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Unveiling multisystem involvement in polyarthritis: A case of rheumatoid arthritis with nutritional anemia and eczema

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Abstract

Rheumatoid Arthritis (RA) is an autoimmune systemic disorder that can present with multisystem involvement. A 20-year-old female presented with fever, multiple joint pains, morning stiffness, and fatigue. Laboratory findings showed elevated Rheumatoid Factor and Anti-CCP antibodies confirming RA, along with iron deficiency anemia and dermatological manifestations—tinea cruris and eczema. She was treated with methotrexate, corticosteroids, antifungals, and iron supplementation, showing gradual clinical improvement. This case highlights the interconnection between autoimmune inflammation, nutritional deficiency, and skin disorders, emphasizing the need for comprehensive and multidisciplinary management in patients with rheumatoid arthritis.

Keywords*:* Rheumatoid Arthritis; Anemia; Eczema; Tinea Cruris; Nutritional Deficiency; Anti-CCP Antibodies

1. Introduction

Polyarthritis is a key clinical presentation in many systemic inflammatory and immune-mediated disorders, and its evaluation plays a central role in identifying underlying etiologies such as rheumatoid arthritis (RA). A thorough assessment of polyarthritis requires detailed clinical history, systematic joint examination, laboratory investigations, and imaging studies to distinguish inflammatory from non-inflammatory causes[1]. Rheumatoid arthritis, one of the most common autoimmune disorders causing chronic symmetrical polyarthritis, manifests with persistent joint pain, morning stiffness lasting more than one-hour, progressive functional limitation, and characteristic involvement of small joints of the hands and feet[2]. The immunopathogenesis involves synovial inflammation, pannus formation, and joint erosion driven by autoantibodies such as rheumatoid factor (RF) as well as anti-cyclic citrullinated peptide (anti-CCP). Evaluation includes measuring inflammatory markers like ESR and CRP, assessing serological markers, and obtaining radiographic imaging to detect early erosive changes. RA is a systemic disease; therefore, extra-articular manifestations such as anemia of chronic disease, fatigue, skin changes, and nutritional deficiencies are frequently observed[3]. Anemia evaluation in patients with inflammatory disorders is particularly important, as chronic inflammation, inadequate dietary intake, and drug-related adverse effects can contribute to nutritional anemia. Iron deficiency anemia may present due to poor intake, malabsorption, or increased physiological requirements, and must be differentiated from anemia of chronic disease through iron studies including transferrin saturation, serum ferritin, as well as total iron-binding capacity[3][4]. Identifying the nutritional component of anemia is essential for targeted correction and improving overall disease outcomes, especially in chronic autoimmune conditions where fatigue and reduced functional capacity significantly affect quality of life.

In addition to joint and hematological manifestations, patients with chronic inflammatory diseases are often susceptible to dermatological conditions, including fungal infections like tinea cruris and eczematous skin changes[5]. Tinea cruris, a dermatophyte infection of the groin region, may occur due to compromised immunity, excessive sweating, poor hygiene, or prolonged use of immunosuppressive medications commonly administered in RA management. Clinically,

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it presents with pruritic, erythematous, well-demarcated patches with peripheral scaling, requiring antifungal therapy and preventive hygiene measures. Concurrently, eczema can present as dry, scaly, and inflamed skin resulting from impaired barrier function, irritation, or allergen exposure, and may be exacerbated by systemic diseases and nutritional deficiencies, particularly low levels of essential fatty acids, vitamins, and minerals[4]. In patients with RA, eczematous lesions may also be aggravated by drug-induced reactions or chronic use of corticosteroids. A holistic approach to patient evaluation should therefore encompass dermatological examination, as skin manifestations often provide important clues about systemic disease activity, treatment side effects, and underlying nutritional deficits[4][5]. Integrated assessment of polyarthritis, nutritional anemia, and dermatological conditions allows for a comprehensive understanding of the patient's disease burden, facilitates early intervention, and improves long-term health outcomes. This multi-system approach is essential for delivering effective and patient-centered care in chronic inflammatory disorders like rheumatoid arthritis.

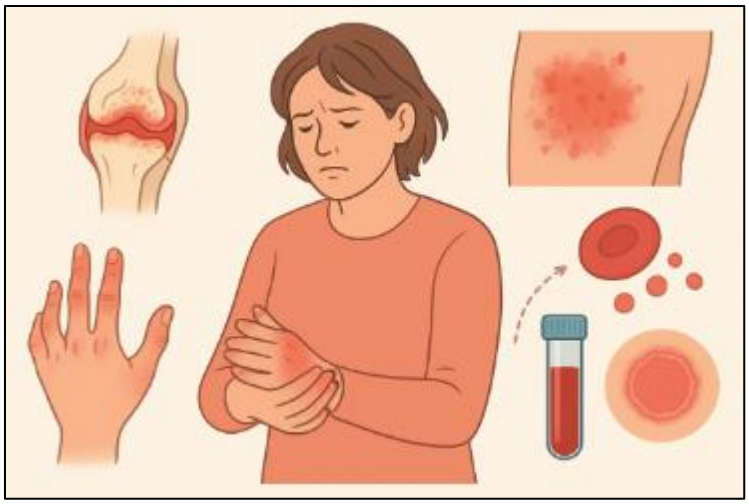

Figure 1 Multisystem involvement in rheumatoid arthritis, including joint inflammation, nutritional anemia, and associated dermatological manifestations

2. Case presentation

A 20-year-old female presents with the chief complaint of fever associated with chills since one-month, multiple joint pains since one year, stiffness of bilateral knee pain since two years and was admitted at Malla Reddy Hospital, Suraram, Hyderabad during the month of September' 2025. After physical examination and radiological investigation, she was diagnosed with Rheumatoid arthritis, Anemia, Tinea cruris

2.1. Present Medical History

Patient was apparently asymptomatic one month ago later developed fever (low grade) associated with evening rise of temperature, episodic type, relieved on medication no aggrevating factors. Patient also had complaints of multiple joint pains insidious in onset & gradually progressive in bilateral wrist with bilateral interphalangeal joints and bilateral knee pain since 1 year associated with redness episodically. Patient also had complaints of stiffness of bilateral knee on waking up since 2 years and reduced after 30 mins on rest. Also complaints of abdominal pain, burning, micturition, oliguria, shortness of breath, chest pain and the patient was admitted in the Malla Reddy Hospital, Suraram, Hyderabad in unit -III of female medicine ward-1 on 17-9-2025 at 12:51pm.

2.2. History of past illness

2.2.1. Past medical history

- Patient is a known case of hypothyroidism since 5 years now not on medication.
- Patient had history of trauma to right arm 6 months ago and 4 years ago patient also had history of iron transfusion 6 times.

2.2.2. Past surgical history

Patient had no any specific and significant past surgical history in the past years.

2.3. Personal history

- Diet: mixed
- Appetite: low
- Sleep: low
- Family history: hypothyroidism +
- Addiction: Patient is not addicted to any form of addiction of drugs, alcohol and smoking/tobacco chewing
- Menstrual history: 6/25 regular days of cycle

LMP: 1/9/25
No clots, No dysmennohea

2.4. Physical examination

General Physical – Pt is conscious, coherent, cooperative

- Build - Moderate
- Health - Unhealthy
- Anemia - Pallor
- Weight - 56 kg
- Jaundice - Not present
- Cyanosis - Not present

Examination

- Clubbing - Absent
- Oedema - Absent
- Glands - Normal

Vital signs

- *Temp:* 98° F
- *Pulse rate:* 68/mt
- *SPO2:* 97%
- *Bp:* 110/70 mm Hg
- *Respiratory Rate*: 16/mt
- *CVS:* S1S2 +
- *RESPIRATORY SYSTEM*: B/L NVBS +
- *ABDOMEN:* Soft, NT
- *CENTRAL NERVOUS SYSTEM:* NFND
- *MUSCULOSKELETON:* NAD
- *SKIN:* NAD
- *LOCAL EXAM:* tenderness + in both knee joints, mild pharyngeal congestion+, scaling over right

2.5. Lab investigations

Table 1 Haematological studies

Lab Tests	Patient's Value	Normal Value	Remarks
Haemoglobin	9.9gm/dL	12.0 – 15.0 gms/dL	ABNORMAL
Basophils	00 %	01 – 02 %	ABNORMAL
Esr	75 mm/hr	<50yrs women: 0-20 mm/hr	ABNORMAL
PERIPHERAL SMEAR			
RBC	NORMOCYTIC HYPOCHROMIC WITH FEW MICROCYTIC HYPOCHROMIC		
WBC	WITH IN LIMITS		
Platelets	ADEQUATE		

Except for the noted abnormalities, the remaining complete blood profile parameters were within normal reference ranges.

Table 2 Renal function test (LFT)

Lab Tests	Patient's Value	Normal Value	Remarks
Uric Acid	3.1 mg/dL	2.6-6.0 mg/dL	ABNORMAL
Except for the noted abnormalities, the remaining Renal function test parameters were within normal reference ranges.			

Table 3 Liver function test (LFT)

Lab Tests	Patient's Value	Normal Value	Remarks
Globulin	4.1 g/dL	2.0 – 3.5 g/dL	ABNORMAL
Except for the noted abnormalities, the remaining Liver function test parameters were within normal reference ranges.			

Table 4 Complete urine examination

Lab Tests	Patient's Value	Normal Value	Remarks
Epithelial Cells	3–4 /HPF	0–5 /HPF	ABNORMAL
Pus Cells	3–4 /HPF	0–2 /HPF	ABNORMAL
Except for the noted abnormalities, the remaining complete urine examination parameters were within normal reference ranges.			

Table 5 Iron profile

Lab Tests	Patient's Value	Normal Value	Remarks
Iron	17 µg/dL	70 – 200 µg/dL	ABNORMAL
Total Iron Binding Capacity (TIBC)	250 µg/dL	261 – 478 µg/dL	ABNORMAL
Ferritin	19.1 ng/mL	10.0 – 120.0 ng/mL	NORMAL

Table 6 Anti-cyclic citrullinated peptide (ANTI CCP)

Lab Tests	Patient's Value	Normal Value
Anti-Cyclic Citrullinated Peptide (Anti CCP)	>500 (Positive)	Negative: <17.0 U/mL Positive: >= 17.0 U/mL

Table 7 Anti-nuclear antibody (ANA) IFA

Lab Tests	Patient's Value	Normal Value	Remarks
Anti-Nuclear Antibody (ANA) IFA	Weak positive (1+)	1+ weak positive 2+ moderate positive 3+ significant positive 4+ strongly positive	1+ weak positive

Table 8 C-reactive protein

Lab Tests	Patient's Value	Normal Value	Remarks
CRP	7.97 mg/L	0.50-10.00 mg/L	NORMAL

Table 9 Rheumatoid Factor (RA)

Lab Tests	Patient's Value	Normal Value	Remarks
Rheumatoid Factor (RA)	160 IU/mL (Positive)	< 10 Negative IU/mL	ABNORMAL

2.6. Other investigations:

2.6.1. Ultrasound abdomen & pelvis

- Diffuse synovial thickening with increased vascularity noted around the right elbow joint-**Inflammatory etiology to be considered, for contrast MRI elbow if clinically indicated**.
- Muscles to the visualized extent appears grossly normal.

2.6.2. ultrasound abdomen & pelvis

No sonological abnormality seen at present study.

2.7. Assessment

It was assessed that the patient was diagnosed with

- **SEROPOSITIVE RHEUMATOID ARTHRITIS**
- **ANEMIA 2° to IRON DEFICIENCY**
- **TINEA CRURIS + ECZEMA**

Table 10 Treatment

TRADE NAME	GENERIC NAME	ROA	DOSE	FREQUENCY	INDICATION
Tab. PAN	Pantoprazole	PO	40 mg	OD	Protects the stomach from acidity or ulcers caused by painkillers (NSAIDs)
Tab. ZERODOL SP	Aceclofenac + Serratiopeptidase + Paracetamol	PO	100+15+ 325mg	BD	Relieves pain, inflammation, and swelling in Rheumatoid Arthritis.
Tab. LEVOCET	Levocetirizine	PO	5 mg	HS	Reduces itching and allergic symptoms in eczema or skin irritation.

Tab. DOLO	Paracetamol	PO	650 mg	SOS	Provides relief from pain and fever associated with arthritis.
Tab. ALCROS SB	Itraconazole	PO	50 mg	OD	Antifungal used to treat Tinea Cruris (fungal infection in groin area).
TENOvate Ointment	Clobetasol	E/A	0.05% w/w	BD	A potent corticosteroid cream that reduces eczema-related inflammation and itching.
MOISTUREX (Soft Lotion)	White Soft Paraffin + Light Liquid Paraffin	E/A	13.2% w/w+ 10.2% w/w	BD	Helps rehydrate and protect the skin in eczema and fungal infection recovery.
LULIFIN Cream	Luliconazole	E/A	1% w/w	BD	Topical antifungal for Tinea Cruris (fungal skin infection).
Tab. METHOTREXATE	Methotrexate	PO	7.5 mg	Once a week	Disease-modifying antirheumatic drug (DMARD) — controls Rheumatoid Arthritis by reducing inflammation and joint damage.
Tab. FOLVITE	Folic Acid	PO	5 mg	Monday, Wednesday, Friday	Given with Methotrexate to prevent side effects like mouth ulcers and anemia.
Tab. FOLITRAX	Methotrexate	PO	15mg	Once every sunday	Disease-modifying antirheumatic drug (DMARD) — controls Rheumatoid Arthritis by reducing inflammation and joint damage.
Tab. Bandy Plus	Ivermectin+ Albendazole	PO	6 + 400 mg	STAT	Antiparasitic — deworms the patient; routine before or during immunosuppressive therapy.
Inj. OROFER S	Iron sucrose	IV	200 mg	STAT	Iron supplement for anemia
Inj. AVIL	Pheniramine maleate	IV	22.75 mg	STAT	Prevents or treats allergic reactions.
Inj. HYDROCORT	Hydrocortisone sodium succinate	IV	100mg	STAT	Given for acute relief of inflammation and pain due to Rheumatoid Arthritis and possibly to control eczema-related inflammation.
Tab. FOLITRAX	Methotrexate	PO	15 mg	Once a week	Controls autoimmune inflammation in Rheumatoid Arthritis.
Tab. WYSOLONE	Prednisolone	PO	5 mg	OD	Steroid to reduce joint inflammation in Rheumatoid Arthritis.
Tab. SHELCAL	Calcium carbonate + Vitamin D_3 (Cholecalciferol)	PO	1 tab	OD	Maintains bone strength and prevents osteoporosis due to long-term arthritis or steroid therapy.

3. Discussion

Polyarthritis with Possible Rheumatoid Arthritis, Nutritional Anemia, and Dermatological Manifestations (Tinea Cruris with Eczema)

Rheumatoid arthritis (RA), a chronic, progressive, systemic inflammatory disease, mostly affects synovial joints but can also damage extra-articular systems such the skin, lungs, and hematological organs. Persistent synovial inflammation that results in bone erosion and cartilage degradation is the characteristic of RA. In this instance, an autoimmune etiology compatible with RA is clearly suggested by the patient's presentation of numerous joint pains, stiffness, increased rheumatoid factor (160 IU/mL), and positive Anti-CCP antibodies (>500 U/mL).

3.1. Clinical Features and Correlation

The patient had persistent joint discomfort in both knees and interphalangeal joints, as well as early-morning stiffness, fever, and exhaustion, all of which are signs of inflammatory arthritis. Laboratory tests showed normocytic hypochromic anemia with low ferritin (19.1 ng/mL), low TIBC (250 μg/dL), and low iron (17 μg/dL), indicating iron deficiency anemia due to chronic inflammation and dietary insufficiency. The existence of persistent systemic inflammation is further supported by the high ESR (75 mm/hr). The immune-mediated deterioration of synovial tissue caused by cytokines like TNF-α, IL-1, and IL-6 is the hallmark of rheumatoid arthritis. Pannus development, increasing cartilage degradation, and joint deformity are the outcomes of this inflammatory cascade. Through cytokine-mediated hepcidin production, which restricts iron absorption and mobilization, chronic systemic inflammation also plays a role in anemia of chronic illness. Malnutrition, decreased appetite, and repeated illness may have exacerbated the presence of nutritional anemia in this instance.

3.2. Dermatological Association

The secondary involvement of skin integrity in systemic inflammatory illnesses is seen in dermatological symptoms such as eczema and tinea cruris. The dermatophyte fungus Trichophyton rubrum, which causes tinea cruris, grows best in damp and immunocompromised situations. Patients with RA who take corticosteroids and immunosuppressive medications for an extended period of time may be more vulnerable to fungal infections. Conversely, eczema is a persistent inflammatory reaction of the skin that is frequently made worse by immunological dysregulation, dryness, or hypersensitivity reactions. Such immune-mediated dermatological symptoms are consistent with the patient's erythematous scaling lesions and itching.

3.3. Treatment and Response

A multidisciplinary treatment plan that addressed every aspect of the illness complex was used to care the patient. While Wysolone (prednisolone) and Hydrocortisone injections offered temporary symptomatic relief from joint inflammation, methotrexate and Folitrax were introduced as disease-modifying antirheumatic medications (DMARDs) to reduce autoimmune inflammation. Pantoprazole was administered as a preventative measure to avoid stomach discomfort caused by NSAIDs. Iron Sucrose (IV) and Orofer injection were used to restore iron stores in order to treat nutritional anemia, while folic acid supplementation helped avoid megaloblastic alterations brought on by methotrexate treatment. Itraconazole (Alcros SB) and Luliconazole cream were used as antifungal treatments for cutaneous lesions, in addition to Clobetasol ointment and moisturex lotion for hydration and dermatitis. Musculoskeletal and dermatological issues gradually improved as a result of this systemic and topical treatment.

3.4. Pathophysiological Overview

The interaction of dietary insufficiency, autoimmune inflammation, and dermatological symptoms emphasizes the multisystemic character of RA. In addition to attacking joints, persistent immune activation in RA also interferes with erythropoiesis and modifies immunological homeostasis, increasing the risk of recurrent infections and skin conditions. Increased synthesis of pro-inflammatory cytokines, autoantibody formation, and complement activation are all brought on by the chronic inflammatory milieu, which prolongs tissue damage.

Furthermore, anemia and skin vulnerability are frequently made worse by the load of chronic diseases, restricted movement, and decreased nutritional intake. Therefore, to enhance functional outcomes and avoid problems, complete treatment that includes immunosuppressive, nutritional correction, and infection control is crucial.

4. Conclusion

A 20-year-old female presented with a history of prolonged joint pain, morning stiffness, fever, and fatigue, and was admitted to Malla Reddy Hospital, Hyderabad, in September 2025. Clinical and laboratory findings revealed elevated Rheumatoid Factor and Anti-CCP antibodies, confirming a diagnosis of Rheumatoid Arthritis. Associated investigations indicated nutritional iron deficiency anemia and dermatological manifestations (Tinea Cruris with Eczema).

The patient was treated with DMARDs, corticosteroids, antifungals, iron supplementation, and supportive care. The integrated approach addressed both systemic inflammation and nutritional deficiencies, resulting in clinical improvement.

This instance highlights how crucial early detection of multisystem involvement in rheumatoid arthritis, where immune dysfunction can manifest beyond the joints. Regular monitoring, nutritional support, and dermatological management are crucial for improving prognosis and quality of life in such patients.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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