Occurrence of crystal arthropathy in patients presenting with synovitis in Nairobi

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Abstract

Background: Crystal arthropathies represent a heterogeneous group of skeletal (musculo-skeletal) diseases associated with the deposition of mineralized material within joints and periarticular soft tissues. Gout is the most common and pathogenetically best understood crystal arthropathy, followed by basic calcium phosphate and calcium pyrophosphate dihydrate deposition diseases, and, in very rare cases, calcium oxalate crystal arthropathy. In Kenya there are no studies to demonstrate the prevalence of these diseases. This study endeavored to describe the different types of crystals seen in patients with synovitis in Nairobi from 1st January 2012 to 31st January 2014.

Objective: To describe different types of crystals seen in patients with synovitis in Nairobi.

Design: Descriptive prospective cross sectional study.

Results: There were 260 samples received from patients with synovitis. Of them, 61 (23.5%) were from males while 199 (76.5%) were from females. The age range of the patients was from 14 – 110 years. The mean, median and mode were 59.6, 60 and 55 years respectively. Majority of the patients were in the 51-60 years age category. Most of the patients recruited had no crystals (n=211; 81.2%) diagnosed, with 14.2%(n=37) having uric acid crystals and 4.6 % (n=12) having CPPD crystals. For the patients who had uric acid crystals (n=37), when gender was cross tabulated against microscopy, males (n=32; 86.5%) were noted to have more uric acid crystals than females (n=5; 13.5%). Among patients diagnosed with CPPD (n=12), there were more females (n=9; 75%) patients compared to males (n=3; 25%). From the total population recruited (n=260), when age range categories were cross tabulated against microscopy, the age ranges 41-50 (n=9; 3.5%) 51-60 (n=12; 4.6%), and 61-70 (n=6; 2.3%) were noted to have more uric acid crystals than any other age category recruited. Patients in the age category 61-70 (n=6; 50 %) had more CPPD crystal detections than any other age category from the patients recruited.

Conclusion: Crystal arthropathy is a major cause of synovitis in patients seen in Nairobi.

Introduction

Synovial fluid analysis may be diagnostic in patients with bacterial infections or crystal-induced synovitis. The white cell count, differential count, cultures, Gram stain, and crystal search using polarized light microscopy are the most valuable studies[1,2]. Noninflammatory fluids generally have fewer than 2000 white blood cells/mm^3, with fewer than 75% percent polymorphonuclear leukocytes[2].

Synovial fluid aspiration and analysis is the gold standard for diagnosis of crystal arthropathies. The objective of this study was to describe the occurrence of crystal arthropathy, using polarizing microscopy technique, among patients presenting with synovitis in Nairobi and to characterize the different types of crystals seen.

Materials and Methods

This was a prospective study of consecutive patients presenting with joint effusion in Nairobi. The patients were seen between 1st January 2012 and 31st January 2014. The aim of this study was to describe different types of crystals seen in patients with synovitis in Nairobi, with the following specific objectives: to characterize the demographic profile of the patients, to describe the types of crystals found in the synovial fluids and to determine the association between the age and gender and the types of crystals found.

Informed consent was obtained from the patients for athrocentesis and their sociodemographic characteristics obtained. The affected joints were then cleaned with alcohol swabs and the overlying skin anaesthetized using 1% lignocaine. A needle was then inserted and about 2ml of synovial fluid aspirated and fluid collected in a sterile bottle. The samples were then sent to the laboratory for analysis. The samples were prepared and examined for crystals using polarizing microscope and a first order red plate inserted between the polarizer and analyzer. This turns the background red. The crystals seen were described by their characteristic shape and sign of birefringence on microscopy.

Results

During the 24 month study period, a total of 260 patients with joint effusion were

enrolled into the study with their synovial fluid collected and analyzed for crystals. The gender distribution was; 61 (23.5%) males while 199 (76.5%) were females.

The age distribution of the patients is depicted in Figure 1. The age range of the patients was from 14 – 110 years. The mean, median and mode were 59.6, 60 and 55 years respectively. Majority of the patients were in the 51-60 years age category.

Out of the total 260 patients sampled, no crystals were seen in 211 (81.2%) synovial fluid samples. Uric acid crystals were seen in 37 (14.2%) and CPPD crystals in 12 (4.6%) of the samples analyzed.

From the total population recruited (n=260), when gender was cross tabulated against microscopy, males (n=32; 12.3%) were noted to have more uric acid crystals than females (n=5; 1.9%). For the patients with CPPD (n=12), there were more females (n=9; 75%) compared to males (n=3; 25%).

As depicted in Table 1, the males had significantly higher risk (RR 8.16) occurrence of any type of crystal arthropathy. The males also had a significantly higher risk (OR 45.54) of uric acid crystal arthropathy. There was however no significant gender difference in the patients with CPPD crystal arthropathy.

From the total population recruited (n=260), when age range categories were cross tabulated against microscopy (Table 2), the age ranges 51-60 (n=12; 4.6%), 41-50 (n=9; 3.5%) and 61-70 (n=6; 2.3%) were noted to have more uric acid crystals than any other age category recruited. Occurrence of CPPD crystal arthropathy was seen among the elderly (over 83% of the cases seen in patients aged above 61 years).

Figure 1: Distribution of patient age ranges

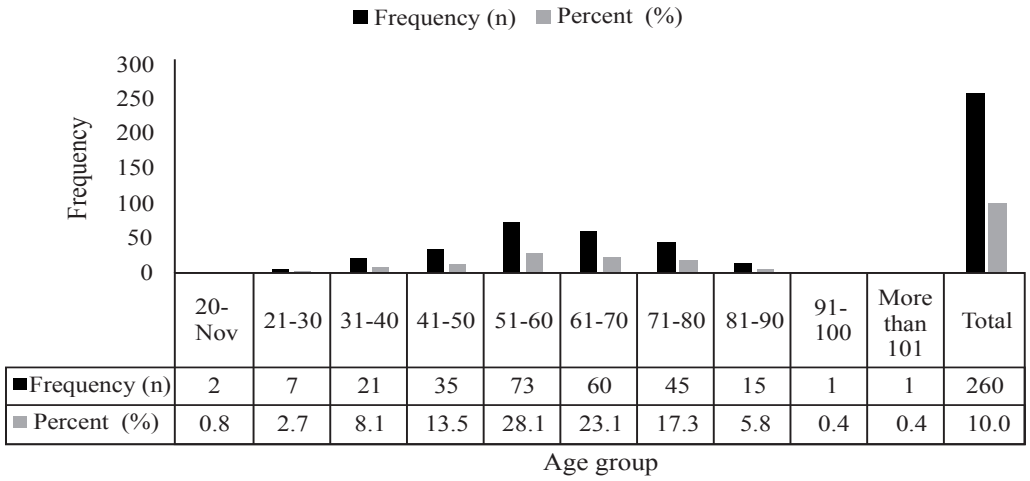

Table 1: Univariate analyses of gender vs. occurrence of crystal arthropathy

	Crystal arthropathy	No crystal arthropathy	Relative Risk	P value
Male	35	26	8.16	0.000001
Female	14	185		
	Mono sodium urate crystal	No crystal	Odds Ratio	P value
Male	32	26	45.54	0.000001
Female	5	185		
	CPPD crystal	No crystal	OR	P value
Male	3	26	2.37	0.204
Female	9	185		

Table 2: Age range categories versus microscopy cross tabulation

		Microscopy			Total
		Uric acid crystals	CPPD Crystals	No crystals seen	
Age categories	11-20	0	0	2	2
	21-30	1	0	6	7
	31-40	4	0	17	21
	41-50	9	1	25	35
	51-60	12	1	60	73
	61-70	6	6	48	60
	71-80	4	1	40	45
	81-90	1	2	12	15
	91-100	0	1	0	1
	More than 101	0	0	1	1
Total		37	12	211	260

Discussion

The understanding of the burden of crystal arthropathy in our setting remains limited. Moreover the diagnostic ability to diagnose crystal arthropathy is quite limited with only one functional polarizing microscope in the country. Thus the burden of this group of diseases is poorly understood. This study, set in Nairobi thus set to establish burden of crystal arthropathy in patients presenting with synovitis. Of all the samples taken for analysis, 49(18.2%) had crystals identified by polarizing microscopy.Those with Mono Sodium Urate (MSU) crystals were 37(75.5%) with Calcium Pyrophosphate Dehydrate (CPPD) crystals accounting for 12(24.5%).

There are no published population surveys on the burden of crystal arthropathies. There is also no published study that has looked at the prevalence of crystal arthropathy amongst patients presenting with synovitis. However there have been several case series reports on the occurrence of gout in Africa. Lowenthal *et al*[3] reported only 2(1.4%) patients with gout out of a total of 138 rheumatology cases seen in 1982 at a University Teaching Hospital. There has been doubling of gout prevalence in the last 2 decades in the United States[4], and the clinical complexity of gout has increased over this same period. Underlying these developments is a perfect storm of convergent factors that have changed the landscape of gout patients and how we treat them. Petersel *et al*[5], observed that in hospitalized patients with acute gout, significant renal impairment was present in approximately 65% of subjects. The increase in population longevity and the high prevalence of chronic kidney disease in the aged are of particular concern because renal insufficiency renders the management of both gouty inflammation and hyperuricemia more difficult.

In this evaluation, male gender was significantly associated with crystal arthropathy of any type (RR 8.16, p 0.000001). Occurrence of MSU crystal was significantly higher in the male gender (OR 45.2, p 0.000001) whereas there was no significant difference between the males and females in the occurrence of CPPD crystals (OR 2.37, p 0.204). This observation is consistent with many studies[4] that have shown the male to female ratio of gout to be up to 20:1, with the disease being rare in premenopausal women. The gender distribution of CPPD crystal deposition disease has differed among large series [6-9], but no major sex predominance appears likely.

A total of 12 patients were found to have CPPD crystals with most of them (10 patients) occurring in patients above 60 years of age. Rosenthal *et al*[7] reported more than 80% of cases of CPPD in patients aged above 60 years with an average age of occurrence of 72 years. Although this was an urban based evaluation, it can be deduced that crystal arthropathy is a major cause of arthritis in patients presenting with synovitis. A larger study will be needed to generalize these findings to the general population.

Conclusion

Crystal arthropathy is a major cause of arthritis in patients presenting with synovitis in Nairobi, with monosodium urate crystals accounting for most of the crystals seen.

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