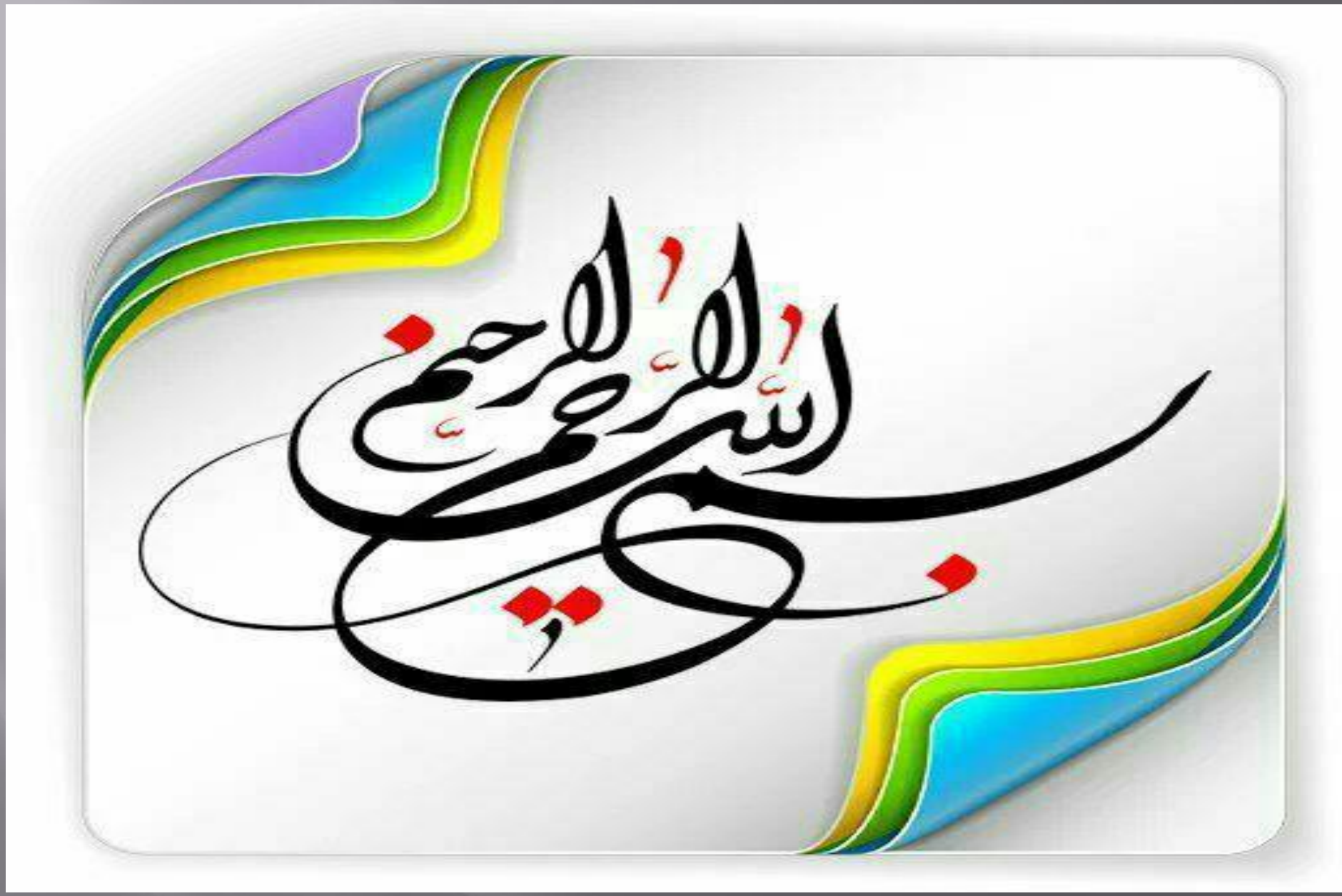
بسم الله الرحمن الرحيم

MUSCULOSKELETAL SYMPTOMS IN SARS-COV-2 (COVID-19) PATIENTS

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استادیار ارتوپدی دانشگاه علوم پزشکی بابل

- The novel SARS-CoV-2 (COVID-19) became a pandemic on 11 March 2020
- People with COVID-19 infection may show several symptoms, including fever, cough, nausea, vomiting, dyspnea, myalgia, fatigue, arthralgia, headache, diarrhea, and rarely arthritis

- Interleukin-6 (IL-6) and tumor necrosis factor-α (TNF- α) levels in plasma and upper respiratory secretions directly correlate with the magnitude of viral replication, fever, and respiratory and systemic

symptoms, including musculoskeletal clinical manifestations [4, 5] Musculoskeletal symptoms such as fatigue,myalgia and arthralgia are common COVID-19 symptoms, but their prevalence has not yet been systematically

investigated

- Until now, no report has been published on the presence of COVID-19 in the skeletal muscles, joint, or bones.
- It is still unclear how the effects of COVID-19 on the musculoskeletal system are mediated

COVID-19 and Acute Sarcopenia

- Sarcopenia is a condition of extreme muscle insufficiency , defined by reduced muscle strength with reduced muscle quantity and/or muscle quality
- Severe sarcopenia is defined by additional demonstration of low physical performance
- Acute sarcopenia most commonly occurs in hospitalised patients

- sarcopenia can develop at any age
- Sarcopenia has been associated with reduced diaphragmatic muscle thickness . Acute declines in diaphragmatic muscle thickness in hospitalised patients can provoke respiratory failure, and

necessitate prolonged mechanical ventilation in critically unwell patients

Muscle loss in acute sarcopenia is due to an imbalance in muscle homeostasis with increased muscle

degradation and reduced muscle synthesis

- Muscle degradation is a term which broadly describes the loss of muscle via both reduction in muscle fibre size (atrophy)

and reduction in the number of muscle fibres (hypoplasia). Hypoplasia is believed to occur secondary to motor neurone death and

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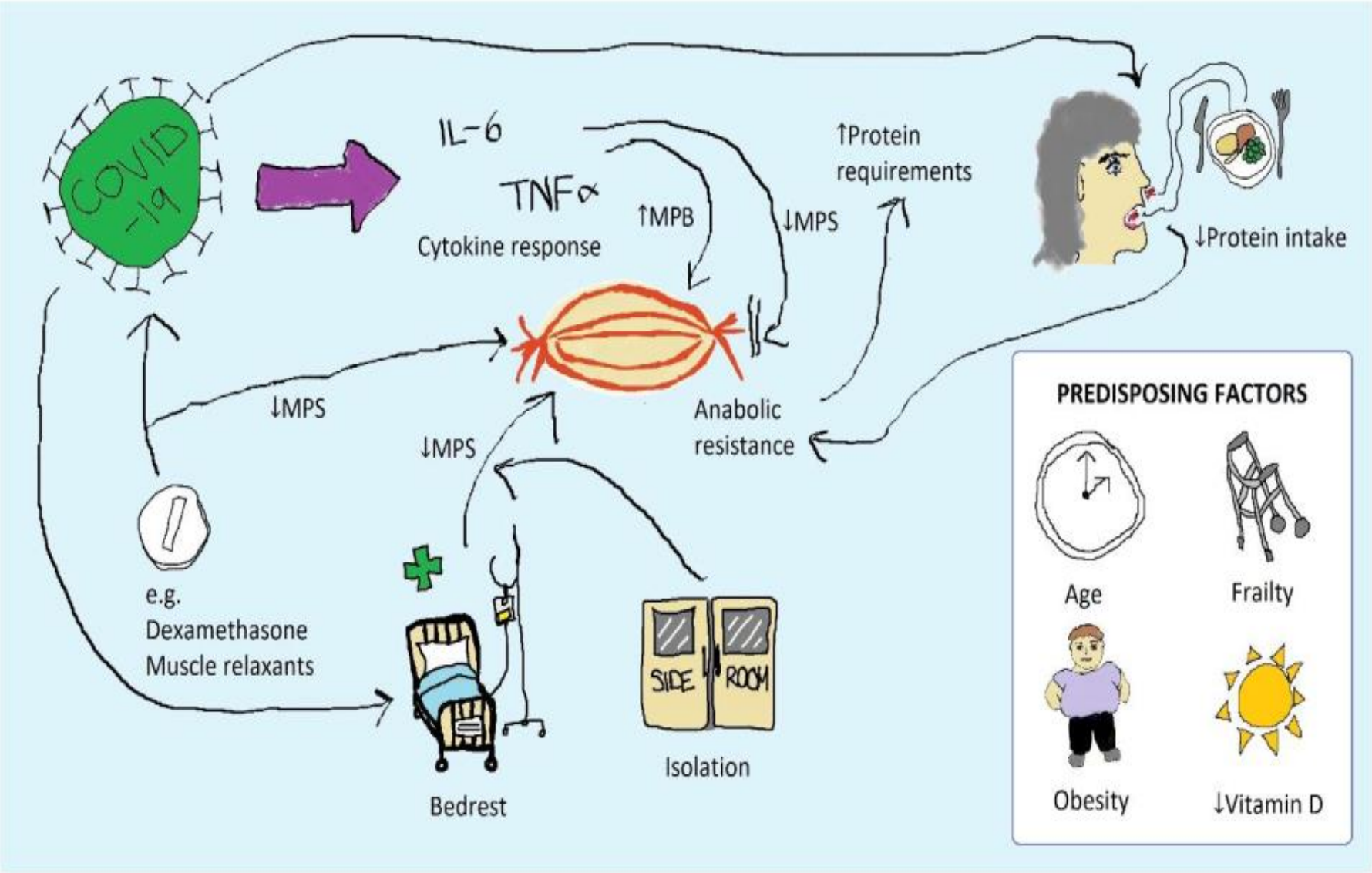


Figure 1. Mechanisms of acute sarcopenia development with COVID-19. Precipitating factors for acute sarcopenia with COVID-19 are demonstrated by pathways and predisposing factors are shown separately. *MPB = Muscle Protein Breakdown; MPS = Muscle Protein Synthesis*

Mechanisms of acute sarcopenia with COVID-19

- Inflammation
- Vitamin D
- Obesity
- Critical care admission
- Nutrition
- Bedrest and physical activity

Inflammation

- Serum concentrations of inflammatory cytokines including Tumour Necrosis Factor Alpha (TNF-α) have been shown to be higher in patients with COVID-19 requiring critical care treatment
- This has negative consequences upon muscle protein synthesis;

Vitamin D

- Vitamin D deficiency has been implicated in sarcopenia; muscle biopsies from individuals with vitamin D deficiency have shown atrophy of Type II muscle fibres
- Vitamin D has also been hypothesised to affect the immune response to respiratory infections

Obesity

- Sarcopenic obesity is a recognised condition defined by reduced muscle mass with increased fat mass
- Sarcopenic obesity may also be associated with ectopic deposition of fat and

  intramyocellular lipid deposition, thus affecting the quality of muscle

Critical care admission

- patients who required admission to critical care relating to marked elevations in systemic inflammation, prolonged bedrest, and use of muscle relaxants to aid prone positioning and reduce risk of viral spread

Nutrition

- sarcopenia in itself has been shown to be associated with weakness in masticatory muscles, which may further exacerbate diminished food intake

Bedrest and physical activity

- Bedrest has been shown to be associated with declines in muscle quantity, strength, and aerobic performance in healthy volunteer studies
- This effect is exacerbated by age [53]. Bedrest leads to reduced muscle protein synthesis via altered expression of ubiquitin ligases in healthy young adults

COVID-19 treatment

- The Randomised Evaluation of COVID-19 Therapy (RECOVERY) trial demonstrated a survival benefit with dexamethasone, particularly when given to the most unwell patients
- medically-induced hypercortisolaemia has been shown to induce muscle loss with bedrest compared to bedrest alone
- Therefore, dexamethasone may increase risk of acute sarcopenia in already vulnerable patients.

- In some cases, up to 2g protein/kg/day may be required and this may even necessitate a period of nasogastric feeding
- An enhanced physiotherapy programme should focus on graded response, assessing what is feasible within the clinical environment.

- Dexamethasone is now given routinely to hospitalised patients with COVID-19 requiring oxygen or critical care admission. However, clinicians should be aware of the potential for increased risk of muscle loss if prolonged courses are given

Myalgia

- Myalgia is a common symptom in patients with viral infections.
- myalgia reflects general inflammation and the cytokine response (an immune response)
- It may not respond to conventional analgesics
- Usually when the viral load pressure is reduced by treating the virus, muscle pain may also be reduced
- Covid-19can pain cause musculoskeletalthrough completelydifferent mechanisms
- Inhyperlactatemia, the ability to carry oxygen to the tissue cells is disrupted and the tissues remain hypoxic
- This condition in themusculoskeletal system maycause ischemia
- Also, during hypoxic growthischemia, increased factors, cytokine levels, ischemic conditions, and microvascular changes can cause pain by overexpression in the dorsal root ganglion

- it is necessary to eliminate the cause of hypoxia to treat this type of pain
- In these pains, the use of analgesics may not be effective
- When the viral load decreases,the red blood cell oxygenation level increases, and the muscle lactate level decreases, the pain disappears spontaneously withviral treatmen

Muscle fatigue

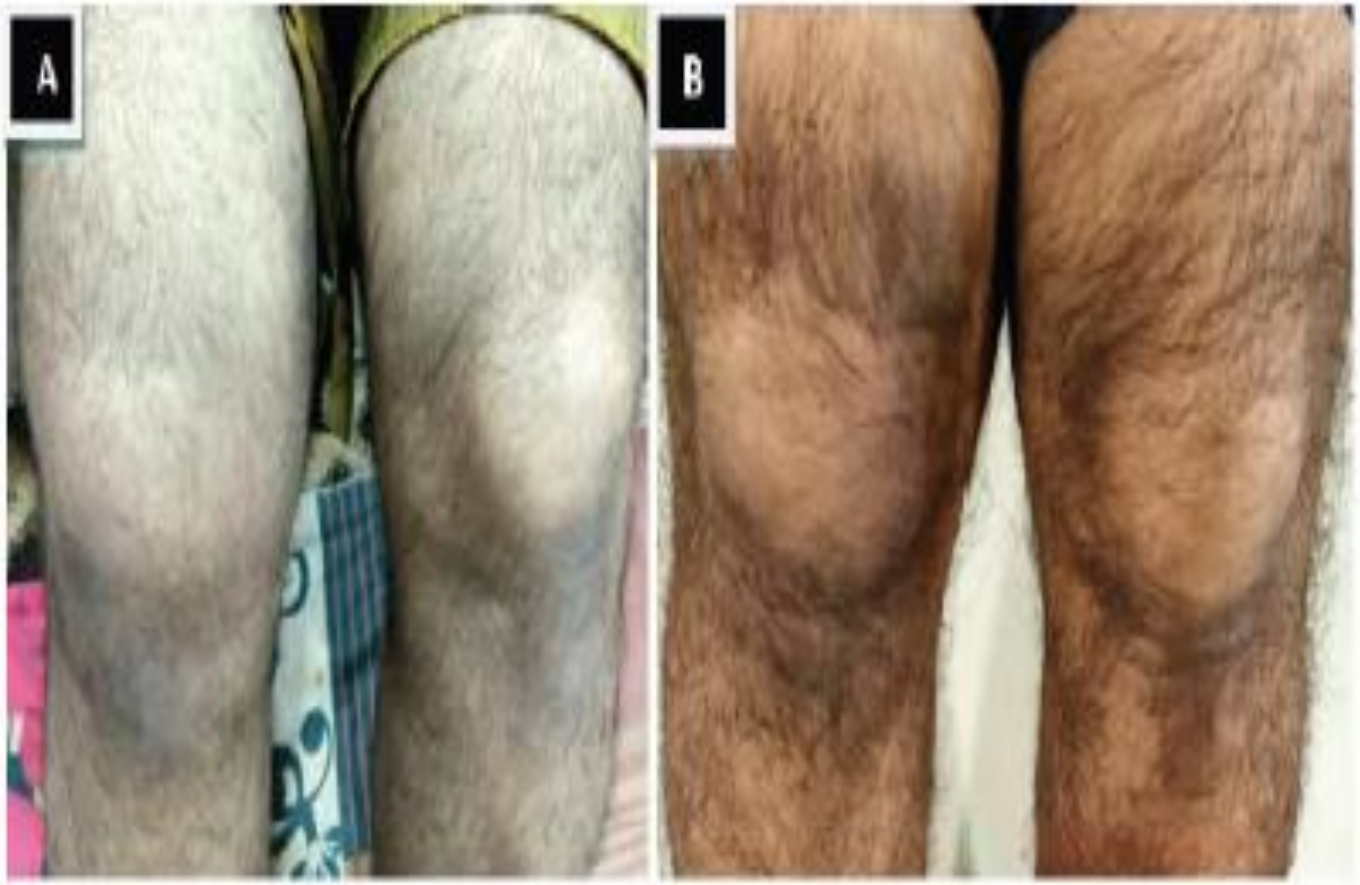
- In people with Covid-19, symptoms such as excessive fatigue, heart beat, muscle aches, feeling of tingling, and some other symptoms have been reported as side effects of the virus
- The presence of a persistent viral infection in the lungs, brain, fat or other tissues may be one of the mechanisms
- low activities (mental or physical) should be done with rest. Return to work should also be a gradual and graded process [

Arthralgia

- Arthralgia is an important clinical complaint seen in many people with viral infections, including the emerging disease of Covid 19
- Low joint pain can be treated with Over-the-counter medications, rub ice, take a hot bath, and do stretching
- However, more severe cases of joint pain may require special medical procedures such as steroid injections, the use of nonsteroidal anti-inflammatory drugs, joint aspiration, or physical therapy (such as physiotherapy, splints, etc.

Figure 2: Plain radiograph (X-Ray) of the affected joint which is unremarkable.

Figure 3: MRI of the affected joint showing mild effusion in the patella-femoral compartment extending to the supra-patellar region. A) MRI T1 weighted image; B) MRI T2 weighted image.



FFigure 1: A) Images of arthritis in the right knee; B) Images of affected joint after NSAID treatment and Glucocorticoid infiltration.

Joint swelling or reactive arthritis

- Usually occurs shortly after infection, and usually resolves within three to six months, and does not cause a particular long-term problem.
- Regarding the mechanism of its creation, the immune system seems to react against excessive infection, and attacks healthy tissue and causes inflammation in it,but the exact cause is not yet known

- Women and men can get it at any age, but it is more common in men and people between the ages of 20 and 40 years old.
- Reactive arthritis can affect any joint, but is more common in the knees, feet, toes, buttocks, and ankles, and has symptoms such as pain (tenderness and swelling in the joints), pain, and tenderness in some tendons (especially in the heels), pain in the back and buttocks, sausage-like swelling in the toes, joint stiffness (especially in the morning)
- There are no specific tests to diagnose reactive arthritis

- Treatment usually includes the following: use of antibiotics (to clear up any factor that may be causing reactive arthritis), use of painkillers such as ibuprofen (to relieve joint pain and stiffness), and manageand treatment of any severe or persistent arthritis.
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Osteonecrosis

- Osteonecrosis has been frequently reported in patients with severe SARS, with rates from 5% to 58%14,67.The majority of these cases involve the femoral head, although the knee,humeral head, talus, calcaneus, and other anatomical sites were affected in lower frequencies

- rehabilitation of patients with Covid-19 does not only include attention to respiratory, infectious or neurological problems
- In fact, Covid 19 patients recover with the aim of improving respiratory function, coping with immobility and its complications, reducing long-term complications, and improving cognitive and emotional areas to improve quality of life


با تشکر