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The pattern of calcium pyrophosphate dihydrate crystals among Iraqi patients in salaheldin area

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ABSTRACT

The aim of this study was to show the prevalence of calcium pyrophosphate dihydrate crystals (CPPD) deposition among patients clinically diagnosed with acute monoarticular arthritis and to determined the difference between uric acid crystals deposition and CPPD deposition in joints among patients with acute monoarticular arthritis. This study was carried out among 50 patients with monoarticular arthritis includes 36 females and 14 males from salaheldin area ages were ranged between 30-80 years with mean (55 years) attended rehabilitation hospital in Tikrit. All were reviewed with history, thorough examination and investigation. Aspiration of synovial fluid were collected from patients who give informed consent aseptically into sterile plastic tubs and examined by polarised light microscope. Also culturally using standard techniques and tested for micro- organism. Sample were cultured and incubated at 37C° aerobically for 24 hours. No significant bacteria was shown. But examination under polarised light microscope shown birefringent test weak positive with rhomboid shape of CPPD crystals which is differ from uric acid crystals which shown negative birefringent test and needle shaped. Also study show 2% of patient with hyperparathyroidism on treatment, 2% of patients with hemochromatosis.

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Introduction

Synovial fluids contain a number of crystals and other particulate matter. The only pathogenic crystals are monosodium urate monohydrate (MSUM) which called uric acid crystals and calcium pyrophosphate dihydrate (CPPD) crystals. The CPPD crystals are deposited in and on cartilaginous surface can provoke acute inflammatory arthritis which involved only one joint which termed monoarticular arthritis clinically similar to acute gout but the difference that CPPD arthropathy attack knee and wrist joint predominantly also metacarpophangeal joints and shoulders can be involved. Four subgroups are described:

1- Asymptomatic CPPD crystals deposition.
2- Acute CPPD crystals arthritis.
3- Chronic CPPD crystals inflammatory arthritis.
4- Osteoarthritis with CPPD crystals deposition.

CPPD primarily affects elderly especially past 60 years old. Several large families with familial forms of early-onset CPPD have been described else where an autosomal dominant mode of inheritance, with an age at onset between 2nd and 5th decades of life. Acute inflammatory arthritis is triggered by trauma, exercise or changes in the weather.

Attacks are self limited and progress with time leading to cartilage calcification which called clinically chondrocalcinosis which with time progress to chronic arthropathy and degenerative joint disease. For younger patients with CPPD consideration of metabolic diseases like hyperparathyroidism,hemochromatosis ,hyrophosphatasia and hypomagnesaemia. Pyrophosphate produced by chondrocytes likely precipitates with calcium to form CPPD crystals which then activate inflammatory process resulting in an acute arthritis. CPPD also drive osteoarthritis by inducing pro inflammatory activity in chondrocytes and synovial fibroblasts resulting in cartilage damage especially in knee and wrist joints.

Patients and methods

A case series study was conducted on 50 patients with monoarticular arthritis attended rehabilitation hospital for the period from January to the end of June 2020. All patients gave their informed consents. Patients were aged 30-80 years. Clinical symptomaticology and complaints prior to examination were recorded. For all patients aspiration of synovial fluid were done aseptically and analysis was done for each sample in addition to culture for 24 hours to exclude microorganisms. The most important examination by using polarised light microscope which is relatively inexpensive, which showing the morphology of rhomboid shape of CPPD crystals which give weak birefringent test positive under polarised light.

These features differentiate CPPD crystals from uric acid crystals which is needle in shape and give negative birefringent test under polarised light.

Results

A total number of 50 patients cmsisting of 36 females and 14 males with monoarthritis, their ages ranged

from 30-80 years. 80% of patients (40) complaint of one knee arthritis and 16% of patients (8) presented with wrist arthritis while only 4% of patients (2) are presented with metacorphalangeal joints arthritis.

Table 1. show the percent of various joints affected and percent of female and males involved.

Joint	Percent	Number of patients	Female number	%	Male number	%
Knee	80%	40	29	72.3	11	27.5
Wrist	16%	8	6	75	2	25
MCP	4%	2	1	50	1	50

Also, study shows only two patients with underlying pathology included one patient with hyperparathyroidism and one with hemochromatosis.

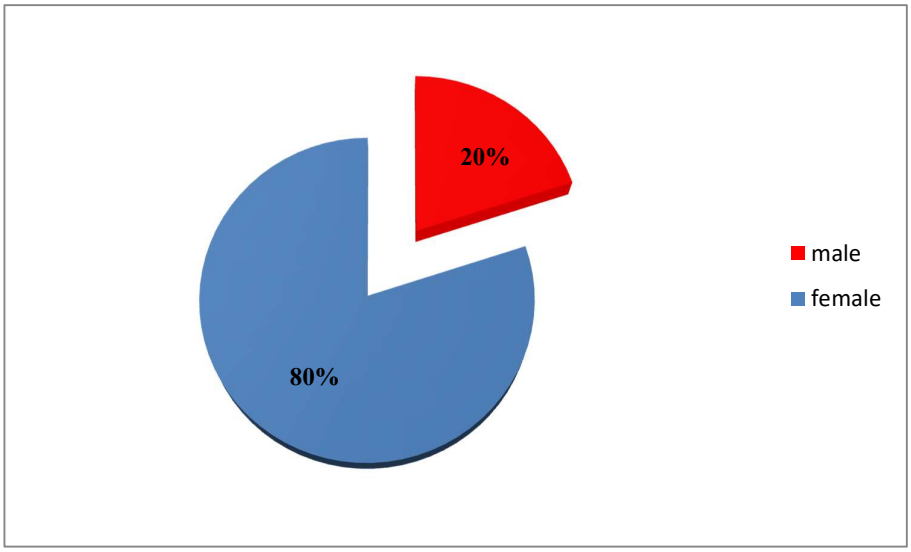

Figure 1. show the distribution of patients according to sex.

Table 2. show the percent of patients according to age in relation to sex.

Age	Number of patients	Percent	Female	Male
30-40	5	10%	1	4
40-50	10	20%	5	5
50-60	10	20%	6	4
60-70	15	30%	13	2
70-80	10	20%	9	1

In this study 30 patients 60% give history of minor trauma and only one patients 2% give history of major surgery three weeks prior to attack.

Discussion

The overall prevalence of CPPD in the present study was CPPD deposition is most commonly sporadic with female preponderance 80% while male only 20% and increasing with age this result is consistent with majority of reports of American and scandanafian countries studies[1,2,3] chondrocalcinosis caused by CPPD deposition is a common asymptomatic radiographic manifestation in the elderly which confirmed by x-ray done for most patients before attack of arthritis in this study which established in all British and European studies[5,6,8,16]. In this study knee joint mostly affected 80% of cases while wrist consist of 16% and metacarpophalangeal joints (MCP) only 4% this result as compared to Australian studies which showed 70% knee joints, 25% wrist joint and 5% MCP so it's nearly similar[4,7,9,18]. Also this study exclude other joints like shoulder and hip from involvement which differ from American and European studies which showed 5% involvement of shoulder but hip not involved[14,10,17,20]. This study revealed metabolic association in 4% of patients which is less than European studies 15-30% of screened patient[15,18,19]. This study shown 60% of patients exposed to minor trauma one week before attack of arthritis and only 2% of patient give history of major surgery three weeks before attack of arthritis while in European studies 25% of patients exposed to major surgery 2-3 weeks prior to attack of arthritis and 50% of patients give history of trauma and heavy work few days before attack of arthritis[11], this study deny any septic presentation which nearly accordant to the study done in European which revealed 1% of patients misdiagnosed as septic arthritis[4].

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