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RESEARCH ARTICLE

THE VALUE OF SYNOVIAL FLUID CYTOLOGY IN THE DIAGNOSIS OF JOINT DISEASES IN A TERTIARY CARE TEACHING CENTRE IN CHAMBA DISTRICT

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Abstract

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Introduction:-

Arthritis and other rheumatic conditions are among the most prevalent conditions in India. Laboratory analysis of synovial fluid may provide an easier non-invasive option and a vital step in diagnosis .The importance of synovial fluid aspiration lies in the fact that it is a simple procedure and an aid to the diagnosis of joint diseases The knee joint was the commonest joint involved .Synovial fluid analysis helps in identifying the differences between inflammatory and non-inflammatory arthropathies and in recognizing specific inflammatory arthropathies early in the course of the disease before the full blown syndrome develops. It permits the rapid diagnosis of joint disease, particularly disorders such as sepsis and crystal related arthropathy where the prognosis is inversely related to delay in diagnosis. (**Swan A et al, 2002**). Pt. Jawahar Lal Nehru Government Medical College Chamba, H.P. is a tertiary care institute with active orthopaedics and medical services where we get patients of arthritis, some of whom are associated with joint effusions. We carried out cytological examination of synovial fluid in such patients to help in early differential diagnosis by correlation with clinical and other investigations.

Material And Methods:-

The study was conducted in Pt. Jawahar Lal Nehru Government Medical College, Chamba, a tertiary care hospital. It was an observational study comprising of collection of cases that were presented in the course of six months w.e.f Ist June, 2018 to 30th November, 2018.All the clinical information provided in the requisition forms was taken into consideration and recorded in a prestructured proforma. Written informed consent was obtained from all the patients after explaining them the nature and purpose of the study. The material consisted of synovial fluid aspirated from patients with joint effusions received in the Department of Pathology over a period of six months.

All the patients with one or more joint effusions were included in the study. Patients with cutaneous tissue infection mimicking acute arthritis were not subjected to arthrocentesis and were excluded from the study to avoid spread of infection. The detailed clinical history, General physical examination, USG, X Ray, CT scan and other hematological were taken from patient. Arthrocentesis was carried out by the orthopaedician and approximately 5 - 10 ml of synovial fluid was collected with sterile, disposable needles and plastic syringes. The syringe was heparinized with 25 U of sodium heparin/ml of synovial fluid in routine arthrocentesis. Volume ,Color, Clarity of

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the synovial fluid were recorded along with String test which was done to test for viscosity of synovial fluid. Normal synovial fluid will form a string approximately 5cm long before breaking. Synovial fluid with poor viscosity will form shorter strings and indicate inflammation. Microscopically, Wet mount analysis, Total Nucleated Cell Count on Hemocytometer (Neubauer's chamber) count was performed on synovial fluid within 1 hour of collection and manual Differential Count. Crystal examination with the help of Polarized microscopy is used to identify crystals in synovial fluid under both low and high power. Tissue Fragments were also identified. Wet Mount slide preparation with staining of smears were done with MGG, H&E, Gram's stain & Acid fast stain, wherever required.

The statistical analysis was done and the results were expressed as percentages with appropriate charts, tables and diagrams. Appropriate statistical methods were applied wherever necessary.

Results:-

All patients with joint effusions were included in this study. A total of **35 synovial fluid specimens** were received for cytological examination in the Department of Pathology over a period of six months.

Table 1:- Distribution of cases of joint effusion in various diseases.

Clinical diagnosis	No. of synovial samples	Percentage
Osteoarthritis	12	34.29%
Tubercular arthritis	08	22.86%
Septic arthritis	06	17.14%
Traumatic arthritis	05	14.29%
Rheumatoid arthritis	02	5.71%
Gout	02	12.85%
Total	35	100%

Fig 1:- Showing distribution of cases of joint effusions in various diseases.

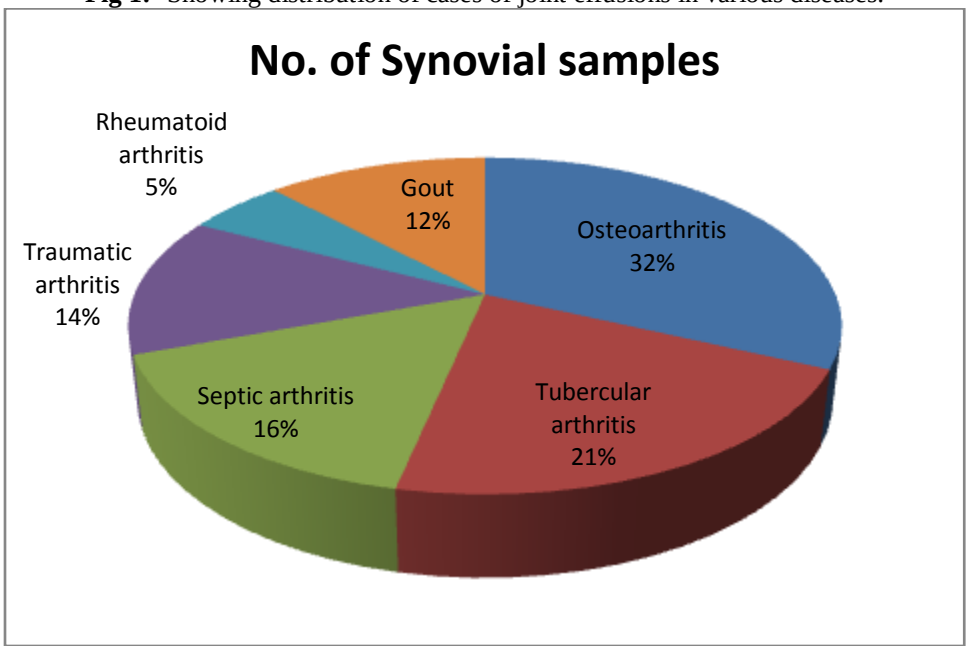


Table 2:- Age wise distribution of synovial effusions (n=35).

Synovial effusions	Osteo arthritis	Tubercular arthritis	Septic arthritis	Traumatic arthritis	Rheumatoid arthritis	Gout	Total	%age
21-30 yrs	-	01	01	-	-	-	**02**	**5.71%**
31-40 yrs	01	01	01	02	01	-	**06**	**17.14%**
41-50 yrs	03	03	02	02	01	01	**12**	**34.29%**
51-60 yrs	02	02	01	-	-	01	**06**	**17.14%**

61-70 yrs	06	01	01	01	-	-	**09**	**25.72%**

Synovial effusions occurred in all age groups ranging from 21 to 69 years but majority occurred in the age group of 41-70 years, accounting for three-fourths of all cases.

In present study synovial effusions were observed in 21(60%) females compared to 14(40%) males with female to male ratio of 1.5:1.

Table 3:- Sex wise distribution of synovial effusions (n=35).

Type of synovial effusion	Male	Female
Osteoarthritis	04	08
Tubercular arthritis	05	03
Septic arthritis	03	03
Traumatic arthritis	01	04
Rheumatoid arthritis	-	02
Gout	01	01
Total	14	21

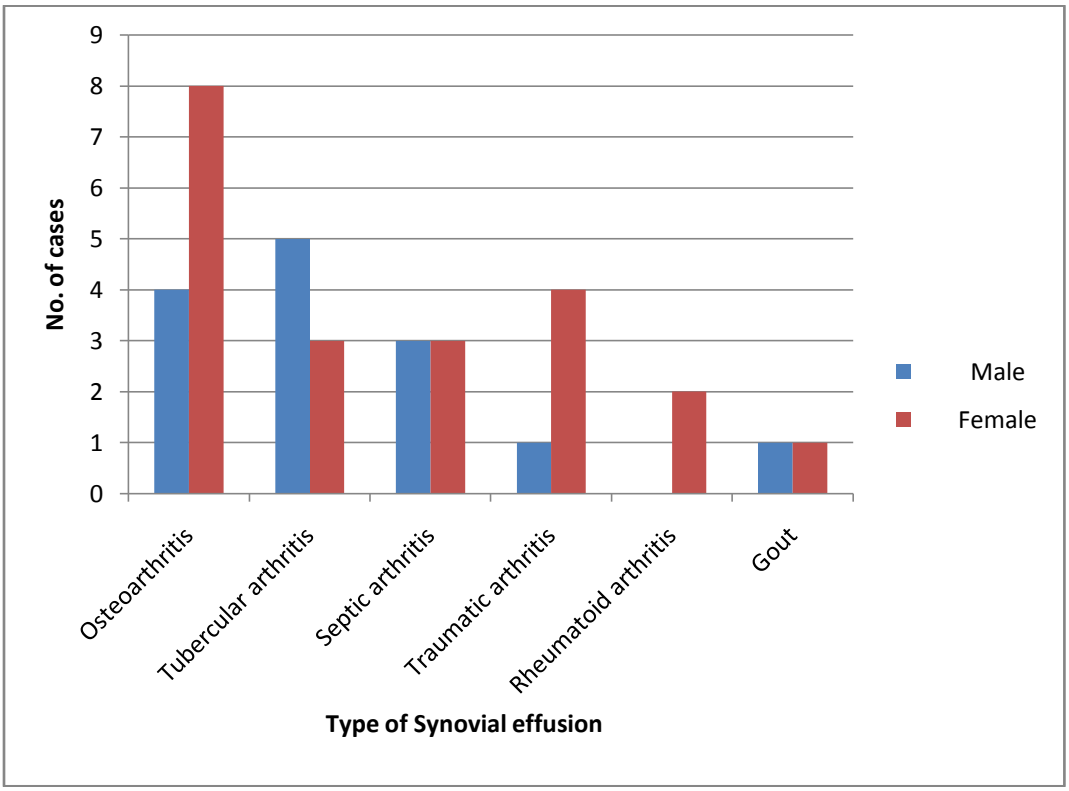


Fig 2:- Showing sex wise distribution of synovial effusions.

Table 4:- Showing distribution of inflammatory and non-inflammatory diseases.

Synovial effusions	Number	Percentage
Non-inflammatory	17	48.58%
Inflammatory	18	51.42%
Total	35	100%

Osteoarthritis formed the largest group of non-inflammatory cases comprising 70.59**%**, followed by **traumatic arthritis (**29.41**%).**Knee joint was involved in all the cases.

Fig 3:- Showing distribution of inflammatory and non-inflammatory effusions.

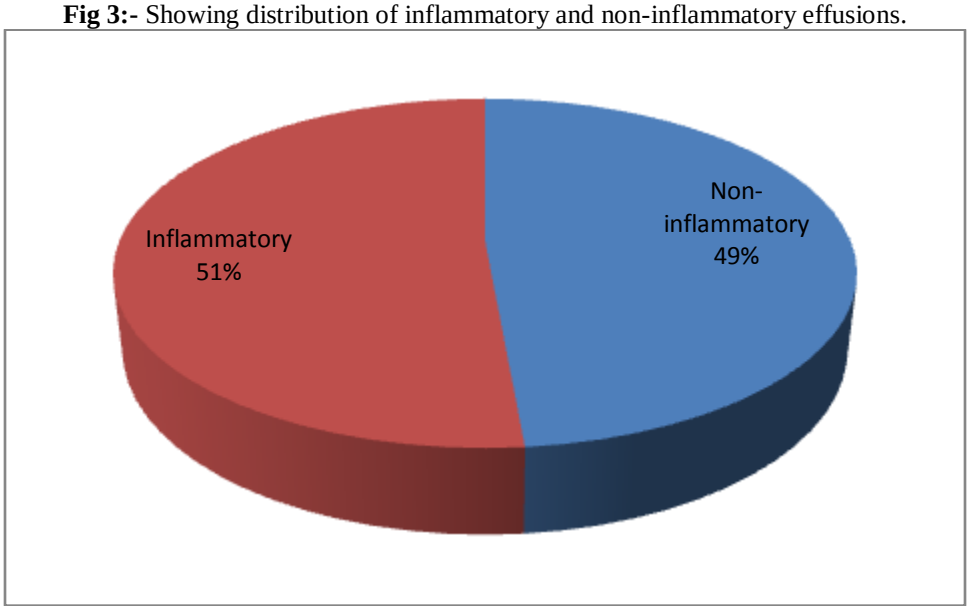


Table 5:- Showing types of Non-InflammatorySynovial effusions (n=17).

Type	No. of cases	Percentage
Osteoarthritis	12	70.59%
Traumatic arthritis	05	29.41%
Total	17	100%

In **Osteoarthritis**, grossly, synovial fluid was clear yellow in all cases. String test was positive in 11 cases and negative in 1 indicating normal viscosity in 11 cases and low in 1. Total leukocyte cell count ranged from 400- 1400 cells/cu mm with a mean of 700 cells/cu mm. The mean differential leukocyte count showed predominance of lymphocytes (68%), neutrophils (22%) and macrophages (10%).

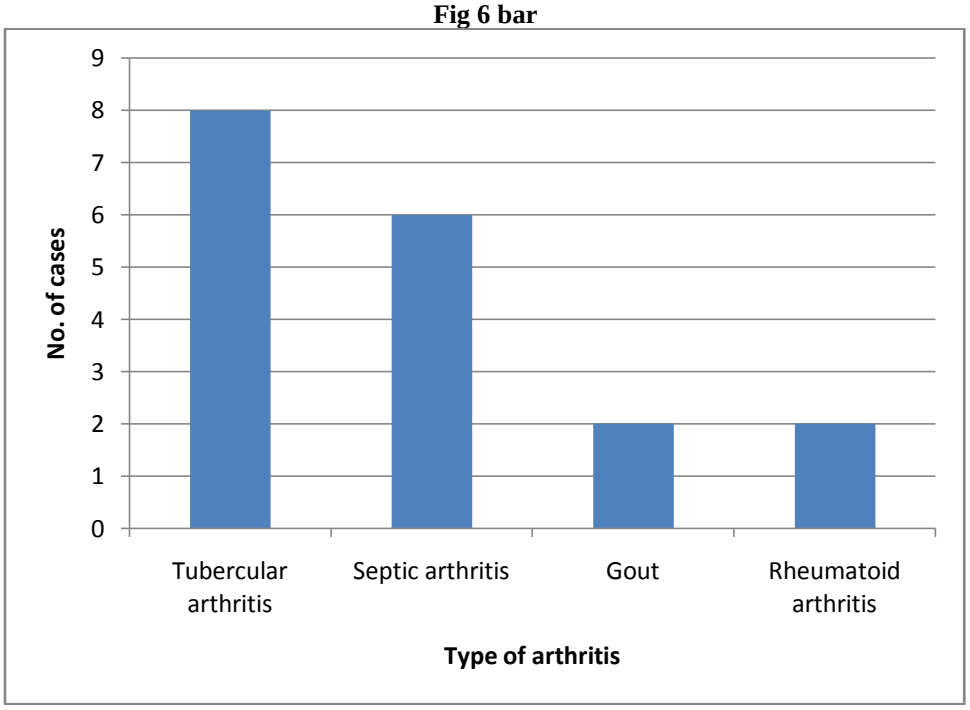
There were 05 cases of **traumatic arthritis** accounting for 29.41% of total non-inflammatory joint effusions. String test was positive in all cases indicating normal viscosity in all cases .Grossly, synovial fluid was red in all the cases.Total leukocyte cell count ranged from 400-1000 cells/cu mm with a mean of 550 cells/cumm. The mean differential leukocyte count showed neutrophils (46%), lymphocytes (42%) and macrophages (12%).

Tubercular arthritis formed the largest group of inflammatory cases, comprising of 44.45% cases followed by **septic arthritis**(33.33%), **Rheumatoid arthritis**(11.11%)and **Gout**(11.11%).Knee joint was involved in all the cases.

Table 6:- Showing types of Inflammatory Synovial effusions (n=18).

Type	No. of cases	Percentage
Tubercular arthritis	08	44.45%
Septic arthritis	06	33.33%
Gout	02	11.11%
Rheumatoid arthritis	02	11.11%
Total	18	100%

Fig 6 bar



There were 8 cases of **tubercular arthritis** accounting for 44.45% of total inflammatory joint effusions. Knee joint was involved in all patients.

Grossly, synovial fluid was turbid in 6 cases and yellow in 2. String test was negative in all the cases indicating low viscosity in all cases. Total leukocyte cell count ranged from 9000 -13000 cells/cu mm with a mean of 10,857 cells/cu mm. The mean differential leukocyte count showed predominance of lymphocytes (73%), neutrophils (20%) and macrophages (07%). Ziehl–Neelsen stain for tubercle bacilli was negative in 7 cases while positive in 1 case.

There were 6 cases of **septic arthritis** accounting for 33.33% of total inflammatory joint effusions. Knee joint was involved in all patients. Grossly, synovial fluid was purulent, turbid in all the cases. String test was negative in all the cases indicating low viscosity in all cases. Total leukocyte cell count ranged from 40,000– 50,000 cells/cu mm with a mean of 43,500 cells/cu mm. The mean differential leukocyte count showed predominance of neutrophils (92%), lymphocytes (06%) and macrophages (04%).

There were 2 cases of **rheumatoid arthritis** accounting for 11.11% of total inflammatory joint effusions. Knee joint was involved in all patients. Grossly, synovial fluid was cloudy and yellow in all the cases. String test was negative in all the cases indicating low viscosity in all cases .Total leukocyte cell count ranged from 4000-16000 cells/cu mm with a mean of 14000 cells/cu mm. The mean differential leukocyte count showed predominance of neutrophils (86%), lymphocytes (10%) and macrophages (04%).

There were 2 cases of **gouty arthritis** accounting for 11.11% of total inflammatory joint effusions. Grossly, synovial fluid was yellow . String test was negative in all the cases indicating low viscosity in all cases .Total leukocyte cell count ranged from 4000 - 5000 cells/cu mm with a mean of 4350 cells/cu mm. The mean differential leukocyte count showed predominance of neutrophils (73%), lymphocytes (20%) and macrophages (07%). Numerous birefringent, needle like crystals were seen on polarizing microscopy.

Discussion:-

Out of 35 cases of synovial effusions studied, 17 were non-inflammatory and 18 were inflammatory effusions.Synovial effusions with total white blood count less than 1500 were classified as non-inflammatory whereas effusions with white blood count greater than 1500 were classified as inflammatory effusions(**Denton,2015)**. Non-inflammatory effusions included osteoarthritis and traumatic arthritis whereas, inflammatory effusions included rheumatic arthritis, septic arthritis, gouty arthritis and tubercular arthritis. Osteoarthritis is the most common form of degenerative joint disease and is a leading cause of disability in elderly

people. In our study, osteoarthritis was the commonest disease . The predominance of osteoarthritis in this study is in accordance with that of the study by **QaziNajeeb et al,2015** where 172 cases(36%) of all the synovial effusions were reported as osteoarthritis**.** However, **Mamatha SVet al,2015**reported a lesser incidence of 20%. In the present study, the age ranged from 21-69 years. **Patrik M et al,1993** reported age ranged from 33 to 96 years.In our study female predominance was observed with female to male ratio of 1.5:1 which is in accordance with study conducted by **Sangha O,2000** who also reported female predominance. Our results were comparable with the study of 100 synovial effusions by**Mamatha SV et al,2015** in which 20 cases of osteoarthritis were reported.. **Percy et al,1975** concluded that the osteoarthritis is a degenerative disease with clear yellow fluid, normal viscosity, firm clots after mucin clot tests and total leukocyte count less than 2000 cells/ cubic millimetre.

Tubercular arthritis was seen in 22.86% patients. Our results were comparable with the study of 100 synovial effusions by **M Ganesh K Reddy et al,2017**in which 22 cases of tubercular arthritis were reported.In our study Ziehl–Neelsen stain for tubercle bacilli was negative in allthe cases which correlated with study of **Mamatha SV et al,2015**who sreported Ziehl–Neelsen stain for tubercle bacilli was negative in all the cases.

Septic arthritis was seen in 17.14 % patients and is defined as the bacterial invasion of joint space.**QaziNajeeb et al,2015**reported a lesser frequency of septic arthritis cases (5%) in comparison to our study.. **Krey et al,1979** reported that polymorphonuclear neutrophils have a sensitivity of 92% and specificity of 78% in diagnosing septic arthritis.

Traumatic arthritis was seen in14.29 % patients .**P Lakshmi Narayana,2017** reported 10 cases (12.82%) of traumatic arthritis. **Ganesh K Reddy et al,2017** reported a lesser frequency of traumatic arthritis 6 cases (6%) in comparison to our study. Our results were comparable with the study of 78 synovial effusions by **P Lakshmi Narayana,2017** in which 10 casesof traumatic arthritis were reported.

Rheumatoid arthritis is an autoimmune-mediated, systemic, inflammatory disease. The course of rheumatoid arthritis varies from mild disease to severe joint destruction. In the present study, 02 cases (5.71%) of rheumatoid arthritis were seen in patients which correlated with study conducted by**Mamatha SV et al,2015.** Septic arthritis was seen in 17.14 % patients and is defined as the bacterial invasion of joint space.**QaziNajeeb et al,2015**reported a lesser frequency of septic arthritis cases (5%) in comparison to our study.. **Krey et al,1979** reported that polymorphonuclear neutrophils have a sensitivity of 92% and specificity of 78% in diagnosing septic arthritis.

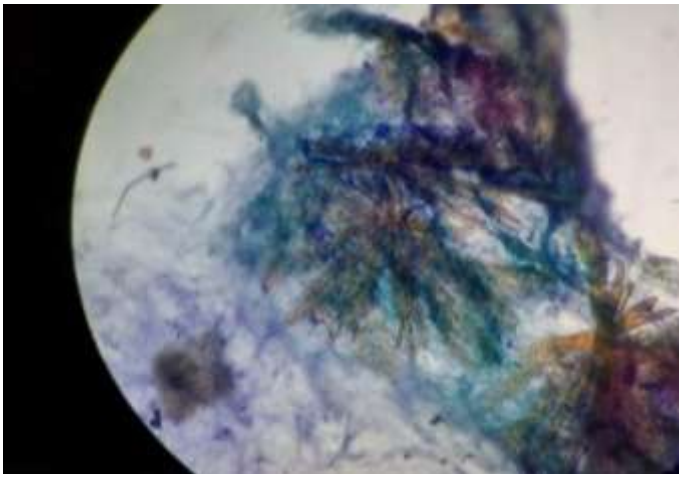
Gouty arthritis is caused by the deposition of crystals of uric acid in a joint.In our study gouty arthritis was seen in 5.71% Comparable frequency 6% of gouty arthritis were seen by **M Ganesh K Reddy et al,2017**.

Conclusion:-

From the present study, it is clear that gross and microscopic examination of synovial fluid is a simple and rapid method of evaluation of synovial effusions which helps in diagnosis and treatment of various arthropathies. Total and differential white cell counts provide a simple method of distinguishing non-inflammatory from inflammatory arthritis and septic arthritis. Presence of birefringent needle like crystals on polarising microscopy confirms diagnosis of gout. Correlation of synovial fluid analysis with clinical, radiological and other laboratory tests helps in diagnosis of rheumatoid arthritis, septic arthritis, gouty arthritis, traumatic arthritis, tuberculous arthritis and osteoarthritis.

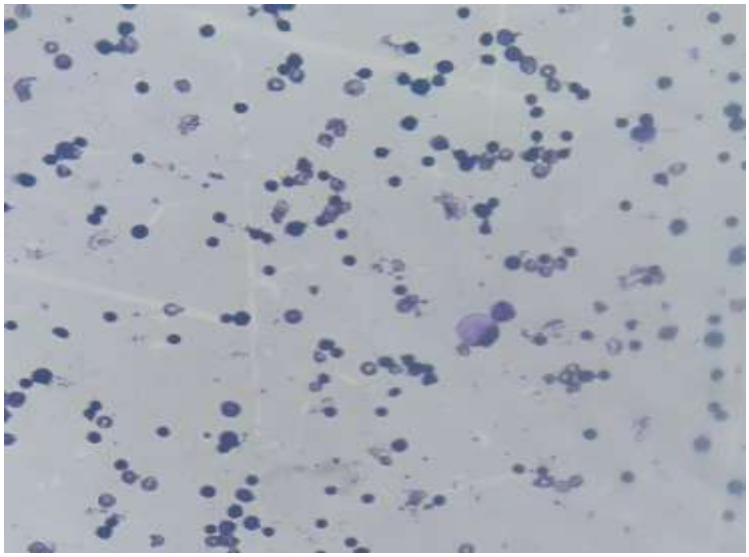
Images :

Gout Crystals

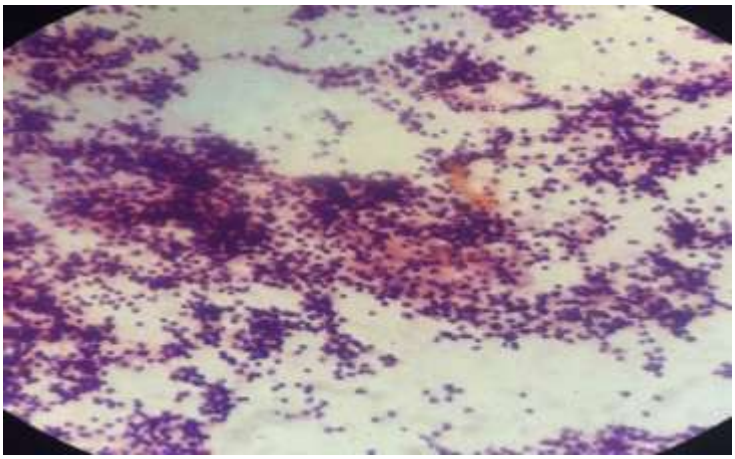


Gout Crystals On Wet Mount

Tubercular Arthritis

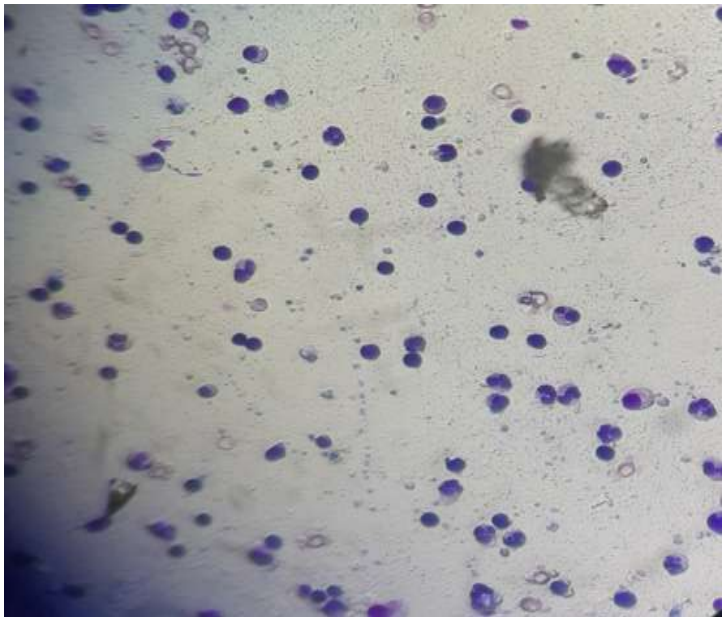


Septic Arthritis



Osteoarthritis

Rheumatoid Arthrtis



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