klebsiella* spp. (*K. pneumoniae*, *K. ornithinolytica* and *K. oxytoca*) each with an incidence of 7.4%(41).

Hospital based study done on 322 wound samples in Jimma University hospital showed, 96.3% samples culture positive of which 22.9% had multiple bacterial infections. Drug resistance profile of gram positive bacterial tested for 16 antimicrobials showed that 94.5% of S.aureus was resistant to penicillin, 91.8% to ampicillin and 76.7% to oxacillin. Vancomycin resistance was found in 16.4% of S.aureus strains. Similarly, 68.3% of coagulase negative Staphylococcus (CNS) were resistant to both penicillin and ampicillin, while CNS were 100% susceptible to many of the antimicrobial medicines tested. P.aeruginosa had 97.3 percent, 87.8 percent, and 83.8 percent resistance to ampicillin, cotrimoxazole, and doxycycline, respectively, while Citrobacter species had 100 percent resistance to ampicillin, cotrimoxazole, and chloramphenicol, and 88.9 percent resistance to doxycycline.(42).

2.1 Significance of the study.

Musculoskeletal infections affect all age's groups, and prevalence different with associated factors, etiology and changing behaviors in progression of disorders over time and important implications for health from antibiotic resistance developments.

Prevalence of antimicrobial-resistant pathogens, including methicillin-resistant Staphylococcus aureus (MRSA) and multidrug-resistant (MDR) gram-negative bacilli (GNB), has increased in the globe. S. aureus with lower susceptibility to vancomycin has recently been discovered. Today, the outcome of both medicinal and surgical management, as well as the trend of antibiotic resistance in the future, should be questioned.

It is clearly known that antibiotic resistant is emerging global problems, particularly in the developing sub Saharan county like Ethiopia. Thus, this study results will show the etiology, and antibiotics sensitively patterns of musculoskeletal infection in Jimma University medical center, where the sensitivity pattern is unknown and empirical therapy is practicing and will help the policy maker, surgeons and clinicians to take action/measure re plan to improve the situation and to initiate other researchers.

This will help surgeons and clinicians to have a local/institutional data which will help them in choosing the appropriate antimicrobial agents leading ultimately to improved patient outcomes.

CHAPTER THREE: OBJECTIVES

3.1 General objective.

- ✓ To identify the aetiologies, drug susceptibility pattern of musculoskeletal infections in adult patients admitted to JMC from July 2020 to July 2021.

3.2 Specific Objectives.

- ✓ To identify the aetiologies of infectious septic arthritis, Pyomositis, osteomyelitis in adult patients admitted to JUMC, from July 2020 to July 2021.
- ✓ To determine drug susceptibility patterns of the isolates pathogen of infectious septic arthritis, Pyomositis, osteomyelitis in adult patients admitted to JUMC, from July 2020 to July 2021.

CHAPTER FOUR: METHODS AND MATERIALS

4.1 study area and study period.

The study was conducted at Jimma University Medical Center (JUMC) which geographically located in Jimma town, Oromia Regional State, Southwest Ethiopia and 352 kilometers away from the capital city Addis Ababa. JUMC has 800 beds and provides services for approximately 15,000 inpatients and 160,000 outpatients per year from the catchment of about 15 million populations. Orthopedics and traumatology is one the department in Jimma University Medical Center serving for the south west Ethiopia catchment area. The study will be conducted from July 2020 to July 2021.

4.2 design and methods.

The study design was institution based prospective cross sectional study, conducted on adult patients with musculoskeletal infection admitted to orthopedics ward from July 2020 to July 2021.

4.3 population

4.3.1 Source population

All adult patients with musculoskeletal infection admitted to JUMC during the study period July 2020 to July 2021 was included.

4.3.2 Study population

All adult greater than 14 years old admitted to JUMC, orthopedic ward with the diagnosis of musculoskeletal infections and who fulfills the inclusion criteria was selected from July 2020 to July 2021.

4.4 sample size and sampling technique.

4.4.1 Sample size determination

All patient seen with the diagnosis of musculoskeletal infection fulfill inclusion criteria from July 2020 to July 2021 was included.

4.5. Sampling technique

Consecutive senses of all patients with diagnosis of musculoskeletal infection fulfill inclusion criteria from July 2020 to July 2021.

4.6. Inclusion and exclusion

Inclusion criteria

- All adults patients age greater than 14 years of age admitted to orthopedics ward, JUMC with the diagnosis of musculoskeletal infection (osteomyelitis, septic arthritis, Pyomositis).

Exclusion criteria

- Patient or parents wouldn't to participate in the study when patient couldn't give consent for other illness.
- Participants who were already on antibiotic treatment for more than 7 days.

4.7. Data collection methods and instruments

4.7.1 Data collection methods

A face-to-face interview and review of record of patients using structured questionnaire was employed to collect data on socio-demographic characteristics of the patients and clinical information. Once the diagnosis of musculoskeletal infection made patients was undergo necessary investigations such as gram stain and culture from the site of infection. Structured case recording formats was used to collect the data.

4.7.2 Microbiological Laboratory diagnosis

Culture and sensitivity tests was done on the relevant specimen (synovia fluid, drained/aspirated pus or bone tissue) following the standard protocol. The bottle was then labeled with unique sample number; date and time of collection; then within 2 hours of collection delivered to microbiology laboratory or if delay happen was transported with amines transport media with charcoal and further microbiological investigations was done. The samples was inoculated onto blood agar, Chocolate agar and MacConkey agar and incubated at 37°c for 24 hours aerobically in candle jar.

4.7.3 Isolation and identification of pathogen

Identification of bacterial isolates was made based on their characteristic appearance on the respective media, Gram-staining, and biochemical reactions such as indole production, urease production, citrate utilization, H_2S production and motility will be done. Gram negative rods was identified by the following laboratory tests: urease, citrate utilization and hydrogen sulfide generation; and motility, lactose fermentation, glucose fermentation and indole test. If the isolate were gram positive cocci, catalase, coagulase, optochin, disk bacitracin disk, novobiocin disk and oxidase test was done to identify the species.

4.7.4 Antimicrobial Susceptibility Test

Antimicrobial susceptibility test was carried out using disk diffusion method on Mueller Hinton Agar (MHA) according to the recommendation of Clinical and Laboratory Standard Institute (CLSI). Three to five similar colonies was picked up with wooden applicator stick and was dipped into normal saline to make direct colony suspension of the isolates and inoculum was adjusted at 0.5 McFarland standard by using densitometer. After few minutes, the suspension was streaked onto MHA plates. The antibiotic susceptibility testing was done for -Ampicillin (10µg), Amikacin (30µg), Ampicillin-sulbactum (10/10µg), Gentamicin (10µg), Ceftriaxone (30µg), Ciprofloxacin (5µg), Trimethoprim-Sulphamethoxazole (1.25/23.75µg), Ceftazidime (30 µg), Clindamycin, Cefepime (30 µg), Amoxicillin-Clavulanic acid (10µg), Meropenem (10 µg), Vancomycin, Cloxacililin, Cephalexin and Chloramphenicol. The plates was incubated at 37 °c for 24 hours under aerobic condition and diameter of zones of inhibition was measured using ruler and will be compared with the standard set by CLSI. Quality control *E. coli*ATCC-25922, *S.aures*ATCC-25923 and *P. aeruginosa* 700603 was used as reference strain.

4.8 study variables

4.8.1 Independent variables

- Age
- Sex
- Underlying medical illnesses
- Type of pathogens
- Markers of musculoskeletal infection

4.8.2 Dependent variables

- Antimicrobial susceptibility patter
- Drug resistant pattern microbial

4.9. Data processing and statistical analysis

All collected data from questionnaire were checked for completeness before entry to a database. Then, the data was entered in to a computer using SPSS statistical software version 26 was used for the analysis. Tables and figures was used to present the findings.

4.10. Quality assurance

Pretesting of the questionnaire was done before data collection starts. Data collectors were oriented on the objectives of the study and as to how they went for data collection. Collected data was sorted and checked for errors and completeness onsite daily by supervisor. A standard bacteriological procedure was followed to keep the quality of all laboratory tests. American Type Culture Collection (ATCC) strains (*E. coli* ATCC 25922 and *S.aureus* ATCC 25923) was used as controls for culture and sensitivity test.

4.11. Plan for dissemination and ensuring utilization of finding

The findings of the study will be submitted to department of surgery, department of Orthopedics, Jimma University medical center, Jimma University post graduate research coordinator. Recommendations will be forwarded to hospital staffs and other stakeholders. In addition, the result will help us to develop guide line for the institution.

4.12. Ethical and environmental consideration

Ethical clearance was obtained from Institutional Review Board of Jimma University and permission was obtained from the authorities of the hospital. Written consent was obtained from the patients. Information from card review was used only for the purpose of this research and confidentiality of information will be kept for all patients. The procedure was done just as part of the routine medical care in the medical center and microbiologic results was timely communicated to the treating surgeons.

4.13: Operational definition of terms.

Antibiotic: An antibiotic is a type of antimicrobial substance active against bacterial infections.

Drug resistant: Drug resistance is the reduction in effectiveness of a medication such as an antimicrobial.

Drug sensitive: means bacteria can't grow if the drug is present which means the antibiotic is effective against the bacteria.

Infection: The invasion and multiplication of microorganisms (bacteria) that are not normally present within the body.

Microbiologic Culture: growing of microorganisms on medium / growth medium.

Osteomyelitis: Osteomyelitis is infection or inflammation that occurs in the bone.

Pyomyositis: pyomyositis is bacterial infection of the skeletal muscle tissue.

Septic arthritis: septic arthritis is an infection in the joint (synovial) fluid and joint tissues.

CHAPTER: FIVE RESULT

5.1: Socio demographic characteristics

The study included a total of 60 patient, which shows majority of participants 23.3% were between age of 30-40 years old followed by 20-30years old(20%)and the lowest age groups of greater than 70 years old account for 5%. The mean age in year was 37.23 ± SD (17.918) and the minimum and the maximum age were 14 and 85years old respectively. Most of the patients were male accounting 39(65%), farmer 24(56.7%) and majority are from outside of Jimma town accounting 32(53.3%). Form 13 patients had associated comorbidity, the most common was DM accounting for 6(10%). **(Table 1)**

Table 1. Frequency distribution of Socio-demographic characteristics of etiology and antibiotics susceptibility pattern of Musculoskeletal infection in JUMC, South west Ethiopia from July 2020-July 2021 G.C

Age		**Frequency**	**%**
15-19		11	18.3
20-29		12	20.0
30-39		14	23.3
40-49		6	10.0
50-59		6	10.0
60-69		8	13.3
>= 70		3	5.0
Total		60	100.00
Sex	**male**	39	65.0
	Female	21	35.0
Occupation	**Unemployed**	6	10.0
	government employed	1	1.7

	Merchant	12	20.0
	Farmer	34	56.7
	Students	7	11.7
	Total	60	100.0
Residence	**Jimma (town)**	28	46.7
	Outside Jimma town	32	53.3
Comorbidity(13)	**DM**	6	10
	Hypertension	5	8.3
	HIV	1	1.7
	Psychiatric disorder	1	1.7

5.2: Distribution of anatomical site involved in the infection.

From this 60 patients, the most anatomic site of musculoskeletal infection was muscle which account 50(83.3%) with isolated muscle in 41(68.3%) and 4 and 3 with bone and joint infection. Joint and bone infection accounts 10 patients with 4(6.7%) each isolated infection. Nine patients have two site infection with 4(6.7%) muscle and bone, 3(5%) muscle and joint and 2(3.3%) bone and joint. **(Table 2)**

Table 2: Frequency distribution by Anatomical site of etiology and antibiotics susceptibility pattern of Musculoskeletal infection in JUMC, South west Ethiopia from July 2020-July 2021 G.C.

Types of Infections.	**Anatomical locations**	**Frequency**	**%**
Muscle (alone =41)	thigh	28	46.7
	calf	18	30.0
	Arm	3	5.0
	Forearm	1	1.7
	Total	50	83.3
Bone(alone N=4)	Femur	4	6.7
	Tibia	4	6.7
	Humorous	1	1.7
	Calcaneus	1	1.7
	Total	10	16.7
Joint(alone N=4)	Knee	5	8.3
	Shoulder	1	1.7
	Ankle	3	5.0
	Total	9	15.0
Two site infection	Muscle and Bone	4	6.7
	Muscle and Joint	3	5.0
	Joint and bone	2	3.3

5.3: The diagnosis and procedure done for patients

The study result showed the most diagnosed infection was pyomyositis 50(83.3%) with isolated pyomyositis in 41(68.3%), followed by osteomyelitis in 12 patient with isolated COM 4(6.7%) COM and Septic arthritis 2(3.3%), acute osteomyelitis 1(1.7%).Septic arthritis were diagnosed in 9 (15%) patients with isolated Septic arthritis 3(5.0%), associated with pyomyositis and with osteomyelitis 4(6.7%), 2(3.3%) respectively. **(Table 3)**

Table3: Frequency distribution for the Diagnosis and procedure done for the patients of etiology and antibiotics susceptibility pattern of Musculoskeletal infection in JUMC, South west Ethiopia from July 2020-July 2021 G.C.

Variable	Frequency	Percent
Pyomyositis	41	68.3
COM	4	6.7
Septic arthritis	3	5.0
pyomyositis and COM	4	6.7
Pyomyositis and septic arthritis	4	6.7
septic arthritis and COM	2	3.3
Acute osteomyelitis	1	1.7
pyomyositis and AOM	1	1.7
Total	60	100.0

AOM: Acute osteomyelitis

COM: Chronic osteomyelitis

5.4: Antibiotics profile of the patients before presentation.

From 60 patients involved in this study 20(33.3%) of them given antibiotics before presentation to the Hospital but not given in 40 (66.7%). The most commonly given antibiotic was ceftriaxone, 5(8.3%) and cloxacillin 5(8.3%) followed by metronidazole 2(3.3%). In 8(13.3%) of those given antibiotics was unspecified antibiotic**. (Table 4), (Figure 1)**

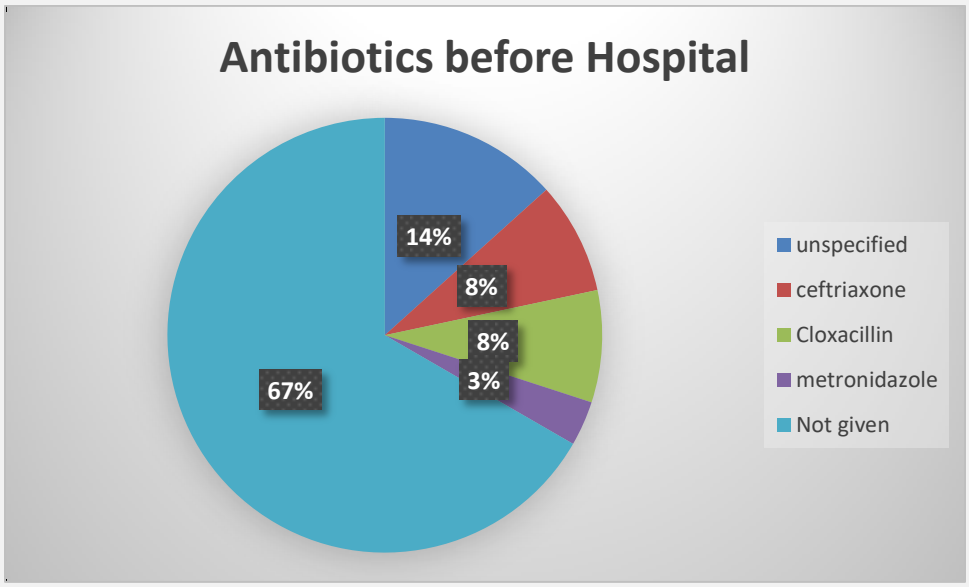

Figure: 1 Patterns of antibiotics used before Hospital presentation for etiology and antibiotics susceptibility pattern of Musculoskeletal infection in JUMC, South west Ethiopia from July 2020-July 2021 G.C

Table: 4 Patterns of presentation Illness for etiology and antibiotics susceptibility pattern of Musculoskeletal infection in JUMC, South west Ethiopia from July 2020-July 2021 G.C

		Frequency	**%**
Durations of illness(day)	<=3	7	11.7
	4-7	24	40.0
	8-14	19	31.7
	15-30	7	11.7
	>=31	3	5.0
	Total	60	100.0
Antibiotics given.	Not given	40	66.7
	Give	20	33.3
	Total	60	100.0

5.5: Pattern of bacterial gram stain in the patients.

In this study, gram stain was done in 40(66.7%) of patients. Sample token from pyomyositi 34(85%), each bone and joint 3(7.5%).Majority of the sample token from pyomyositis patients 29(48.3%) isolated pyomyositis and 2 pyomyositis with osteomyelitis, 2 pyomyositis with septic arthritis patients. Most detected where gram positive cocci 28(70%) followed by gram negative 11(27.5%). One of them had both gram positive and gram negative.

From 29 pyomyositis gram patients, 19(47.5%) was gram positive cocci, 9(22.5%) was gram negative and 1 patients stain both gram positive and gram negative patients.

From 3 isolated septic arthritis patient, 2 pyomyositis and septic arthritis, 2 osteomyelitis and septic arthritis patients only total of 7(17.5) gram positive bacteria were detected.

From 2 isolate osteomyelitis patients, 2 pyomyositis and osteomyelitis patients and 2 osteomyelitis and septic arthritis patients' 4(10%) gram positive and 2(5%) gram negative bacteria were detected. **(Figure 2) (Table 5)**

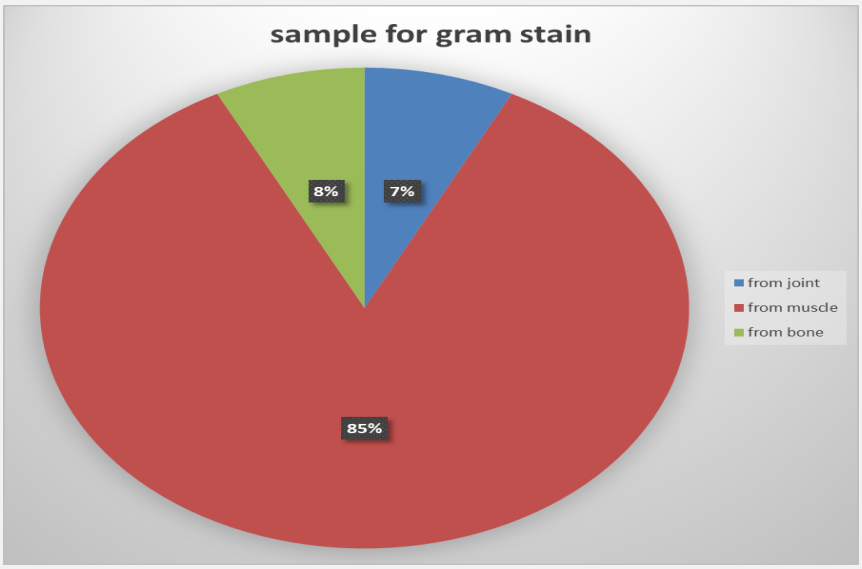

Figure: 2 Anatomical site Patterns from Gram stain done for etiology and antibiotics susceptibility pattern of Musculoskeletal infection in JUMC, South west Ethiopia from July 2020-July 2021 G.C

Table: 5 Patterns Gram stain for etiology and antibiotics susceptibility pattern of Musculoskeletal infection in JUMC, South west Ethiopia from July 2020-July 2021 G.C.

Gram stain of bacteria	Anatomical site of infections							
	Muscle	Joint	Bone	Muscle and joint	Muscle and bone	Joint and Bone	Total	Percent
Gram positive cocci.	19	3	1	2	1	2	28	70%
Gram negative	9	0	1	0	1	0	11	27.5
Both gram positive cocci and gram negative	1	0	0	0	0	0	1	2.5
Total	29	3	2	2	2	2	40	100..0

5.6: Profile of the isolated bacteria from culture.

From all 60 patient's culture done, 66.7 %(N=40) patients had growth and 33.3 %(N= 20) patients had no growth. From this 40 patient growth, 42 bacteria were isolated by having 2(3.3%) patients with poly bacteria and 38(63.3%) patients with mono bacteria Most common bacteria identified were S.aureus 52.3% (22/42) followed by E.coli,14.3%(6/42) Acinetobacter account for 9.5 %(4/42) and S.Pyogene identified in 7.12 %(3/4). Majority of the growth were from pyomyositis patients 56.7 %(34/60) and 36 bacteria were identified. Most of them are mono bacterial but double bacterial identified on two patients. In septic arthritis and Osteomyelitis 9.5 %(4/42) and 4.8% (2/42) were identified respectively.

From 36 bacteria identified in pyomyositis patients, most common identified bacteria were S.*aureus50 %(18/36)* and E.*coli 16.6 %(6/36),* S.Pyogene 8.3 %(3/36), *Acinetobacter 8.3 %(3/8)* bacteria respectively and others bacteria account 2.7 %(1/36) each. From 4 bacteria isolated in septic arthritis patients 73 %(3/4) S. *aurous,* 25% %(1/4) *Acinetobacter* bacteria and from 2 bacteria isolated osteomyelitis, 1 S.*aureus* and 1 Ag*alactiae* were identified. From this study S.aureus is the most common etiologic bacteria isolated. **(Table6)**

Table: 6 Isolated bacteria from culture for etiology and antibiotics susceptibility pattern of Musculoskeletal infection in JUMC, South west Ethiopia from July 2020-July 2021 G.C

Isolated bacteria	Anatomic site of infection			Frequency	Percent
	Muscle	Joint	Bone		
S.*aureus*	18	3	1	22	52.3
S.*Pyogene*	3	0	0	3	7.2
A*galactiae*	1	0	1	2	4.78
Acinetobacter	3	1	0	4	9.5
E.*coli*	6	0	0	6	14.3
Group B *Streptococcus*	1	0	0	1	2.4
Proteus *mirabilis*	1	0	0	1	2.4
K.*oxytoca*	1	0	0	1	2.4
p. *aeruginosa*	1	0	0	1	2.4
Citrobacter	1	0	0	1	2.4
Total	36	4	2	42	100

5.7: Bacterial profile with anatomic site infection.

From sample for 41 pyomyositis patients, 27(65.6%) of this had growth showing S.aureus 14 ,E.coli 6, *Acinetobacter 3 and S.Pyogene 2.* From 3 isolated and 6 mixed septic arthritis with either pyomyositis or osteomyelitis patient 4 bacteria were identified accounting for 3(75%) S.aureus and 1(25%) Acinetobacter from isolated bacteria causing septic arthritis.

From 4 isolated COM patients 2 bacteria were identified accounting for 1 S.aureus and 1 S.*agalactiae*. **(Table7)**

Table 7: Identified bacteria's profiles from culture for etiology and antibiotics susceptibility pattern of Musculoskeletal infection in JUMC, South west Ethiopia from July 2020-July 2021 G.C

Growth pater		**Anatomic site**								**Frequency**	**Percent**
		AOM	SA	P	COM	P. &COM	P &SA	P.& AOM	SA &COM		
Identified bacteria	**No growth**	0	1	14	2	1	2	0	0	20	33.3
	Growth	1	2	27	2	3	2	1	2	40	66.7
S.*aureus*		1	2	14	1	0	2	1	1	22	52.3
S.*Pyogene*		0	0	2	0	1	0	0	0	3	7.1
S.*agalactiae*		0	0	1	0	0	0	0	1	2	4.8
Acinetobacter		0	0	3	0	1	0	0	0	4	9.5
E.*coli*		0	0	6	0	0	0	0	0	6	14.3
Group B *Streptococcus*		0	0	1	0	0	0	0	0	1	2.4
Proteus *mirabilis*		0	0	1	0	0	0	0	0	1	2.4
K.*oxytoca*		0	0	1	0	0	0	0	0	1	2.4
p. *aeruginosa*		0	0	1	0	0	0	0	0	1	2.4
Citrobacter		0	0	0	0	1	0	0	0	1	2.4
Total		1	2	30	1	3	2	1	2	42	100.0

AOM: Acute Osteomyelitis COM: Chronic Osteomyelitis

P: Pyomyositis SA: Septic Arthritis

5.8 Drug susceptibility pattern for bacteria grown on culture.

From 22 S.aureus bacteria isolated, Ceftriaxone drugs sensitivity done for 72.7% (16/22) of S.aureus showed 14(87.5%) resistant and 2 sensitive, of 81.8% (18/22) done for Ampicillin 17(94.4%) were resistant and 1 was sensitive, of 77.2 %(17/22) S.aureus done for ciprofloxacin 14(82.4%) were sensitive and 17.6 were resistant. S.aureus is more resistant than susceptible for vacomycin with 53.8 %(7/13) resistant and 46.2 %(6/13) susceptibility. S.aureus was less resistanttociprofloxacin(S=82.4%(14/17,R=17.6%(3/17),gentamycin(S=73.3%(11/15),R=36.4%(4/15),to oxacillin(S=71.4%(10/14,R=28.6(4/14)) and to clindamycin(S=R=50%(3/6).

The second common isolated bacteria E.coli is more resistant to all antibiotic. The result showed to ceftriaxone and ampicillin(R=66.7%(4/6),S=33.3%(2/6), to gentamycin and ciprofloxacin(R=75%(3/4),S=25%(1/4) to clindamycin (R=80%(4/5),S=1/5) and all 4 done for cotrimoxazole and 1 done for vancomycin were resistant.

Acinetobacter 100% resistant to ceftriaxone (4/4), gentamycin (3/3) and clindamycin (3/3) but 75% resistant to ampicillin (3/4), ciprofloxacin (3/4). For vancomycin(R=66.7 %(2/3), S=33.3 %(1/3) and for cotrimoxazole 50% sensitive and resistant (2/4). Susceptibility pattern for S.Pyogene showed more sensitive for vancomycin 66.7 %(2/3) but 50 %(1/2) resistant to clindamycin and 100% resistant to ceftriaxone (3/3), ampicillin (3/3) and ciprofloxacin (2/3). **(Table 8)**

Table: 8 Drug sensitivity pattern for etiology and antibiotics susceptibility pattern of Musculoskeletal infection in JUMC, South west Ethiopia from July 2020-July 2021 G.C

Susceptibility pattern / Microorganism	Antibiotics	CFT	AMP	AMK	GN	CPRO	COT	CZD	CLND	AGMT	MEP	VAC	TTC	CAF	PNC	OXC	ERT
S.*aureus*(22)	S	2	1	2	11	14	11	3	3	5	3	6	3	6	4	10	10
	R	14	17	1	4	3	2	3	3	5	1	7	2	4	17	4	6
	ND	6	4	19	7	5	9	16	16	12	18	9	17	12	1	8	6
S.*Pyogene*(3)	S	0	0	0	0	0	0	1	1	0	0	2	0	0	0	0	1
	R	3	3	0	0	2	1	0	0	1	0	0	0	0	0	0	1
	ND	0	0	3	3	1	2	2	2	2	3	1	3	3	3	3	1
S.*agalactiae (2)*	S	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	R	2	2	0	0	0	0	0	0	0	0	0	1	0	0	0	2
	ND	0	0	2	2	2	2	2	2	2	2	2	1	2	0	2	0
Acinetobacter(4)	S	0	1	3	0	1	2	0	0	1	4	1	0	0	0	0	0
	R	4	3	1	3	3	2	3	3	2	0	2	1	2	4	1	1
	ND	0	0	0	1	0	0	1	1	1	0	1	3	2	0	3	3
E.*coli(6)*	S	2	2	3	1	1	0	O	1	1	4	0	1	1	2	1	0
	R	4	4	2	3	3	4	6	4	3	2	1	2	3	3	0	1
	ND	0	0	1	2	2	1	0	2	2	0	5	3	2	1	5	5
GB.S*treptococcus(1)*	S	1	1	0	0	0	0	O	0	0	0	1	0	0	1	0	0

	R	0	0	0	0	O	0	0	0	0	0	0	0	0	0	0	0
	ND	0	0	1	1	1	1	1	1	1	`1	0	1	1	0	1	1
Proteus *mirabilis(1)*	S	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
	R	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0
	ND	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
K.*oxytoca(1)*	S	0	0	0	1	1	0	0	1	0	1	0	0	1	0	0	0
	R	1	1	0	0	0	1	1	0	1	0	0	1	0	1	0	0
	ND	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1
P.*aeruginosa*	S	0	0	0	1	0	0	1	0	0	1	1	0	0	0	0	0
	R	1	1	0	0	1	1	0	1	1	0	0	0	1	0	0	0
	ND	0	0	1	0	0	0	0	0	0	0	0	1	0	1	1	1
Citrobacter(1)	S	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
	R	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0
	ND	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1
Total		42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42

S=Sensitive R=Resistant ND= Not done

CFT= Ceftriaxone CPR=ciprofloxacin AGM=Augmentin

AMP=Ampicillin COT= Co-trimoxazole MEP=Merepim

AMK=Amikacin CZD=Ceftazidime VAC=Vancomycin

GN=Gentamycin CLND= Clindamycin TTC= Tetracyclic

PNC= Penicillin OXC=Oxacillin CAF= Chloramphenicol

ERT=Erythromycin.

5.9: Drug susceptibility pattern to specify site of bacterial infection.

The study shows drug susceptibility pattern of bacteria from pyomyositis from 21 bacteria to ceftriaxone 19.1%(4/17) sensitive and 80.9%(17/21)bacterial were resistant, from 31 bacteria's to Ampicillin showed 90.3%(28/31) resistant and 9.7% (3/31) were sensitive, from 27 bacteria's to ciprofloxacin shows 55.6%(15/27) were sensitive and 44.5%(12/27) bacteria were resistant, From 20 bacteria's to clindamycin shows 70%(14/20) were sensitive and 30%(6/20) were resistant, from 12 bacteria for Oxacillin showed 75%(9/12) were sensitive and (25%3) were resistant.

The susceptibility from the septic arthritis showed 3 bacteria from septic arthritis were sensitive to ceftriaxone, from five bacteria done to Ampicillin showed all are resistant, from 6 bacteria done to clindamycin showed all are sensitive, from 3 bacteria to each ciprofloxacin, cotrimoxazole and oxacillin showed all are sensitive. But form 5 bacteria done to Ampicillin showed all are resistant. **(Table9)**

Table: 9 Drug sensitivity pattern for specific site of etiology and antibiotics susceptibility pattern of Musculoskeletal infection in JUMC, South west Ethiopia from July 2020-July 2021 G.C specific susceptibility pattern

Site		CFT	AMP	AMK	GN	CPRO	COT	CZD	CLND	AGMT	MEP	VAC	TTC	CAF	PNC	OXC	ERT
Muscle(34)	S	4	3	8	12	15	11	5	14	6	12	11	4	7	6	9	9
	R	17	28	4	10	12	11	11	6	11	2	9	4	7	22	3	8
	ND	3	3	22	12	7	12	18	14	17	20	14	26	20	6	21	17
JOINT(6)	S	3	0	0	1	3	3	1	6	2	1	0	0	0	2	3	2
	R	0	5	0	1	0	0	0	0	0	0	1	2	2	4	0	2
	ND	3	1	6	4	3	3	5	0	4	5	5	4	4	0	3	2
BONE(6)	S	0	0	0	2	2	2	1	3	1	2	1	1	1	2	1	2
	R	6	6	2	2	3	2	3	2	2	0	4	5	2	3	2	1
	ND	0	0	4	2	1	2	2	1	3	4	1	0	3	1	3	3

CHAPTER SIX: DISCUSSION

In one year prospective study a total of 60 patient with musculoskeletal infection which includes spectrum of isolated Pyomyositis 41 (68.3%) patients, Septic arthritis 9(15%) of this 03 isolated and 06 with pyomyositis and Osteomyelitis and isolated chronic osteomyelitis 10(16.7%) were admitted to Jimma University Orthopaedic ward. Majority of participants 23.3% were between ages of 30-40 years old followed by 20-30years old (20%) and mean age of 37.23 ± SD (17.918).Most them were male 39(65%) and came from outside of Jimma town accounting 32(53.3%). About 13(21.6%) patients had associated comorbidity with DM accounting for 6(10%).

Study done in India 70 patient of Septic arthritis, Boston University in USA, Study on osteomyelitis in South Africa and University of Gonder in Ethiopia on wound showed male predominance of musculoskeletal infection with 83%, 65.9 %, 78% and 59.1% respectively (2,11,23,27,40) which is comparable this this study in male predominant. Most common identified Risk factor was DM 35%, 18.8%, 16.8% in USA and India which shows comparable in common risk factor but the percent is higher than this study because of higher prevalence of DM in developed county then developing county.

In this study, gram stain was done in 40(66.7%) of the patient. Most detected bacteria were gram positive cocci 28(70%) followed by gram negative 11(27.5%). One of them had both gram positive and gram negative.

From 29 pyomyositis patients, 19(47.5%) was gram positive cocci, 9(22.5%) was gram negative and 1 (1.7%) patients stain both gram positive and gram negative patients. A proportional study done in Ohio USA on 60 pyomyositis shows 55% gram stain, 31.7% gram positive and 13.3% mixed gram positive and gram negative(2). Other study on 61 cases of pyomyositis showed 70% gram positive and 30 gram negative with 5% mixed gram negative and gram positive(6). The result is comparable with most come identified bacteria's were gram positive but poly microbial gram stain lower in this study which may related to the quality of detecting capacity. Study done in open wound in University of Gonder and black lion University in Ethiopia showed gram positive 43.5%,30.5% and gram negative 56.6,41% respectively which suggested gram negative predominant(40,41).

From 3 isolated septic arthritis patient, 2 pyomyositis and septic arthritis, 2 osteomyelitis and septic arthritis patients only total of 7(17.5) gram positive bacteria were detected which is lower than gram stain rate 47% from 70 patients with Septic arthritis in study done in USA Boston University(23). and comparable with gram stain detection rate of 14% of 94 patients with septic arthritis done Israel with 86% gram negative and 14% gram negative(43).It is difficult to compare because of different geographic area and no study done specific to Septic arthritis in or continent.

From 2 isolate osteomyelitis patients, 2 pyomyositis and osteomyelitis patients and 2 osteomyelitis and septic arthritis patients 2(5%) gram positive bacteria were detected 1 S.aureus and 1Agalactea. When compared to study done in South Africa on 60 patients Osteomyelitis showed gram positive 22% with 38.3% by S.aureus and in Rwanda which showed with gram positive S.aureus of 6-.80% (31,38) the number gram positive bacteria of this study is lower even though gram positive is common. This lower rate related to lower number of osteomyelitis patient in this study.

From this study culture growth rate was 66.7 %(N=40) with no growth 33.3 %(N= 20) patients. A 42 bacteria, 2(3.3%) patients with poly bacteria and 38(63.3%) patients with single bacteria were isolate. Majority of the growth were from pyomyositis patients 56.7 %(34/60) with 36 bacteria ware identified. The common bacteria identified were S.aureus 52.3% (22/42) followed by E.coli 14.3 %(6/42) and Acinetobacter each account for 9.5 %(4/42) and S.Pyogene identified in 7.12 %(3/42). A study done in USA single centre study showed 1.3% poly bacterial isolation but in study done on wound in Gonder University, Black lion Hospital in Ethiopia showed poly bacterial(21%,48.8%,) , single bacteria(81.7%,51.2%) respectively. The growth rate in Gonder University and Meta-analysis done on wound in Ethiopia Teaching Hospital showed 84%, 70% respectively(2,39–41). This study growth rate is lower than study done in USA but comparable with study done in meta-analysis done in Ethiopia.

From 36 bacteria identified in pyomyositis patients, most common identified bacteria were S.aureus 50 %(18/36) and E.coli 16.6 %(6/36), S.Pyogene 8.3 %(3/36), Acinetobacter 8.3 %(3/8) bacteria respectively and others bacteria account 2.7%1/36) for each.

Study done in USA Ohio, Boston University, Gonder University, Black lion Hospital and met-analysis on teaching Hospital in Ethiopia showed S.aureus as most common isolated bacteria(48.3%,46.3%,28%,14.5% and 36%) respectively(2,32,39–41). Which is comparable to this study showing S.aureus is the most etiology for musculoskeletal infection.

From 7 septic arthritis patients 4 bacteria was isolated with the most common bacteria S. aurous 75% (3/4), flowed by Acinetobacter 25% %(1/4). From 2 bacteria isolated osteomyelitis, 1 S.aureus and 1 S.agalactiae were identified which is comparable to study done in Sub-Saharan Africa, in Rwanda where S.aureus (60-80%) is the most isolated bacteria in osteomyelitis, even though the small for osteomyelitis in this study is small.

From this study S.aureus bacteria drugs resistant pattern was done for commonly used antibiotics in our county. The most resistant pattern for some antibiotics were for Ceftriaxone (87.5%), for Ampicillin (94.4%), for ciprofloxacin 17.6%. for vacomycin with 53.8 %(7/13) resistant. But less resistant to ciprofloxacin 17.6%(3/17), to gentamycin 36.4%(4/15),to oxacillin 28.6(4/14)) and to clindamycin 50%(3/6). From stud done in Gonder University, Meta-analysis from Ethiopian teaching Hospital, only open wound in Jimma University showed resistant pattern of S.aureus to Ampicillin (84.6%,72%,91.8%),to ceftriaxone(19.8%,73%),to ciprofloxacin (19.6%,27%),to vacomycin (16.4%,49%),to oxacillin(76.9%,76.7%)(39, 40, 42).In this study S.aureus resistance to ceftriaxone, ampicillin, and vancomycin was increased because of imperial therapy but oxacillin is lower because of lower rate of oxacillin use in our Hospital.

E.coli drugs resistant pattern from this study was to ceftriaxone and ampicillin 66.7 %(4/6) to gentamycin and ciprofloxacin 75 %(3/4), to clindamycin 80 %(4/5) and to co-trimoxazole 100% and to vancomycin 1 were resistant. From study done in Gonder University, meta-analysis done in Ethiopia the resistant pattern to ampicillin (75%, 84%) and to ciprofloxacin (50%, 73%)(40, 44).when compared to this study the resistance of E.coli to ciprofloxacin is increased which related to widely use of imperial ciprofloxacin in orthopaedic ward because of increased resistance of ceftriaxone.

Strength of the study

This study is the only study done on antibiotic dugs susceptibility pattern form musculoskeletal infection spectrum in Ethiopia

Limitations of the study.

The drug sensitivity was not done for all available antibiotics because of resource scarcity.

CHAPTER: SEVEN CONCLUSION AND RECOMMENDATION

6.1: Conclusion

In one year prospective study a total of 60 patient with musculoskeletal infection which includes spectrum of isolated Pyomyositis 41 (68.3%) patients, Septic arthritis 9(15%) and osteomyelitis 10(16.7%) were admitted to Jimma University Orthopedic ward. Majority of participants about 23.3% were between ages of 30-40 years. About 70 % (28) patients had gram positive cocci and 27.5 %(11) had gram negative. From 42 bacteria isolated the common bacteria were S.aureus 52.3% (22/42) followed by E.coli, Acinetobacter each account for 9.5 %(4/42).The resistant pattern of S.aureus were for Ceftriaxone (87.5%), for Ampicillin (94.4%), for ciprofloxacin 17.6%. for vacomycin 53.8 %(7/13) but less resistant to ciprofloxacin 17.6%(3/17) , gentamycin 36.4%(4/15) and oxacillin 28.6(4/14).E.coli resistant pattern for ceftriaxone and ampicillin was 66.7 %(4/6), for gentamycin and ciprofloxacin 75 %(3/4) and clindamycin 80 %(4/5).

6.2: Recommendation

This study shows the antibiotic resistance to the commonly used antibiotics like ceftriaxone and vancomycin is increasing, it is recommended to have culture result for all patients with musculoskeletal infection before initiation of antibiotics and use the most susceptible antibiotics for treatment.

I recommend the Hospital to have its own guideline for antibiotic use depend on the local bacterial resistant pattern and use this study finding as base line to develop guideline.

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ANNEX

Information sheets

The purpose of this research study is to determine "Etiology and antimicrobial susceptibility pattern of musculoskeletal infections in adult admitted to Jimma Medical Center". When you are a research participant, the principal investigator and the study staff will follow the rules of the research study protocol. You are being asked to voluntarily take part in a research study. Before deciding to be a part of this study, you need to read this Information and Consent Form.
This form tells you what will happen during the study and the risks and benefits for you if you choose to take part in this study. It explains the other choices you have besides taking part in this study. The form also explains you to stop taking part in the study at any time.

This consent form may contain words that you do not understand. Please ask the principal investigator or study staff to explain any words or information that you do not clearly understand. Your questions should be answered clearly and to your satisfaction. Before you make a decision to participate, we want you to understand the information in this form.

Sometimes, during a study, we may learn of new information which may make a difference in whether you want to continue to participate.

Potential benefits

Your will not receive any direct benefit from participating in this study.

Voluntary participation and withdrawal from the research

Your participation is voluntary. You may refuse to participate for any reason at any time, without penalty or loss of benefits to your otherwise entitled. You may withdraw yourself from the study by contacting the study staff.

Confidentiality

Your identity and your personal records will be kept confidential to the extent permitted by the applicable laws and/or regulations and will not be made publicly available. If results of this study are published or presented at a conference, your identity will not be revealed. Confidentiality will be maintained during and after your participation in this study.

Guca odeeffannoo

Kaayyoon qorannoo kanaa walitti hidhaminsa dhukkuboota qaama Lafee, buusaa, maashaa (qancaroo) / ga'eesssota waggaa 14 olii , gidduu gala yaalaa jimmaatti siree qubatanii kanjiran, rakko dhukkubichaa baruu fi adda baasuudha. Yeroo qorannoo keessatti hirmaattan dursaan qorannoo kanaa fi miseensotni qorannichaa seeraqorannoo hordofuun kanhojjetanta'a. yeroo qorannoo keessatti hirmaattan fedhiin keessan ni gaafatama. Yoo fedhii hin qabaanne dhiisuun ykn diduun ni dandahama. Yoo qorannoo kana keessatti hirmaachuuf eeyyamamo taatan gucha armaan gadii dubbisuun ykn dhaggeffaffan waliigaluu keessan mallatteessun isin irraa eegama

Guci kun wantoota yeroo qorannoo mudachuu dandahan kan ibsudha.. Yeroo qorannichaa rakkoo ykn faayidaan isin mudachuudanda'an ilaaluun qorannichatti hirmaachuu fi dhiisuu filachuu dandeessu. Gama biraan isin qorannoo kana irratti hirmaachuu dhiisuuf mirga guutuu akka qabdanni ibsa. Guci kun tarii jechoota isin hubachuu hindandeenye yoo qabaate, dursaa qoratichaa ykn miseensota isaa soda tokko malee yoo gaafattan isaan isiniif ibsuu nidanda'u. Gaaffiin keessan hangaisiniif ifa ta'utti deebiin quubsaa ta'e isiniif ni kennama.

Bu'aa kallattii

Gama biraan faayidaaleen isin kallattiin waan qorannoo kana keessatti hirmaateef argattan ykn argatu hinjiru.Kanaaf wanti nuti isiniif waadaa gallu hin jiru.Sababni isaa bu'aaqorannoo kana ammuma irraa ka'uun tilmaamuun hindanda'amu waanta'eefi.

Fedhiin hirmaachuu fi erga jalqabanii gidduutti qorannicha keessaa bahuu

Isin kan hirmaattan fedha keessanin. Jalqabuma isin akka hin hirmaanne diduu ni dandeessu. Yoo kana gootan wanti isin irraa gahu ykn waan hirmaachuu diddaniif dhabdan tokkollee hin jiru.Kanaaf, yoo jidduutti adda kutuu feetan nutti himuun adda kutuu ni dandeessu akkasumas yeroo biraa deebitanii akka itti hirmaattan gochuu ni dandeessu.

Icciitii keessan qabuu ilaalchisee

Waahee keessan ilaalchisee odeeffannoon dhuunfaa isaa/ishii iccittiidhaan qabama.Yeroobu'aan qorannoo kanaa maxxanfamu ykn koonfiraansilee adda addaa irratti dhiyaatu, wanti isin ibsu

tokko illee hin dhiyaatu. Kanaaf icciitiin odeeffannoo keessanii hundiisaa yeroo qorannoos akkasumas qorannoo kana booda icciitii dhaan qabama.

STATEMENT OF CONSENT

I have been informed about this study's purpose, procedures, possible benefits and risks, and the use and disclosure of my health care information from this research. I have read and understood this consent form, and have been given the opportunity to ask any questions I may have. All my questions have been answered to my satisfaction. I freely give my consent to participate in this research study. I authorize the use and disclosure of my health information to the parties listed in the authorization section of this consent for the purposes described above. By signing this consent form I have not waived any of the legal rights to me, otherwise entitled.

You will be provided with a signed copy of this form.

CONSENT SIGNATURE

Printed name of Patient /Legal Guardian _____

Signature of Patients/Legal Guardian _____

Date ……..

PERSON OBTAINING CONSENT

I attest that the requirements for informed consent for this research project described in this form have been satisfied – that I have discussed the research project with the patient and explained to him or her in nontechnical terms all of the information contained in this informed consent form, including any risks or adverse reactions that may reasonably be expected to occur. I certify that the information provided was given in a language that was understandable to the participant's parent or guardian. I further certify that I encouraged the patient or legal guardian to ask questions and that all questions asked were answered.

Printed name of Person Obtaining Consent

_____

Signature of Person Obtaining Consent

Yaadawaliigaltee

Aniwaa'eeqorannookanaa, adeemsaisaa, faayidaa fi miidhaa inni fiduudanda'u fi waa'ee itti fayyadama odeeffannoo koo fi iccittii isaa natti himameejira. Yaada walii galtee kana dubbissee hubadheera. Akkasumas wanta naaf hin galle akkan gaafadhuuf carraan naaf kennamee jira. As irratti gaaffin ani qabu ture hundi karaa quubsaa ta'een naaf deebi'ee jira. Yaada walii galtee qorannoo kana keessatti hirmaachuu koo kana yeroon kennu bilisata'ee osoo dhiibbaan tokko narra hin jiraatii nidha .Odeeffannoo fayyaa koo yaada waliigaltee sababa qorannoo armaan olitti ibsameef kennuu fi itti fayyadamuuf ani namasirriidha..

Uunki kun ergamallattaa'ee booda kopiin tokko isiniif kennama.

Maqaa dhukkubsataa _____

Guyyaa, ji'a fi baradhalootamucichaa (dd-MM-yyyy) _____

Mallttoomaatii dhukubsata _____ Guyyaa_____

Nama walii galtee fudhatu

Yaadniwaliigaltee fudhachuu qorannoo kanaa barbaachisaa akkata'e fi as keessatti ibsame quubsaa fi namoota qorannoo kana keessatti hirmaataniif karaa ifata'ee fi salphaatti hubatamuun kan ibsame ta'uu ibsuun barbaada. Odeeffannoon yaada walii galtee kana keessatti ibsaman hundi osoo hin hafiin miidhaa dhufuu danda'u dabalatee hirmaattotaf sirriitti ibsamee jira. Odeeffannoon kennaman hundi karaa ifata'ee fi ifaan hirmaattotaaf waan gale ta'uu isaa nan mirkaneessa.

Maqaa nama walii galtee fudhatuu_____

Mallattoo nama walii galtee fudhatuu _____

የመረጃ ቅጽ

የዚህ ምርምር ጥናት እና አላማ በጅማ ዩኒቨርሲቲ ሜዲካል ማዕከል ተኝቶ በአጥንንት፣ መገጣጠሚያ እና ጡንቻ ኢንፌክሽን መንሳኤዎች፣ አጋላጭ ምክንያቶች፣ ለመድሃኒቶች የሚኖራቸው ምላሽ እንዲሁም የህክምና ውጤት ላይ ያተኩራልለ። የእርስዎ በዚህ ጥናት ሲሳተፉ የምርምር ቡድኑ የጥናት እና የምርምር ህግጋት እና ደንቦች የሚከተሉ ይሆናል። እርስዎ በዚህ ምርምር ላይ ሲሳተፉ በፍቀደኝነት ላይ የተመሰረተ ይሆናል። በጥናቱ ላይ ከመሳተፍዎ በፊት ይህንን የተሳታፊዎች መረጃ እና የስምምነት ውል ሊያነቡ ወይም ሊነበብልዎት የገባል።

ይህ መረጃ የተዘጋጀ ጥናቱ ለእርስዎ ምም አይነት ጉዳት የማያስከትል እንዲሁም ጥቅም የለው መሆኑን እንገልፃለን። ይህ መረጃ እርስዎ ከጥናት እና ምርመር በፊለጉበት ጊዜ የማቋረጥ መበት እንዳለዎት ያሳውቃል። የህ የስምምነት ውል እርሰዎ የመያረዱት ነገር ሊኖረው ስለሚችል በጥናቱ ላይ የሚገኙ አባላት እንሰዲያብራሩልዎት መጠየቅ ይችላለ። ነገር ግን እርስዎ ጥናቱ ውስጥ ከመሳተፍዎ በፊት ይህን የመረጃ ቅጽ አንብበው ወይም ተነብቦልዎት

<u>ጥቅማ ጥቅም</u>

እርስዎ በዚህ ጥናት ተሳታፊ በመሆንዎ በቀጥታ ሊያገኙ የሚችሉት ጥቅም ባይኖርም ወደፊት በተመሳሳይ እግር ወደዚህ ህክምና ቷም ለሚመጡ ታካሚዊች ውጡቱ ይረዳል።

በዚህ ጥናት ተሳታፊ በመሆንዎ ምንም አይነት ማበረታቻ ወይም ክፍያ አያገኙም።

በጥናቱ የመሳተፍ ወይም የቋረጥ መብት

በዚህ ጥናት ለመሳተፍ መብትዎ ሙሉ በሙሉ የጠበቀ ይሆናል። ጥናጡን በማንኛውም ጊዜ የማቋረጥ መብት የለዎት ሲሆን ክጥናቱ መዉጣትዎን ለጥናት ቡድኑ ማሳወቅ የገባል።

<u>ምስጥራዊነት</u>

በዚህ ጥናት የሚሰበሰበዉ መረጃ የግል ጉዳእን ያካተተ በመሆኑ ምስጥራዊ እንዲሆን ጥንቃቄ ተድጎበታል። ማንነትዎን የሚገልፅ ነገር ይፋ አይሆንም፤ በምስጥር ኮድ ይቀመጣል እንጂ የእርስዎ/ የልጅዎ ስም አይጠቀስም።

የስምምነት ቅፅ

የዚህ ጠናትና ምርምር አላማ፣አካሄድ፣ ጠቅም እና ጉዳት ተነግሮኛል። የህነ ስምምነት አንብቤ ወይም ተነቦልኝ የጠረዳሁ ሲሆን ጠያቄ ካለኝ ለመጠየቅም ዕድል ተሰጥቶኛል። ሁሉም ጥያቄዎች በአግባቡ ተመልሶልኛል። እና በጥናቱ ውስጥ ለመሳተፍ ሙሉ

ፍቃደኝነታችንን እንገልፃለን ፡፡ የእኔን የጤና መረጃ ለጥናቱ አላማ እንዲውል ፈቅጃለሁ፡፡ የህንን ውል በመፈረሜ ሌሎች የህግ መብቶቼ አይጣሱም፡፡

በዚህ የመረጃ ቅጽ ላይ የሚገኑትን የጥናት እና ምርመር መረጃዎች ለጥናቱ ተሳታፊ በሚገባና በተግልፅ ቋንቋ፣ ጥቅም እና ተጉዳቱን እንዲሁም ሊከሰት የሚችሉ ችግሮችን አሳውቄአለሁ፡፡ በተጨማሪም የጥናቱ የልገባውን ነገር እንዲጠይቅ በማበረታታት ጥያቄውን በአግባቡ እና በሚፍቀደው መልኩ መልሻለሁ፡፡

የጥናቱ ስብሳቢ ስም 1. ---------- ፊርማ ----------

2. ---------- ፊርማ----------

የማረጋጫ ቅጽ

ስሜ _____ይባላል፡፡ በጅማ ዩኒቨርሲቲ ህክምና ማዕከል ውስጥ አገለግላለሁ፡፡ በጅማ ዩኒቨርሲቲ ሜዲካል ማዕከል ተኝቶ ህክምና በአጥንት፣ መገጣጠሚያ እና ቲንቻ ኢንፌክሽን መንስኤዎች፣ አጋላጭ ምክንያቶች ፣ ለመድሃኒቶች የሚኖራቸው ምላሽ እንዲሁምየህክምና ውጤት ሁሪያ ላይ በሚያተኩረው ጥናት ላይ እንድትሳተፍ/ፊ እጋብዝሃለሁ/ ሳለሁ፡፡

በጥናቱ ላይ ስትሳተፍ ላጥያቄዎቹ የሰጠኁን/ሽውንምላሽ፤ እንዴት እንደመለስክ/ሽማንም እንዲያውቅ አይደረግም፡፡

የህን ቅጽ አንብቤ/ ተነቦልኝ ስፈርም በዚህ ጥናት ለመሳተፍ ፍቃደኛ መሆኔን ያመለክታል፡፡

የተሳታፊ ፊርማ_____

ቀን.....

ANNEX –I

Jimma university medical center.

Questionnaires

Questionnaires for data collection on etiology and antimicrobial susceptibility pattern of musculoskeletal infections in adult admitted to orthopedics ward Jimma University Medical Center (JUMC).

*Card No.*_____ *Code:* _____

PART I: Socio-demographic characteristics

No.	Questions	Categories
NO	QUESTIONS	
101	Age(year)	
102	Sex	1.Male 2.Female
103	Residence	1. Jimma 2.outside of Jimma
	If 2 to 103 state woreda	
105	Income	
106	Educational status	1.can not read and write 2.read and write 3.primery school(1-8) 4.Secondary school(9-10) 5.Preparatory school(11-12) 6.Technical and vocational(10+1,10+2,10+3) 6.university/College
109	Occupation	1.unemployed

		2.government employee 3.merchant 4.farmer 5.NGO 6 Other(specify)
112	Family size	

PART II: General Condition of the patient

No	**Questions**	Categories
201	Duration of illness in days before arrival	……days
206	Did the patient visit other health facility	1.yes 2.No
207	If yes to above question which one	1.health center 2.Hospital 3.private
208	Did the patient receive any antibiotics in past 7 days prior coming here?	1 yes 2.No
209	If yes, What is the drug?	…….days
210	If yes, Duration of antibiotics in days?	……..days
214	Anatomic locations of illness (more than one answer is possible)	**Bone** 1 femur 2 tibia 3 humerus 4 radius 5.ulna 6 other

		Joint 1.knee joint 2 shoulder joint 3 hip joint 4. elbow joint 5. Ankle joint 6. Others.
		Muscle 1.thigh 2.calf 3.arm 4.forearm 5.others
215	Does the patient have any of the comorbidity?	1.HIV 2.DM 3.Malignancy 4.chemotherapeutic agents 5.steroid uses 6.other(specify
216	What was the diagnosis of the patients?(more than answer is possible)	**1** Acute osteomyelitis. 2. Septic arthritis. 3. Pyomyositis. 4. Chronic osteomyelitis. 5. Cellulitis. 6. Sub-cutaneous abscess.

217	What kind of procedure was done?(more than one answer is possible)	1.abscess drainage 2. Irrigation and Debridement. 3.Arthrotomy 4.bone window 5. Others specify.
218	What antibiotics was the patient receive before culture? (State).	…….
219	Was the antibiotics changed after culture?	1. Yes 2. .no
220	If yes to above question ,state antibiotics	……
Part III Laboratory profile of the patient		
NO	**QUESTIONS**	**CATEGORY**
308	Was gram stain done?	1. Yes. 2. No.
309	If yes from which sample? (More than one answer is possible).	1.from joint 2 from muscle 3.from bone aspirate
310	What was the description (morphology) of the organism identified?	1 ---------- 2----------
311	Was culture and sensitivity done from the sample?	1.Yes 2.No
312	If yes, to above question, what was organism identifies?	1---------- 2----------
313	Attached the antibiotic sensitivity pattern of the identified organism.	
315	Was culture done from	1.from joint 2 from muscle 3.from bone aspirate
316	Was there any growth?	**1 Yes 2 No**
317	What was Identified organism?	**1----------** **2---------**

318	Which drugs are sensitive	**1** **2** **3**
	Which drugs are not sensitive	
	How long the patients did take IV antibiotics during Hospital stay	