# PREVALENCE OF MUSCULOSKELETAL MANIFESTATIONS IN POST-ACUTE COVID 19 SYNDROME PATIENTS AND THEIR QUALITY OF LIFE AT KENYATTA NATIONAL HOSPITAL

A thesis submitted in partial fulfillment of the requirement for the degree of Master of Medicine in Internal Medicine (MMed) at The University of Nairobi.

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# Dedication

I dedicate this thesis to my biological father, Dr. Joel. L. Ole Kiyiapi (Consultant Physician & Nephrologist) and to his MMed classmate and fond friend, my bonus father, Prof. G.O. Oyoo (Consultant Physician & Rheumatologist) both of whom are my academic role models, teachers and mentors who guided me lovingly and steadfastly throughout my Internal Medicine journey.

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# List of Abbreviations and Acronyms

| | |
|---|---|
| **ACE 2** | Angiotensin-Converting Enzyme 2 |
| **ACR** | American College of Rheumatology |
| **ADL** | Activities of daily living |
| **Ag RDT** | Antigen Rapid Diagnostic Test |
| **ARDS** | Acute Respiratory Distress Syndrome |
| **BMI** | Body Mass Index |
| **COVID-19** | The Coronavirus Disease 2019 |
| **CCC** | Comprehensive Care Clinic |
| **CRP** | C Reactive Protein |
| **CWP** | Chronic Widespread Pain |
| **FS** | Fibromyalgianess Scale |
| **FSS** | Fibromyalgia Symptom Scale |
| **FM** | Fibromyalgia |
| **FibroCOVID** | Fibromyalgia post-acute COVID-19 |
| **FIQR** | Revised Fibromyalgia Impact Questionnaire |
| **HRCT** | High Resolution Computed Tomography |
| **HRQoL** | Health-Related Quality of Life |
| **KNH** | Kenyatta National Hospital |
| **MERS** | Middle East Respiratory Syndrome |
| **MOPC** | Medical Outpatient Clinic |
| **MSK** | Musculoskeletal |
| **PACS** | Post-acute COVID-19 Syndrome |
| **PI** | Principal Investigator |
| **Post-COVID CRF** | Case Report Form for Post-COVID condition |
| **RT PCR** | Reverse Transcription Polymerase Chain Reaction |
| **SARS** | Severe Acute Respiratory Syndrome |
| **SARS CoV 2** | Severe Acute Respiratory Syndrome Coronavirus 2 |
| **SF 36** | 36-Item Short Form Survey |
| **SPSS** | Statistical Package for the Social Sciences |
| **UoN** | University of Nairobi |
| **WHO** | World Health Organization |
| **PCFS** | Post-COVID-19 Functional Status Scale |

# Abstract

**Background:** Since its discovery in Wuhan, China, severe acute respiratory syndrome coronavirus 2 (*SARS CoV 2*) ravaged the globe on an unprecedented scale. While coronavirus disease (COVID-19) was initially thought to be an *acute* disease only, protracted symptomatology led to the characterization of post-acute COVID-19 syndrome (PACS). The prevalence of musculoskeletal (MSK) manifestations in PACS has been demonstrated in different populations with fibromyalgia (FM) in post-acute COVID-19 identified as a new facet of PACS. MSK manifestations have decreased the quality of life (QoL) of patients affecting their self-care, mental health, work ethic and livelihood. Our study sought to quantify the burden of MSK manifestations in PACS in order to raise awareness and increase clinicians' interrogation of underlying MSK diagnoses in our local setting.

**Objective:** To determine the prevalence of MSK manifestations in post-acute COVID-19 syndrome patients and their quality of life at Kenyatta National Hospital (KNH).

**Methods:** A descriptive cross-sectional study conducted at KNH. We recruited 101 patients, randomly sampled from the inpatient COVID-19 database. Following screening for eligibility, contact via phone was established and those who consented verbally were scheduled for physical participation after chart review. Study tools were filled by participants and a musculoskeletal examination was conducted by the Principal Investigator (PI). MSK manifestations were recorded accordingly. Diagnosis of FM was done using the American College of Rheumatology (ACR) criteria and assessment of QoL was done using the 36-item short form (SF 36) questionnaire.

**Results:** The prevalence of MSK manifestations in PACS was 57.4% (95% CI 47.5% - 66.3%), the most common being fatigue (65.5%), arthralgia (58.6%) and myalgia (53.4%). The prevalence of FM was documented as 10.9% (95% CI 5.9% - 17.8%). Patients with MSK manifestations were 6.8 times more likely to have poor QoL than those without MSK manifestations. PACS patients with MSK manifestations were more likely to be female, who had a high BMI and long duration of hospital stay where they were treated with steroids in the acute phase of COVID 19. Older patients with comorbidities and smokers were also predisposed to MSK manifestations. There was no statistical significance found with COVID 19 vaccination status.

**Conclusion:** MSK manifestations are significant clinical features affecting 57.4% of PACS patients, who are about 7 times more likely to have poor QoL, adversely influencing their livelihood.

# Chapter One: Introduction

Since its first discovery in Wuhan, China (1) severe acute respiratory syndrome coronavirus 2 ( *SARS-CoV-2* ) has claimed almost seven million lives with a remarkable confirmed case pool of above seven hundred million worldwide as of June 2023 (2). The epidemiological distribution in Africa is across 47 out of the 54 countries including Kenya, which has recorded cumulative cases of over three hundred thousand and deaths above five thousand (2).

Coronavirus disease (COVID-19) was initially thought to be an *acute* disease only, predominantly affecting the respiratory system by definition, but it did not take long before patients' protracted symptomatology prompted research that yielded the characterization of post-acute COVID 19 syndrome (PACS) (3), initially denoted "Long COVID". These two terms are now used interchangeably.

PACS is now described as a bonafide array of clinical manifestations that persist after the acute phase of COVID 19 with sequelae involving the cardiorespiratory, neuropsychiatric, musculoskeletal, renal, hematological, gastric, endocrine, and even dermatological systems (4).

Approximately 3 in 5 post-acute COVID 19 patients are known to have at least one persisting symptom, with 2 out of 5 having at least one musculoskeletal manifestation (5). Musculoskeletal (MSK) manifestations in PACS have now been reported to have prevalence rates of over 40% of all other persisting symptoms (5,6). The most common musculoskeletal manifestations are fatigue, myalgia and joint pain. It is noteworthy that parts of the PACS spectrum stand in close similarity to some long defined systemic medical conditions. This poses the challenge to clinicians to establish whether they categorically satisfy the criteria of conditions thereof in every field. One such disorder is Fibromyalgia. Fibromyalgia in PACS ("FibroCOVID") is an emerging entity expected to present itself as a challenge to rheumatologists post-pandemic with up to 30% of patients with PACS found to satisfy the criteria of traditional fibromyalgia in an Italian population (7,8). Locally, prevalence rates of fibromyalgia in various medical conditions range from 13% to 65% most recently (9–11), and it is interesting to see how FibroCOVID compares to this.

The impact of long COVID and specifically MSK manifestations and fibromyalgia on patients' well-being and their quality of life (QoL) has been immense, affecting their personal care, mental health and even work ethic, inferentially affecting their livelihood (3,4).

The main gap in handling PACS patients globally and locally is follow up after discharge for reevaluation, diagnosis and management (12) due to few or lack of healthcare infrastructure to cater for these patients. The World Health Organization (WHO) in mitigating this challenge has come up with The Case Report Form (CRF) for Post-COVID condition designed to offer guidelines on the assessment of intermediate and chronic sequelae of COVID 19 (13).

The burden of MSK manifestations in PACS in our setting is unknown as far as our awareness goes, and our study therefore seeks to investigate this to establish informed multidisciplinary healthcare worker methods to cater for our patients.

# Chapter Two: Literature Review

## 2.1 The Coronavirus Disease 2019 (COVID-19)

### 2.1.1 Definition

The virus *SARS CoV 2*, was first detected in patients with Pneumonia in Wuhan, China in 2019. It became a worldwide pandemic in 2020 (1,14). It is the third coronavirus to cause a worldwide pandemic in the last two decades, the first being Severe Acute Respiratory Syndrome (SARS) from Foshan, China (15) in 2002 and the second being Middle East Respiratory Syndrome (MERS) from The Arabian Peninsula in 2012 (16).

### 2.1.2 Transmission and Symptomatology

Transference of virus occurs mainly via respiratory droplets and to a lower extent, contact surface spread (17).

The symptomatology associated with COVID-19 is multisystemic and has been reported variably in different populations (18).

### 2.1.3 Pathophysiology

*SARS CoV 2* has an affinity for the Angiotensin-Converting Enzyme 2 (ACE 2) receptor which is present in many organs of the body such as the heart, kidney, lung, testis, and brain (19,20). Early in the disease, the virus targets the nasal and bronchial epithelial cells and the pneumocytes through the Spike Protein (S Protein) which adheres to the ACE 2 receptor to start host cell invasion (20). S protein undergoes activation via a two-step protease cleavage (21,22) causing conformational change leading to fusion between the virus and the host membrane (23).

Once the Type 2 alveolar pneumocytes are infiltrated, the viral RNA undergoes transcription facilitated by the enzyme reverse transcriptase and translation to create new nucleocapsids. The virus-laden pneumocytes then release a myriad of cytokines and inflammatory markers including interleukins (IL-1, IL-6, IL-8, IL-120, IL-12), tumor necrosis factor-alpha (TNF $\alpha$), interferons gamma and beta (IFN $\gamma$ & $\beta$) among others that comprise the so-called "cytokine

storm". Both the innate and adaptive immunity is involved, with the recruitment of neutrophils and cluster of differentiation cells (CD4 helper T cells and CD8 cytotoxic T cells) as host defence mechanisms that cause inflammation in this process and lung injury on a spectrum of pneumonitis at best and Acute Respiratory Distress Syndrome (ARDS) at worst (1,21,23).

The dysregulated host response may lead to an inflammatory process limited to one organ, or it may be fulminant viral sepsis with multi-organ failure and important life-threatening clinical consequences (1,23-28).

## 2.2 Diagnosis of COVID-19

Samples harvested from the respiratory tract are taken to the laboratory where amplification of the virus occurs through a real-time polymerase chain reaction (RT-PCR) (29). Although the antigen rapid diagnostic test (Ag RDT) is inferior in sensitivity and specificity to PCR (30) it still has high utility for detecting early phase disease and its usefulness, especially within the first week of onset of symptoms and in those with high viral loads cannot be overemphasized (31).

Other laboratory abnormalities that aid in the diagnosis of COVID-19 include lymphopenia (83%), elevated erythrocyte sedimentation rate, ferritin, c-reactive protein, IL-1, IL-6, and deranged coagulation parameters (elevated D-dimer in 46%, thrombocytopenia, low fibrinogen, prolonged prothrombin time) (24,29).

High-resolution computerized tomography (HRCT) is the imaging test of choice for COVID-19 and is extremely sensitive. The pathognomonic features of this disease are bilateral, peripheral, lower-lobe ground-glass opacities with or without consolidations and septal thickening. Atypical appearances include cavitations, calcifications, effusions, reversed halo signs and lymphadenopathy (1,21).

## 2.3 Post-acute COVID-19 Syndrome

The two latter respiratory pandemics, SARS and MERS have exerted a constellation of persistent symptoms among patients post-pandemic, reinforcing the characterization of PACS (32,33).

Based on recent literature, PACS multisystemic sequelae are categorized into two: (a) Subacute sequelae lasting between 4 to 12 weeks from the outset of acute symptoms, and (b) Chronic sequelae/PACS lasting 12 weeks beyond the outset of acute symptoms and non-attributable to other pre-covid diagnoses (34,35).

A Chinese study done on 1,733 PACS patients in Wuhan found that fatigue and myalgia were the most common manifestations at 63% followed by sleeping difficulties and depression at 26% and 23% respectively (36).

An Italian study done on 143 post-hospitalized patients at an average follow up of 60 days determined persisting symptoms in 87.4% of the cohort defined as; fatigue (53.1%), dyspnea (43.4%), joint pain (27.3%) and chest pain (21.7%) (37).

In USA, a study done at 38 hospitals in Michigan that evaluated the outcomes of 1,250 patients discharged at 60 days found 32.6% of patients with persisting symptoms, including dyspnea (22.9%), cough (15.4%) and loss of taste and/or smell (13.1%) (38).

The decision to categorize long COVID patients as those with persisting symptoms after 90 days came after a consensus that this corresponds to a longer phase of the illness (12).

A 6-month retrospective long COVID study in the United Kingdom found 57% and 37% of patients with at least one feature of long COVID at 180 days and between 90 and 180 days respectively including; myalgia, fatigue, pain, depression, respiratory and abdominal symptoms (39).

A study done in the USA, Rochester at Mayo Clinic presents one of the first definitional criteria for post-COVID syndrome that would be useful in phenotyping these patients and creating a framework for their management and paving the way for further research (40).

The incidence of PACS is estimated at 10%–52%, and this estimation can reach a remarkable 85% for hospitalized patients (41).

## 2.4 Musculoskeletal Manifestations in PACS and Risk Factors

Musculoskeletal (MSK) manifestations have been reported variably in different populations in PACS. *Karaarslan et al* found that 43.2% of PACS patients in a population in Istanbul had MSK manifestations where the most frequent was fatigue, joint pain and myalgia (5) followed by back pain and neck pain, similar to his colleague *Bakilan et al* (6) who found fatigue, spine pain and myalgia as the most common. This latter study found that the presence of any chronic disease, long duration of hospital stay and back pain as an admission complaint was related to MSK manifestations post COVID-19.

In Bangladesh, *Numan et al* (42) found that the most common manifestations were myalgia and joint pain specifically in the lower limb region followed by the lower back region. This study also found factors like age, body mass index, period of the acute phase of COVID/length of hospital stay, comorbidities, exercise practices and smoking to be contributory to the development of MSK features post-COVID (42).

*Disser et al* from New York also documents the most frequent sequelae as myalgias, arthralgias and fatigue, noting that post-covid patients are indeed expected to have MSK sequelae due to the use of corticosteroids in their management, which are known to have adverse effects on skeletal muscle and bone and impact recovery of musculoskeletal function (43). A Brazilian study notes that isolations, hospitalizations, and social distancing affects muscle disuse and physical inactivity (44). Muscle atrophy is a result of inflammation, immobilization, insufficient nutrition, and administration of corticosteroids.

A French study found that myalgia, fatigue, dyspnea, and joint pain were the most common manifestations six months after hospitalization for acute COVID, and that presence of three or more symptoms at M6 (month six) was independently associated with the female gender (45). A depiction of the patterns of MSK manifestations in PACS is found in *Table 1* below.

**Table 1: Patterns of MSK manifestations in PACS** *(r.44)*

| | |
|---|---|
| Neuromuscular involvement: neuropathies & myopathies | • COVID-19 patients admitted to the ICU that have undergone invasive ventilation and pronation cycles are at increased risk of critical illness myopathy (CIM) and critical illness polyneuropathy (CIP), and more rarely Guillain Barre Syndrome.<br>• In cases of uncooperative or sedated patients, electromyography and single nerve conduction studies can be used for diagnosis.<br>• Management of CIM and CIP includes reducing the time a patient spends in an immobilized state and pulmonary rehabilitation/early mobilization. |
| Inflammation impact on MSK | • COVID-19 induced proinflammatory state may lead to inflammatory reactive arthritis, muscle fibrosis, increased bone fragility, tendinopathy, and muscle weakness. |
| Arthralgias & myalgias | • Arthralgia and myalgia commonly present early in COVID-19 patients, even in the absence of pulmonary symptoms, with myalgia occurring more commonly.<br>• Studies have suggested that arthralgia can precede the onset of fever and pulmonary symptoms in infected patients.<br>• Management of myalgia and/or arthralgia in patients with a history of COVID-19 consists of NSAIDs and/or rehabilitation. |
| Musculoskeletal sequelae of COVID therapy | • The use of IFN-β and IFN-α as therapy for COVID-19 may be associated with arthralgia and myalgia in patients.<br>• It has been reported that in patients being treated with ribavirin, >10% of patients reported arthralgia and musculoskeletal pain.<br>• Care should be given with opioid use, as strong opioid use was associated with higher in-hospital mortality, whereas other pain medications did not show a significant association with in-hospital mortality.<br>• Prolonged corticosteroid use has been associated with various effects on bone and muscle, including associations with osteonecrosis, reduced bone mineral density, osteoporosis, muscle atrophy, and muscle weakness. |
| Rehabilitation and recovery | • Musculoskeletal symptoms may continue to persist following recovery from COVID-19, with the most common complaints including fatigue, back pain, arthralgia, myalgia, low back pain, and neck pain.<br>• Rehabilitation can improve persistent musculoskeletal symptoms, including exercise training programs and/or physical therapy.<br>• Prevention of prolonged physical inactivity may assist in minimizing muscle disuse atrophy and loss in functional performance. |

### 2.4.1 Case Report Form (CRF) for Post-COVID condition

The post-COVID CRF is a WHO document designed to offer guidelines on the assessment of medium and chronic sequelae of COVID-19 (13). It has three modules:

Module 1: Demographical data, comorbidity history and details on diagnosis and management of the acute phase of COVID.

Module 2: Assesses symptoms post-covid, including, as listed: joint pain/swelling, persistent fatigue, persistent muscle pain, muscle/joint stiffness etc.

Module 3: Is a diagnostic model in systemic categories where the clinician notes diagnoses made after history taking, physical examination and investigation of post-COVID patients. The MSK manifestations listed include arthralgia, myalgia, fatigue, fibromyalgia and muscle atrophy, among others, with an "other" check box for the clinician's discretion.

This study will adapt guidelines from all the three modules of the post-COVID CRF with a focus on the musculoskeletal system.

### 2.4.2 Fibromyalgia in Post-acute COVID-19 Syndrome: "FibroCOVID"

Fibromyalgia in PACS garnered research interest when the undisputed chief complaint of musculoskeletal pain—the cardinal symptom of fibromyalgia, was observed in about one—third of long covid patients (46). One of the most consequential studies on this was done in Italy by *Ursini et al*, who collected data in April 2021 among 616 individuals at 6+/- 3months after their COVID 19 diagnosis finding that 30.7% of his study population satisfied the criteria for fibromyalgia, with increased BMI and male sex being the most important risk factors for post-covid fibromyalgia (8).

In the USA, a study was done to check the features of a mobile health application among patients with fibromyalgia like PACS in an ongoing clinical trial (47).

A Russian study published three cases that demonstrated the hypothesis that local trauma to connective tissue in COVID 19 patients with joint hypermobility was a trigger factor causing fibromyalgia (48).

An African case report in Egypt done by Gheita et al presented a tale of three cases post-COVID 19 referred to the rheumatologist due to their persisting symptoms: three females with no comorbidities who complained of anxiety/depression, generalized musculoskeletal pain, headache, paresthesia and non-restorative sleep. General examination, laboratory workup (including autoimmune profile) and imaging tests were all normal, but tender points on examination led to the diagnosis of fibromyalgia (49).

The impact on the clinical practice of the aforementioned studies is that FibroCOVID is a new facet of PACS, and clinicians should expect a rise in these presentations requiring management (8), hence the need to lay the framework for targeted healthcare in our setup.

### 2.4.3 Diagnosis of Fibromyalgia

The diagnosis of fibromyalgia has historically relied on the 1990 ACR criteria (*Appendix 3*) which categorically stipulates that pain must be present for more than 12 weeks with

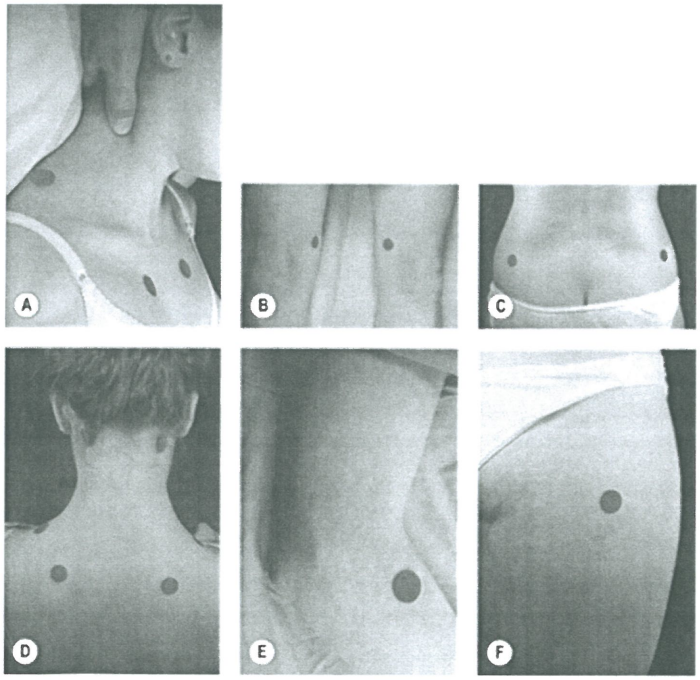
tenderness elicited in at least 11 out of the 18 specific tender points (50). The tender point should be examined manually (*Figure 2*) or with a pressure algometer/dolorimeter (*Figure 1*).

A positive tender point is ascertained when the patient complains of pain at approximately $4kg/cm^2$ of pressure which can be approximated as the pressure required to blanch the nail bed of the thumb.

The chronic widespread pain (CWP) has to be in four quadrants, i.e., the left and right side of the body, above and below the waist and axial skeletal pain (51).While revisions to these criteria have been done, the 1990 version remains indispensable to clinicians with a sensitivity of 88.4% and a specificity of 81.1% (52).

**Figure 1: Pressure algometer**

**Figure 2: Locations of the nine pairs of tender points for diagnostic classification of fibromyalgia.**



### 2.4.4 Assessing QoL of PACS patients with MSK manifestations

Studies on long COVID have reported variably that patients have had significant health-related impact on their quality of life (HRQoL). For example, a study from the United Kingdom by *Ziauddeen et al* (3) found that a third of PACS patients were unable to live alone without assistance in their activities of daily living (ADL). In this study, 16.9% of long COVID patients could not work solely due to their protracted symptomatology, while 37% of patients reported that they had lost their income and hence livelihood. Overall, a staggering 64.4% were found unable to perform their ADL (3).

The Short Form 36 Health Survey questionnaire (SF36) will be used (*Appendix 6*). The SF36 is a widely validated multipurpose tool that evaluates HRQoL (53) by looking at physical capability, physical role, pain, general well-being, energy levels, social well-being, emotional role, and psychological well-being. The weighted sums of the eight scaled tallies are directly converted to 0–100 with 0 being the lowest score and 100 being the maximum score per scale. A lower score (0-49) is a predictor of more disability. A score of more or less than 50 represents a better or worse QoL respectively (54,55).

## 2.5 Justification

Protracted symptomatology 12 weeks past the acute phase of COVID 19 is a consistent trend worldwide.

The main gap globally is the effective follow up of PACS patients at least 3-6 monthly for re-evaluations for as long as needed (as recommended by WHO Post-covid CRF) and management specific to their dynamic health needs.

Locally, the COVID 19 pandemic exposed our local healthcare infrastructure as not only having a deficit in handling inpatient clients, but also, in following them up after discharge for management of PACS sequelae as a unique cohort. Our study sought to be part of the solution by shining a light on the rheumatological aspect of PACS thereby raising clinicians' awareness for better follow-up of our patients.

MSK manifestations in PACS have been reported in many populations as one of the main contributors of decreasing patients' quality of life by causing debilitating pain, lethargy and psychosocial deterioration with reduced productivity.

Data from our study will quantify the burden of MSK manifestations and its effect on quality of life in PACS thereby increasing clinicians' interrogation of underlying MSK diagnoses in PACS, inform implementation of risk stratification of patients during follow-up based on associated factors, facilitate patient education and health-seeking behavior and foster multidisciplinary coordination.

Furthermore, our study will improve the management of PACS patients and inform future research priorities.

## 2.6 Research Question

What is the burden of musculoskeletal (MSK) manifestations among post-acute COVID-19 syndrome patients at Kenyatta National Hospital?

## 2.7 Broad Objective

To determine the prevalence of musculoskeletal manifestations in post-acute COVID-19 syndrome (PACS) patients and their quality of life at Kenyatta National Hospital.

## 2.8 Study Objectives

### 2.8.1 Primary Objectives

1. To determine the prevalence of MSK manifestations in PACS.
2. To determine the prevalence of Fibromyalgia in PACS.
3. To determine the quality of life of PACS patients using the SF 36 questionnaire.

### 2.8.2 Secondary Objectives

1. To determine the associated factors for developing MSK manifestations in PACS.
2. To determine the association between MSK manifestations and QoL of PACS patients.

# Chapter Three: Methodology

## 3.1 Study Design

A descriptive cross-sectional study.

## 3.2 Study Site

This study was done at Kenyatta National Hospital (KNH). KNH has an inpatient COVID 19 database which is comprehensive with information on patients who were admitted from start of pandemic until present, and counting.

## 3.3 Study Population

Post-hospitalised PACS patients who were randomly sampled from KNH inpatient COVID 19 database.

## 3.4 Sample Size Calculation

Fischer's formula for prevalence studies:

$n = Z^2 P (1–P)/d^2$

where:

n is sample size

z is the statistic corresponding to 95% level of confidence

p is prevalence (Turkish study on prevalence of MSK manifestations in PACS by *Karaarslan* was 43.2% [5])

d is margin of error/precision

$n = 1.96^2 \times 0.432(1–0.432)/0.1^2$

$n = 3.8416 (0.432 \times 0.568)/0.01$

$n = 3.38416 \times 0.245376/0.01$

$n = 0.9426364/0.01$

$n = 94.26$

Therefore, a minimum of **94** participants was required for our study (actual recruitment number is **101** participants which caters for minimum requirement).

## 3.5 Inclusion Criteria

a) COVID-19 positive patients by Ag RDT or PCR.
b) Post-hospitalised PACS patients 12 weeks and beyond since initial diagnosis.
c) Patients above 18 years who gave informed written consent.

## 3.6 Exclusion Criteria

~~a)~~ Patients who had alternative known comorbidities as cause for MSK manifestations.
~~b)~~ Patients who declined participation.

## 3.7 Case Definitions

**Post-acute COVID-19 Syndrome (PACS) -** chronic sequelae 12 weeks past the acute phase of COVID 19 as determined by date of positive Ag RDT or PCR non attributable to a pre-covid diagnosis. In this study, PACS was diagnosed according to criteria in Appendix 4.

**MSK Manifestations -** presence of one or more manifestation(s) including myalgia, arthralgia, fatigue and muscle atrophy among others as highlighted in the post-COVID CRF for assessment of chronic sequelae up to and beyond 14 months from initial *SARS CoV 2* diagnosis. In this study, MSK manifestations are defined as signs and symptoms denoting various underlying MSK diagnoses.

**Fibromyalgia** is a rheumatological condition of interest defined as chronic widespread pain lasting more than 12 weeks clinically diagnosed by the elicitation of this pain on a minimum of 11 out of 18 specific tender points on physical examination.

Patients with FM will inevitably have MSK manifestations, but not all patients with MSK manifestations will have FM, which is diagnosed as aforementioned by the ACR Criteria.

## 3.8 Recruitment and Sampling Methods

### 3.8.1 Sampling and Recruitment Procedure

1. A list of patients who were hospitalised for COVID 19 was generated from the KNH inpatient database and used as the sampling frame for our study. The database contains comprehensive information about the patients including and not limited to contact information (patient and next of kin), physical address, age, dates of admission and discharge, mortalities and comorbidities.
2. Inclusion/exclusion criteria was applied and remaining number of patients fed into MS Excel for simple random sampling.
3. Random numbers were generated from MS Excel for patients to be included in the study using Advanced MS Excel 'randomizing list' features.
4. Line listing of about 500 patients was done taking into consideration contingency matters and PACS prevalence in various populations. Consecutive numbering down this list until saturation of sample size was employed.
5. Phone numbers retrieved from the database were used to contact patients for informed verbal consent for study. Those who consented via phone were screened for eligibility for participation. This initial phone call lasted about 3-7 minutes.
6. A chart review was done for recruited patients on: admission chief complaints, duration of hospital stay and use of corticosteroids in the acute phase.
7. Scheduling for physical participation was done via phone for examination of the musculoskeletal system.
8. Patients who declined/were unreachable/were excluded for having pre-covid diagnoses with MSK manifestations were accounted for and replaced from the pre-generated line list until sample size saturation.
9. Participation of patients on follow up at KNH was scheduled around said clinic dates, while those not on follow up were slotted for Wednesday mornings at Clinic 17. Physical study participation lasted about 15-30 minutes.

## 3.9 Data Collection and Clinical Methods

### 3.9.1 Study Tools

a) Patient Data Entry Form.
b) Informed Consent Form.
c) The 36-Item Short Form Survey.
d) The 1990 ACR/EULAR FM Diagnostic Criteria.
e) Proposed PACS Diagnostic Criteria.
f) The post-COVID CRF.

### 3.9.2 Data Collection Process

Patients eligible for our study who gave verbal consent were recruited for participation. A chart review was done, and a follow up PI-patient encounter was scheduled. Data collection was done between November 8, 2022 and January 10, 2023.

1. File data collected by the PI and trained research assistants included;
   - Demographics: age, sex, level of education, occupation and marital status
   - Admission chief complaints
   - Duration of hospital stay
   - Treatment details for acute phase including oxygen therapy and use of corticosteroids.
2. At patient encounter, following written informed consent more history was taken on;
   - Pre-existing conditions history
   - COVID 19 vaccination status of patient
   - MSK symptoms in PACS using the post-COVID CRF as a guideline.
3. Height and weight were measured and BMI was calculated.
4. The PI conducted a focused physical examination of the participants for MSK manifestations and documented each accordingly.
5. The SF-36 questionnaire was administered to all participants for determination of their quality of life.
6. Questionnaires were self-administered. We employed the service of a Swahili linguist to translate the questionnaires into Kiswahili for our patients who did not understand English.

7. Data was saved in a secure computer database only accessed by the principal investigator and research assistants. Physical data entry forms were neatly stored under lock and key by the PI.

## 3.10 Study Variables

### 3.10.1 Exploratory Variables

1. Age in years established from date of birth to the time of the study.
2. Sex as either female or male.
3. Comorbidities as reported by patients or documented in file.
4. Length of hospital stay from admission date to discharge date.
5. Treatment modalities both in the acute phase of COVID and in PACS (Focus is on use of corticosteroids).

### 3.10.2 Outcome Variables

1. Prevalence of MSK manifestations in PACS.
2. Quality of Life of PACS patients with MSK manifestations.
3. Prevalence of Fibromyalgia in PACS.

## 3.11 Data Analysis

Raw data was cleaned and coded into a Microsoft Excel spreadsheet. Analysis was done using the SPSS Version 25 (New York). Categorical data such as sex, was condensed into proportions, and continuous data such as age, was reported as means, medians and standard deviations. Graphs, tables and charts have been used to present our results:

**Objective 1:** The prevalence of MSK manifestations was reported as frequencies and a percentage with 95% CI. Distribution of MSK manifestations was also presented using percentages.

**Objective 2:** The prevalence of FM among PACS patients was reported as frequencies and a percentage with 95% CI.

**Objective 3:** HRQoL as assessed by the SF 36 tool was reported as a score out of 100 for all participants where a score of more or less than 50 represented a better or worse QoL

respectively. A mean score for the populations with and without MSK manifestations was also reported.

**Secondary Objectives**: Clinical variables (e.g., age, sex, length of hospital stay, BMI, comorbidities, use of corticosteroids) were assessed against MSK manifestations (e.g., myalgia, arthralgia, fatigue) using the chi square test of associations for categorical data in a univariate analysis. The association between QoL and MSK manifestations was also tested using chi square. Odds ratios were computed and presented as estimates for risk of developing MSK manifestations and poorer QoL respectively.

## 3.12 Ethical Considerations

1. This study was approved by the Department of Internal Medicine and The Kenyatta National Hospital – University of Nairobi Research and Ethics Committee.
2. For confidentiality, anonymity of patients was maintained.
3. Patients were handled according to MOH/KNH safety guidelines.
4. Verbal consent for participation was first acquired via phone followed by written informed consent in person at the scheduled physical participation part of our study.
5. There was no coercion for participation in the study and no victimization for declining to participate.
6. Patients were reimbursed appropriately for their transport cost (public transport rates) to avoid economic incentives for participation in the study.
7. Scheduling for physical study participation was done promptly and at patients' convenience, avoiding conflicts of interest and wasting of patients' time.

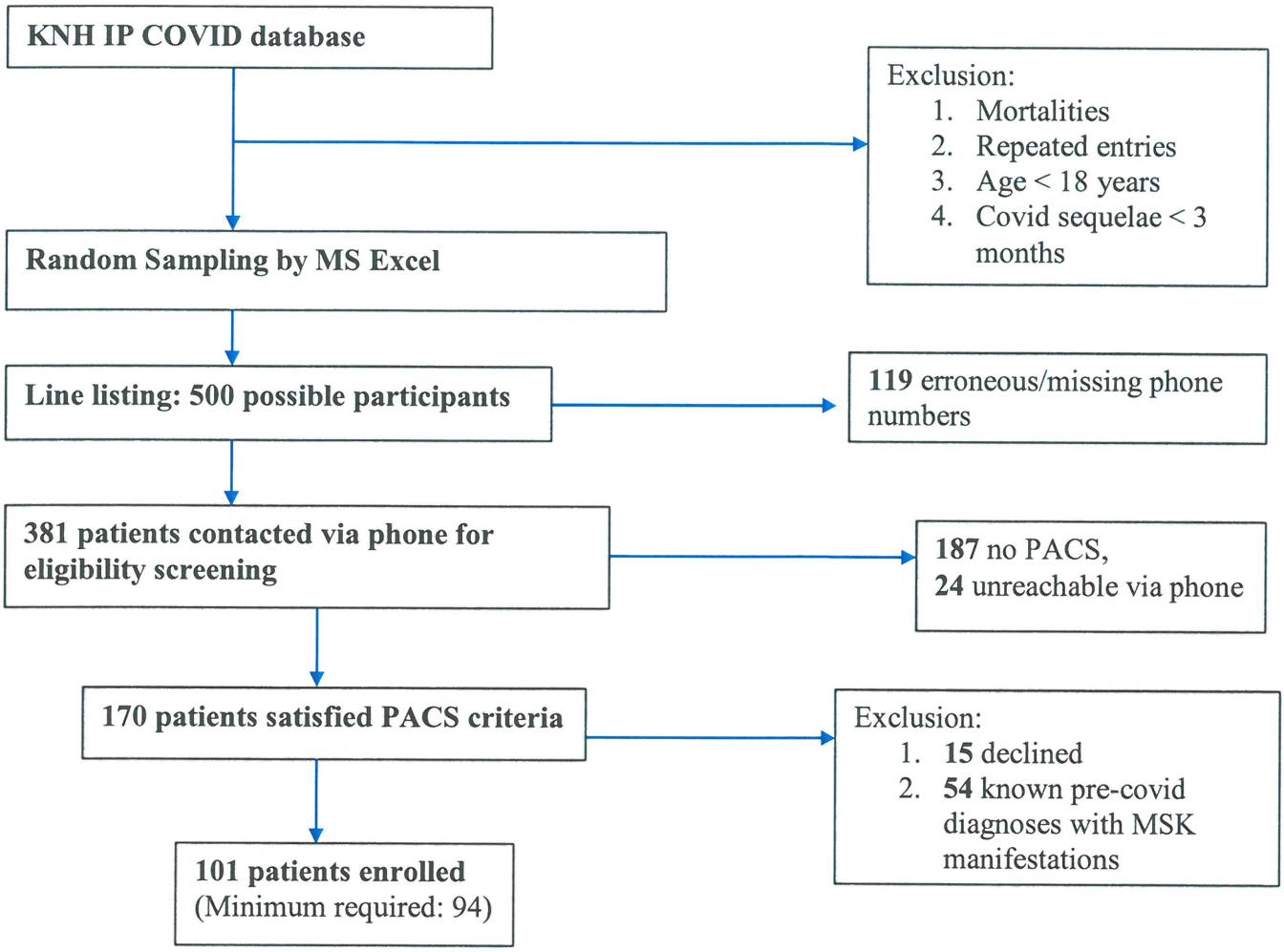
# Chapter Four: Results

## 4.1 Patient recruitment

A total of 381 participants were contacted via phone for eligibility screening. Of these, 24 were unreachable, and 187 did not fulfil PACS criteria. Of the 170 that satisfied PACS criteria, 54 were excluded for having known pre-covid diagnoses with MSK manifestations and 15 declined to participate.

Therefore, a total of 101 participants with PACS were registered into our study and assessed between November 2022 and January 2023. The recruitment process is demonstrated in *Figure 3* below:

**Figure 3: Flow Chart showing Patient Recruitment**



## 4.2 Socio-demographic and clinical characteristics

### 4.2.1 Socio-demographic characteristics

The average age of our study participants was 45.2 years (SD 11.2) with a range of 22-69 years. The respondent group of highest participation was the 30-39 age bracket at 29.7%. Majority of our patients were females, 7 points above the males at 53.5%. The socio-demographic characteristics of our population is illustrated in *Table 2*.

**Table 2: Socio-demographic characteristics of Post-acute COVID 19 syndrome patients**

| Variable | Frequency (%) |
|---|---|
| **Age in years** | |
| Mean (SD) | 45.2 (11.2) |
| Min-max | 22-69 |
| Category, n (%) | |
| 20-29 | 6 (5.9) |
| 30-39 | 30 (29.7) |
| 40-49 | 29 (28.7) |
| 50-59 | 22 (21.8) |
| 60-69 | 14 (13.9) |
| **Marital status** | |
| Single | 27 (26.7) |
| Married | 59 (58.4) |
| Separated | 10 (9.9) |
| Divorced | 2 (2.0) |
| Widowed | 3 (3.0) |
| **Level of education** | |
| Primary | 11 (10.9) |
| Secondary | 34 (33.7) |
| Tertiary | 56 (55.4) |
| **Occupation** | |
| Student | 1 (1.0) |
| Unemployed | 8 (7.9) |
| Employed | 39 (38.6) |
| Self employed | 52 (51.5) |
| Retired | 1 (1.0) |
| **Sex** | |
| Male | 47 (46.5) |
| Female | 54 (53.5) |

### 4.2.2 Clinical Characteristics

Patients with comorbidities amounted to 53.5% of the study population with the most common comorbids being Type 2 Diabetes, Hypertension and Post-covid lung fibrosis. Our population had a mean BMI of 26 (SD 4.4). The median duration of hospital stay was 17

(IQR 10-28) days, with a range of 3-49 days. All of our participants had persisting manifestations beyond 3 months up to 18 months from their time of covid diagnosis. More participants were treated with Dexamethasone (68.3%) than not. Majority of the study subjects were not vaccinated for COVID 19 at 70.3%. Only 24.8% of the respondents had history of smoking. *Table 3* demonstrates the clinical attributes of the study subjects.

**Table 3: Clinical Characteristics of Post-acute COVID 19 syndrome patients**

| Variable | Frequency (%) |
|---|---|
| **BMI** | |
| Mean (SD) | 26.0 (4.4) |
| Min-max | 19.0-40.0 |
| **BMI category** | |
| High BMI | 62 (61.4) |
| Normal BMI | 39 (38.6) |
| **Comorbidities** | |
| Yes | 54 (53.5) |
| No | 47 (46.5) |
| **Type of chronic illness** | |
| Alcohol use disorder | 1 (1.0) |
| Asthma | 3 (3.0) |
| COPD | 4 (4.0) |
| Diabetes type 2 | 16 (15.8) |
| Dilated cardiomyopathy | 1 (1.0) |
| HIV | 2 (2.0) |
| Hypertension | 11 (10.9) |
| Hypothyroidism | 3 (3.0) |
| Post COVID lung fibrosis | 8 (7.9) |
| Pulmonary embolism | 5 (5.0) |
| **Duration of hospital stay (Days)** | |
| Median (IQR) | 17 (10-28) |
| Min-Max | 3-49 |
| **Duration of PACS (Months)** | |
| Median (IQR) | 9.0 (6.0-13.0) |
| Min-max | 3-18 |
| **Corticosteroids (Dexamethasone)** | |
| Yes | 69 (68.3) |
| No | 32 (31.7) |
| **COVID-19 vaccination status** | |
| Yes | 30 (29.7) |
| No | 71 (70.3) |
| **History of smoking** | |
| Yes | 25 (24.8) |
| No | 76 (75.2) |
| **Alcohol use** | |
| Yes | 20 (19.8) |
| No | 81 (80.2) |

## 4.3 Prevalence of Musculoskeletal Manifestations in PACS

The prevalence of MSK manifestations was found to be 57.4% (95% CI 47.5% - 66.3%) as shown in *Figure 4* above, defined as the presence of one or more MSK manifestation(s) among PACS patients.

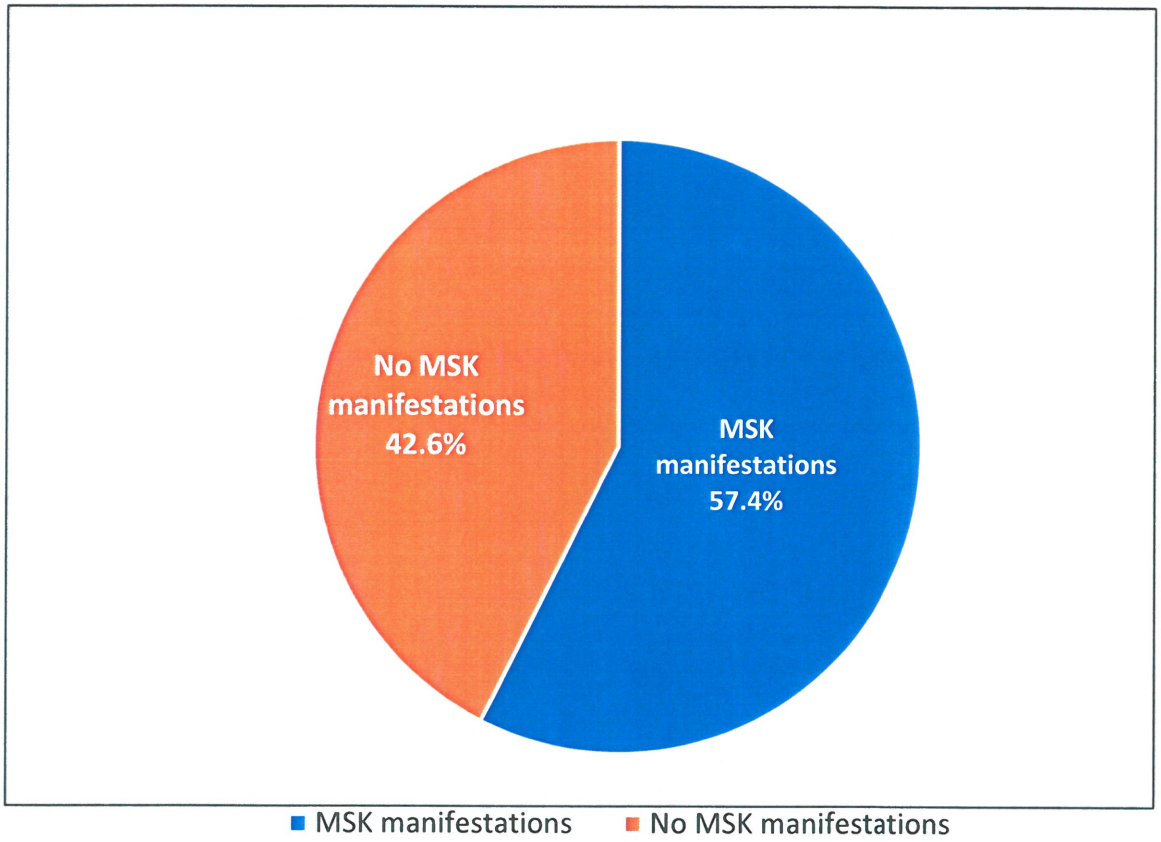



**Figure 4: Prevalence of MSK Manifestations in PACS**

## 4.4 Prevalence of Fibromyalgia in PACS

Among the 101 PACS patients, 11 satisfied the ACR criteria of having tenderness in more than, or equal to 11 out of the 18 specific tender points by digital palpation. Therefore, the prevalence of Fibromyalgia in PACS in our population was found to be 10.9% (95% CI 5.9% - 17.8%).

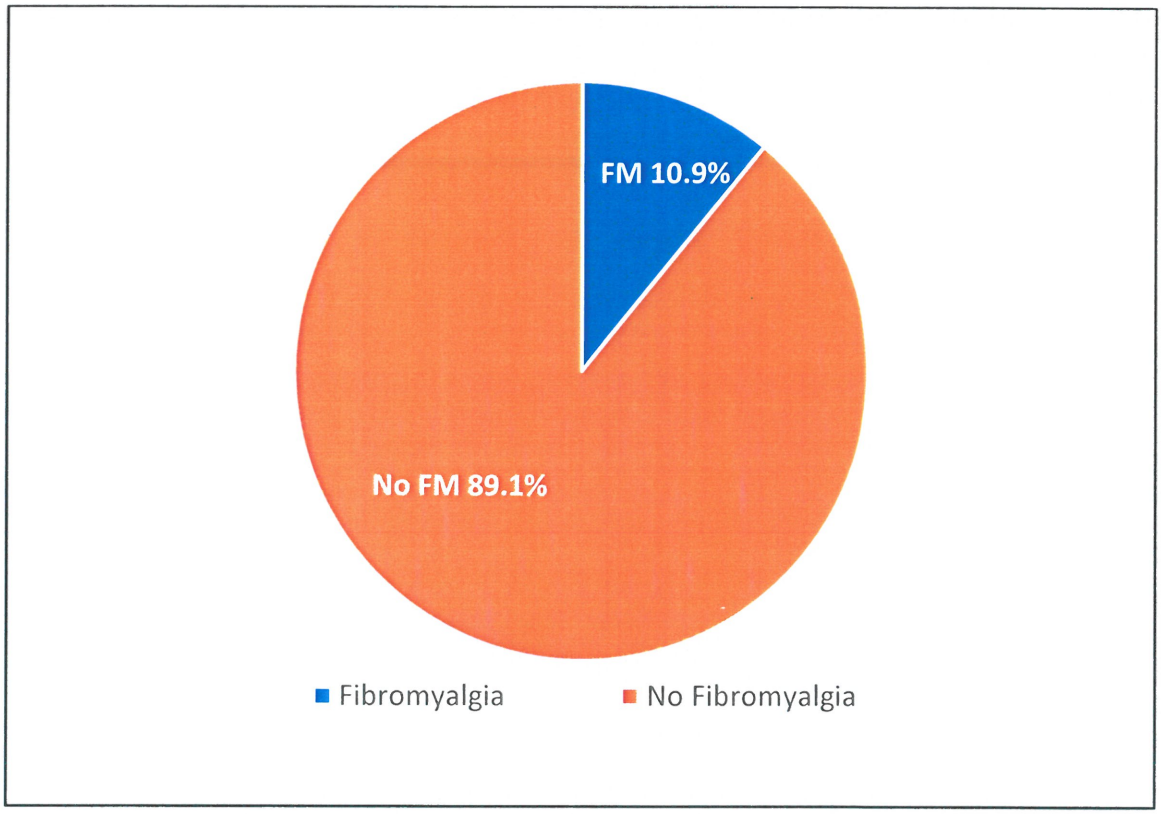



**Figure 5:Prevalence of FM in PACS**

## 4.5 Distribution of MSK manifestations

The graph below (*Figure 6)* shows the various MSK manifestations encountered in our study population, the most frequent being fatigue (65.5%), arthralgia (58.6%) and myalgia (53.4%).

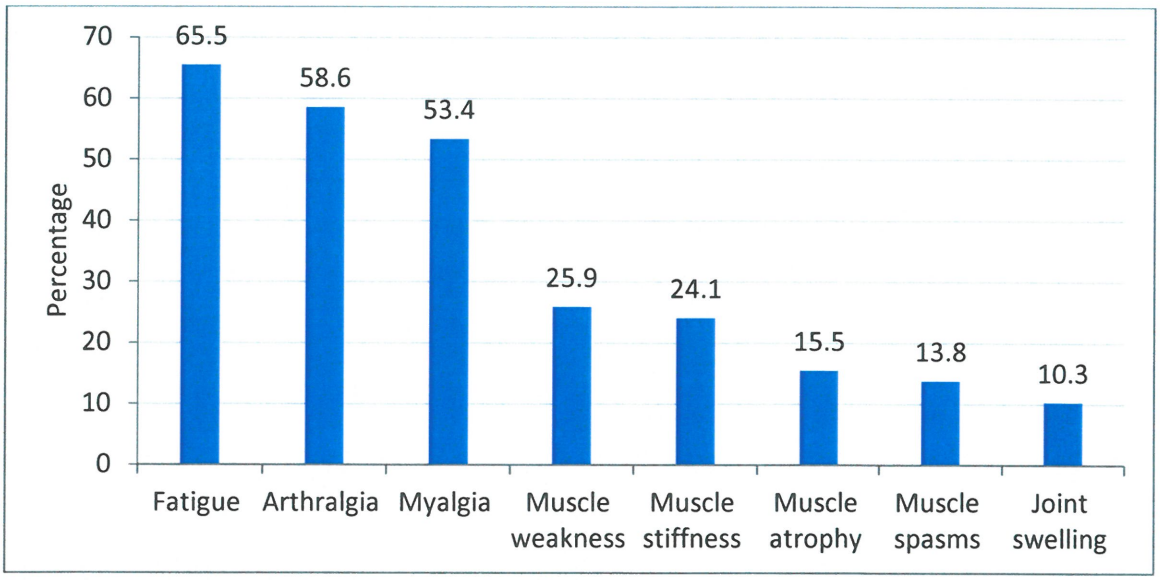



**Figure 6: Percentage distribution of MSK manifestations**

## 4.6 Quality of Life of patients with MSK manifestations in PACS

All participants filled in the SF 36 QoL form, which is divided into the aforementioned 8 domains. The weighted sums of the 8 scaled tallies are converted to 0-100. A total score of more or less than 50 represents a better or worse QoL respectively.

Out of the 101 patients, 49 had poor QoL at 48.5% of the study population. Of these, a majority at 39 (79.6%) had MSK manifestations. *Table 4* illustrates the QoL of patients with MSK manifestations in PACS.

**Table 4: Quality of life of patients with MSK manifestations in PACS**

| Variable | Frequency (%) n=101 | MSK manifestations Yes(n=58) | No(n=43) |
|---|---|---|---|
| **Quality of life** | | | |
| **Category, n (%)** | | | |
| Good QoL (Score 50-100) | 52 (51.5) | 19 (36.5) | 33 (63.5) |
| Poor QoL (Score 0-49) | 49 (48.5) | **39 (79.6)** | 10 (20.4) |

The mean QoL score for patients with MSK manifestations was significantly lower (Mean 44.3) than that of those without MSK manifestations (Mean 55.4), P<0.001 as seen in *Table 5* below. The proportion of patients with poor QoL was significantly higher (67.2%) among patients with MSK manifestations, OR 6.8 (95% CI 2.8 – 16.6), P < 0.001.

**Table 5: Association of MSK manifestations and QoL of PACS patients**

| Variable | MSK manifestations Yes (n=58) | No (n=43) | OR (95% CI) | P value |
|---|---|---|---|---|
| **SF 36QoL score** | | | | |
| Mean (SD) | **44.3** (9.7) | 55.4 (9.4) | - | <0.001 |
| **Quality of life, n (%)** | | | | |
| Poor QoL (Score 0 – 49) | 39 (**67.2**) | 10 (23.3) | **6.8** (2.8-16.6) | <0.001 |
| Good QoL (Score 50 – 100) | 19 (32.8) | 33 (76.7) | 1.0 | |

## 4.7 Factors associated with MSK manifestations in PACS

Patients with MSK manifestations were significantly older (Mean 48.6) compared to those without MSK manifestations, P<0.001. Prevalence of MSK manifestations also increased with age with those aged below 40 at 38.9% and those between 60-69 at 85.7%, OR 9.4 (95% CI 1.8 – 48.6), P = 0.007.

Females were more likely to develop MSK manifestations (83.3%) compared to males (27.7%), OR 13.1 (95% CI 5.0-34.1), P <0.001.

Patients with high BMI (83.9%) were more likely to develop MSK manifestations than those with normal BMI (15.4%), OR 28.6 (95% CI, 9.5 – 86.1), P <0.001.

Patients treated with steroids had more than ten-fold risk of developing MSK manifestations compared to those that were not treated with steroids (P<0.001), and those who were smokers were 8 times more likely to develop MSK manifestations compared to non-smokers (P<0.001).

The duration of hospital stay was significantly higher among patients who developed MSK manifestations (Median 22 days) compared to those without MSK manifestations (Median 10 days), P < 0.001.

COVID 19 vaccination status was not significantly associated with developing MSK manifestations (P = 0.097). Patients with comorbidities were about 5 times more likely to develop MSK manifestations compared to those without comorbidities (P <0.001). *Table 6* shows factors associated with MSK manifestations in PACS.

**Table 6: Factors associated with MSK manifestations in PACS**

| Variable | MSK manifestations | | OR (95% CI) | P value |
|---|---|---|---|---|
| | Yes(n=58) | No(n=43) | | |
| **Age in years** | | | | |
| Mean (SD) | 48.6 (11.3) | 40.6 (9.2) | - | <0.001 |
| Category, n (%) | | | | |
| <40 | 14 (38.9) | 22 (61.1) | 1.0 | |
| 40-49 | 15 (51.7) | 14 (48.3) | 1.7 (0.6-4.5) | 0.302 |
| 50-59 | 17 (77.3) | 5 (22.7) | 5.3 (1.6-17.8) | 0.006 |
| 60-69 | 12 (85.7) | 2 (14.3) | 9.4 (1.8-48.6) | 0.007 |
| **Marital status** | | | | |
| Single | 9 (33.3) | 18 (66.7) | 1.0 | |
| Married | 37 (62.7) | 22 (37.3) | 3.4 (1.3-8.8) | 0.013 |
| Sep./Div./Wid. | 12 (80.0) | 3 (20.0) | 8.0 (1.8-35.7) | 0.006 |
| **Level of education** | | | | |
| Primary | 6 (54.5) | 5 (45.5) | 1.0 | |
| Secondary | 19 (55.9) | 15 (44.1) | 1.1 (0.3-4.1) | 0.938 |
| Tertiary | 33 (58.9) | 23 (41.1) | 1.2 (0.3-4.4) | 0.788 |
| **Occupation** | | | | |
| Unemployed | 6 (60.0) | 4 (40.0) | 1.5 (0.4-5.9) | 0.564 |
| Employed | 26 (66.7) | 13 (33.3) | 2.0 (0.8-4.7) | 0.114 |
| Self employed | 26 (50.0) | 26 (50.0) | 1.0 | |

**Table 6 Continued;**

| Variable | MSK manifestations | | OR (95% CI) | P value |
|---|---|---|---|---|
| | Yes(n=58) | No(n=43) | | |
| **Sex** | | | | |
| Male | 13 (27.7) | 34 (72.3) | 1.0 | |
| Female | 45 (83.3) | 9 (16.7) | 13.1 (5.0-34.1) | <0.001 |
| **BMI** | | | | |
| Mean (SD) | 28.6 (3.9) | 22.5 (2.0) | - | <0.001 |
| **BMI category** | | | | |
| Normal BMI | 6 (15.4) | 41 (84.6) | 1.0 | |
| High BMI | 52 (83.9) | 10 (16.1) | 28.6 (9.5-86.1) | <0.001 |
| **Comorbidities** | | | | |
| Yes | 40 (74.1) | 14 (25.9) | 4.6 (2.0-10.7) | <0.001 |
| No | 18 (38.3) | 29 (61.7) | 1.0 | |
| **Duration of hospital stay in days** | | | | |
| Median (IQR) | 22 (17-32) | 10 (6-14) | - | <0.001 |
| Category, n (%) | | | | |
| ≥median 17 days | 46 (86.8) | 7 (13.2) | 19.7 (7.0-55.2) | <0.001 |
| <median 17 days | 12 (25.0) | 36 (75.0) | 1.0 | |
| **Duration of PACS** | | | | |
| Median (IQR) | 12 (8-15) | 6 (5-8) | - | <0.001 |
| Category, n (%) | | | | |
| ≥median 9 months | 42 (80.8) | 10 (19.2) | 8.7 (3.5-21.6) | <0.001 |
| <median 9 months | 16 (32.7) | 33 (67.3) | 1.0 | |
| **Corticosteroids (Dexamethasone)** | | | | |
| Yes | 51 (73.9) | 18 (26.1) | 10.1 (3.7-27.4) | <0.001 |
| No | 7 (21.9) | 25 (78.1) | 1.0 | |
| **Smoking** | | | | |
| Yes | 22 (88.0) | 3 (12.0) | 8.1 (2.2-29.5) | <0.001 |
| No | 36 (47.4) | 40 (52.6) | 1.0 | |
| **Alcohol** | | | | |
| Yes | 14 (70.0) | 6 (30.0) | 2.0 (0.7-5.6) | 0.204 |
| No | 44 (54.3) | 37 (45.7) | 1.0 | |
| **COVID vaccination status** | | | | |
| Yes | 21 (70.0) | 9 (30.0) | 2.1 (0.9-5.3) | 0.097 |
| No | 37 (52.1) | 34 (47.9) | 1.0 | |

# Chapter Five: Discussion

The main objective of our study was to quantify the burden of MSK manifestations among PACS patients and to determine their QoL. As a secondary objective, we set out to determine the associations between certain clinical variables and MSK manifestations.

We showed that a significant proportion of PACS patients at 57.4% (95% CI 47.5% - 66.3%) developed MSK manifestations as sequelae of acute disease in our population. This high prevalence could be attributed to the clinical characteristics of our study population dominated by factors known to predispose to MSK manifestations such as; majority female sex, long duration of hospital stay and preponderance to the use of steroids in the acute phase in our set-up, among others. *Karaarslan et al*, in a study of 285 PACS patients found a prevalence of 43.2% in a population in Istanbul, Turkey (5). This Turkish study is different in methodology from ours in that they primarily conducted a telephone survey while we followed up patients for physical examination. They therefore missed out on some MSK physical examination findings such as muscle atrophy, muscle spasms and joint oedema.

Our study demonstrated that the most common MSK manifestations were fatigue (65.5%), arthralgia (58.6%) and myalgia (53.4%). This is consistent with recent data from a study by *Numan et al* in Bangladesh (41) as well as Disser *et al* from New York who did a worldwide meta-analysis (42).

We documented a modest prevalence rate of Fibromyalgia in PACS of 10.9% in our population. This finding is significant because it is higher than the prevalence in our local general population of 1% (9). However, it is low compared to the 30.7% which was the prevalence of FM in a prototypical Italian research done by *Ursini et al* (8) among 616 individuals. This discrepancy is most likely due to different diagnostic criteria used. *Ursini* conducted a google-forms, web-based survey and used a patient-centred modification of the 2010 ACR Criteria called 'A Fibromyalgianess Scale' (FS) or 'Fibromyalgia Symptom Scale' (FSS) which could have lowered the threshold for the diagnosis of Fibromyalgia.

Although the FS has recently been adopted for internet-based surveys, we would note that a symptomatology screen alone stands in stark contrast to traditional clinical practice that has historically relied on the tender point examination by the clinician for diagnosis of FM. The

1990 ACR Criteria has been criticised for its lack of consideration of symptoms such as sleep difficulties and fatigue (52). However, despite the current revisions incorporating the aforementioned features, the 2010/2011 and 2016 ACR Criteria have not been validated for use in tertiary referral hospitals. The 1990 ACR Criteria therefore remains the most widely established instrument for use in all clinical settings with a sensitivity of 88.4% and a specificity of 81.1% (58). This disparity between prevalence rates could also be due to intrinsic racial variations in the populations as well as differences in incidence and severity of COVID 19 recorded in the two regions (Italy and Kenya) according to the WHO COVID 19 dashboard (2).

It is interesting to note that the prevalence of FM in PACS in our set up stands in close proximity to previously recorded rates in medical conditions in our set up.
*Dokwe et al* in 2011 established the prevalence of FM at 13% in medical and rheumatology clinics in KNH (9).
*Mumo et al* in 2013 found a prevalence of FM of 17.9% among HIV patients attending comprehensive care clinic - CCC (10), while *Umar et al* in 2017 found a prevalence of 27.9% among Diabetic patients at KNH (11).
*Yego et al* in 2021 found a prevalence of FM of 18% in a multicentre study of ESKD patients on haemodialysis (56), while *Awadh et al* in 2022 found a prevalence of FM of 65% among SLE patients (57).

We found that the proportion of patients with poor QoL was significantly higher (79.6%) among patients with MSK manifestations, OR 6.8 (95% CI 2.8 – 16.6), $P < 0.001$. This finding is likely due to the impairment of all 8 domains among PACS patients with MSK manifestations in our study. *Ziauddeen et al* (3) from the UK showed that 64.4% of patients were unable to perform ADL at optimum, and another 37.0% reported loss of income due to illness. *Ziauddeen* used the Post-Covid Functional Scale (PCFS) and the Functional Status Score (FSS) to report on QoL. These tools leave out emotional well-being, mental health and pain aspects of QoL covered by the SF 36 which we used in our study. This could be the reason for his relatively lower finding.

At univariate analysis, our study found that female sex ($p<0.001$), a high BMI above 25 ($p<0.001$), long duration of hospital stay ($p<0.001$), use of steroids at acute phase ($p<0.001$), older age 60-69 years ($P=0.007$), presence of comorbidities ($p<0.001$) and smoking ($p<0.001$)

were statistically significant associated factors for developing MSK manifestations in PACS. These findings are similar to that of *Numan et al* (41) who conducted a 90-participant study in Bangladesh and *Bakilan et al* in a Turkish study of 280 participants (6).

It is not clearly understood why *Ursini et al* (8) found that male sex had a predisposition to MSK disease considering historical data that suggests a hormonal role due to preponderance to females. This finding appears to be in isolation from ours and studies that we have reviewed in literature.

Majority of our study participants (68.3%) were treated with Dexamethasone. This was likely due to their oxygen requirement necessitating in-patient care. We found that these patients had more than a ten-fold risk of developing MSK manifestations than those who were not treated with steroids, in keeping with *Disser et al* from New York who noted exacerbated MSK manifestation(s) in PACS patients whose prescriptions had longer-duration and/or higher doses of steroids (42).

The length of hospital stay was found to be significantly associated with incidence of MSK manifestations with patients who were admitted for more than 17 days (median) being nineteen times more likely to develop MSK manifestations. A Brazilian, *Greve et al* in a reflective analysis (43) noted that isolations, hospitalizations, social distancing and lockdowns caused physical inactivity which secondarily led to development of MSK manifestations including disuse muscle atrophy. Our study had a similar pattern where all participants found to have muscle atrophy (15.5%) had long hospital stays. In addition to adverse effects caused by steroids, *Greve* notes that insufficient nutrition and overall change in muscle homeostasis contributed primarily to inflammation and MSK diagnoses.

While literature remains divided on this issue, this study found no statistical significance in association between COVID 19 vaccination and development of MSK manifestations in PACS (P=0.097).

Our study demonstrates that MSK manifestations in PACS are disruptive with physical and functional changes in the lives of individuals affecting their QoL. It aids in raising the hypothesis for larger in-depth studies to better characterise these patients.

## 5.1 Conclusion

MSK manifestations are important clinical features of PACS patients, prevalent at 57.4% in this study. Fibromyalgia is also documented at a significant prevalence of 10.9%. Factors predisposing to MSK manifestations in PACS include female sex, a high BMI >25, long duration of hospital stay >17 days, smoking and use of corticosteroids as treatment in the acute phase. PACS patients with MSK manifestations are about 7 times more likely to have poor QoL, which negatively affects them by reducing their QoL for work and livelihood.

## 5.2 Recommendations

1. Screening for MSK manifestations as standard of care among post-covid survivors, interrogation of underlying MSK diagnoses among PACS patients and early referral to rheumatologists.
2. Developing risk stratification guidelines on PACS patients with MSK manifestations based on associated factors to be applied in patient engagement and follow-up.
3. Offering psycho-social support to PACS patients with MSK manifestations at our clinics and linking them to counsellors as needed.
4. Physical therapy for PACS patients with MSK manifestations in addition to treatment for underlying MSK diagnoses.
5. A larger longitudinal study to further evaluate the risk/associated factors predisposing to MSK manifestations in PACS.

## 5.3 Study Strengths

1. A novel study in the region raising awareness on the burden of MSK manifestations in PACS.
2. Use of standard tools that have been validated in our population for assessment and diagnosis.

## 5.4 Study Limitations

1. Our sampling frame was the inpatient COVID 19 database. This means that our results may not be generalizable to outpatient and home-based PACS patients.
2. Single-centre regional referral facility: largely recruiting from Nairobi County and counties in its environs; patients from rural communities may have been missed.

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# Appendices

## Appendix 1a English: Patient Data Entry Form

**Part 1: Demographics**

Participant's Initials (*Indicate the first letters of your First, Second and Surname*) _____

Age in Years _____ Year of Birth _____ Height _____ Weight _____

Sex: Male _____ Female_____

Marital Status: _____

(*Single, Married, Divorced, Separated*)

Level of Education: _____

(*None, Primary, Secondary, Undergraduate, Master, Doctorate*)

Occupation: _____

County of Origin: _____

Smoking: Current _____ Former _____ Never _____

Alcohol: Current _____ Former _____ Never _____

**Part 2: Date of COVID-19 Diagnosis _____**

**Hospital Admission date from _____ to _____**

**Part 3: Comorbids History (Tick only if present in the blank following)**

Type 2 Diabetes ____ HIV ____ Asthma/COPD ____

Hypertension____ Chronic Kidney Disease _____ TB_____

Chronic Heart Disease (Not HTN) _____ Thyroid Disease _____ Cancer _____

Chronic Lung Disease _____ Neurological/Psychiatric Disorder _____ Obesity ____

Other (indicate all preexisting conditions clearly) _____

**Part 4: Drugs History**

Treatment during acute phase (tick if patient was treated with…)

Corticosteroids_____ Immunotherapies _____ Antibiotics _____ Antivirals _____

Oxygen therapy _____

Are you currently on any medications?

If yes, List them all_____

**Part 5: Symptomatology (*tick if present*)**

Fatigue _____

Joint Pain _____

Muscle pain _____

Muscle stiffness _____

Joint Swelling _____

Musculoskeletal pain _____

Bodily pain _____ Headache____ Neck pain _____ Back pain _____ Other _____

Other symptoms (*list all*) _____

**Part 6: Vaccination Status**

Have you been vaccinated for COVID 19? _____

When were you vaccinated? _____

Do you know the name of the vaccine you received? _____ If yes, indicate here_____

How many doses of vaccine did you get? _____ How far apart? _____

# Appendix 1b Kiswahili: Fomu ya takwimu za wagonjwa

**Sehemu ya 1: Idadi**

Nambari ya mshiriki _____

Umri kwa miaka _____Mwaka wa kuzaliwa _____ Urefu_____ Kilo _____

Jinsia: Mwanaume _____ Mwanamke _____

Hali ya ndoa: _____

(*Sijaoa(olewa), Nimeoa(olewa), Tumetengana, Tumetalakiana*)

Kiwango cha elimu: _____

(*Hamna, Shule ya msingi, Sekondari, Uzamili, Mabwana, Udaktari*)

Kazi: _____

Kaunti ya asili: _____

Uvutaji Sigara: Sasa _____ Hapo awali _____ Sijawahi _____

Unywaji wa pombe: Sasa _____ Hapo awali _____ Sijawahi _____

**Sehemu ya 2: Tarehe ya utambuzi wa COVID-19 _____**

**Tarehe za kulazwa hospitalini kutoka _____ hadi _____**

**Sehemu ya 3: Historia ya magonjwa yanayoshirikiana (Weka sahihi ikiwa ipo)**

Ugonjwa wa sukari ____ Virusi vya ukosefu wa kinga mwilini (HIV) ____ Pumu ____

Ugonjwa wa Shinikizo ____ Ugonjwa sugu wa figo _____ Kifua kikuu _____

Ugonjwa sugu wa moyo_____ Ugonjwa wa tezi _____ Saratani _____

Ugonjwa sugu wa mapafu _____ Ugonjwa wa Neurolojia/Saikolojia _____ Ugonjwa wa kunenepa ____

Nyinginezo _____

**Sehemu ya 4: Historia ya Madawa**

Matibabu wakati wa awamu ya papo hapo (weka sahihi iwapo mgonjwa alitibiwa na;)

Dexamethasone _____ Tocilizumab _____ Remdesevir _____ Dawa za wadudu _____

Oksijeni _____ Nyinginezo _____

Je, uko kwa dawa yoyote kwa wakati huu?

Ikiwa ndio, ziorodheshe zote _____

**Sehemu ya 5: Dalili za ugonjwa (*weka sahihi ikiwa ipo*)**

Uchovu _____

Maumivu katika viungo _____

Maumivu ya misuli _____

Ugumu wa misuli _____

Uvimbe wa viungo _____

Maumivu ya Shingo _____ Mgongo _____ Miguu _____ Mikono ____ Kanda nyingine ya mwili _____

Dalili zingineo (*orodhesha*) _____

**Sehemu ya 6: Hali ya chanjo**

Je, umepewa chanjo ya COVID 19? _____

Ni lini ulipata chanjo? _____

Unajua jina la chanjo uliyopokea? _____ Ikiwa ndio, andika hapa _____

Ulipata kipimo ngapi cha chanjo? _____ Miezi ngapi kati ya kila kipimo? _____

# Appendix 2a English: Informed Consent Form

**Introduction**

My name is Dr Miriam Kiyiapi. I'm a Masters Student in Internal Medicine who is conducting a study on the prevalence of musculoskeletal manifestations, and quality of life of patients with post-acute COVID-19 Syndrome at Kenyatta National Hospital. I would like to invite you to participate in this study.

**Process, Confidentiality and Intervention**

This study will be anonymous and discrete. A patient data entry form will be given to you to fill for demographical data collection only in which you will not be required to use your identity/name at any point. This informed consent also has to be signed as a prerequisite. You will then fill in forms with clinical questions about when you were diagnosed with COVID-19, what symptoms you are experiencing now, what other comorbid you may have and the effect of all these on your quality of life. If you consent, the principal investigator will then perform a physical examination on you.

**Participation in this study**

Participation in this study will be completely voluntary and withdrawal at any point will not be penalized in any fashion. You may ask questions at any time, but the researchers will not assist in answering the actual particulars in the various questionnaires.

**Duration of study**

The study will be conducted over two months, with a one-time enrolment per patient/participant policy.

**Benefits of participating in our study**

There will be no payment for participating in our study for us to meet our ethical standards. However, there will be transport cost reimbursement by appropriate public transport rates to avoid economic incentives for study participation. The main benefits will be that you will be part of breakthrough research that will lead to the development of healthcare infrastructure that will mitigate the problem of MSK manifestations in PACS in our local setting, and that this platform offers you a medical assessment on important post-covid complications. Should

you be diagnosed with any musculoskeletal disorder, we will provide the networks for a rheumatologist (or clinician) for your management and follow up.

**Participant's Declaration**

I, ..... (use your initials), hereby consent to be a participant in Dr. Miriam Kiyiapi's study on MSK manifestations in PACS. She has explained to me the intent and goals of this research, and all my arising questions have been answered satisfactorily.

Date..... Signature.....

For any questions, contact

Dr. Miriam Kiyiapi (PI)

+254712743561

miriamkiyiapi@students.uonbi.ac.ke

or the supervisors on this research:

Prof. Omondi Oyoo george.oyoo@uonbi.ac.ke

Dr. Peter Oyiro peteroyiro@uonbi.ac.ke

Dr. Frederick Wangai fkwangai@uonbi.ac.ke

If you have any question about your rights as a study volunteer, kindly contact Dr. Beatrice Amugune, the secretary of the KNH/UON-ERC at;

Telephone 020 726300-9 Ext 443555

Email uonknh_erc@uonbi.ac.ke

Or write to;

Secretary, KNH-UoN ERC

P.O Box 20723 – 00202

KNH, Nairobi

# Appendix 2b Kiswahili: Kuhusu Idhini

**Utangulizi**

Jina langu ni Dkt. Miriam Kiyiapi. Mimi ni mwanafunzi wa Masters ambaye anafanya utafiti juu ya kuongezeka kwa udhihirisho wa magonjwa ya misuli na viungo, na ubora wa Maisha ya wagonjwa walio na Dalili za COVID 19 za baada ya papo hapo katika hospitali ya Kitaifa ya Kenyatta. Napenda kukualika kushiriki katika utafiti huu.

**Mchakato, Usiri na Uangalizi**

Utafiti huu hautakutambulisha wala kuwa wazi. Fomu ya kuingiza takwimu za wagonjwa itapewa wewe kujaza ambayo hautahitajika kutumia kitambulisho chako/jina wakati wowote. Takwimu zinazohitajika hapa ni ya idadi, wakati wako wa kugunduliwa na COVID 19, Dalili unazopata sasa na hali nyingine ambayo unaweza kuwa nayo. Kuna pia fomu ya kukagua ubora wako wa maisha. Idhini hii pia inapaswa kuwekwa sahihi kama sharti la lazima kabla ya kushiriki katika utafiti. Ukikubali, mpelelezi mkuu basi atafanya uchunguzi wa mwili juu yako.

**Ushiriki katika utafiti**

Ushiriki katika utafiti huu utakuwa wa hiari kabisa na kujiondoa wakati wowote hautaadhibiwa kwa mtindo wowote. Unaweza kuuliza maswali wakati wowote, lakini watafiti hawatasaidia kujibu maelezo halisi katika dodoso mbali mbali.

**Muda wa utafiti**

Utafiti utafanywa kwa muda wa miezi miwili, na kila mgonjwa/mshiriki ataandikishwa mara moja tu.

**Faida za kushiriki katika utafiti**

Hakutakuwa na malipo ya kushiriki katika utafiti wetu ili tufikie viwango vyetu vya maadili. Walakini, kutakuwa na ulipaji wa gharama ya usafirishaji kwa viwango sahihi vya usafiri wa umma ili kuzuia motisha za kiuchumi kwa ushiriki katika utafiti. Faida kuu itakuwa kwamba utakuwa sehemu ya utafiti wa mafanikio ambayo itasababisha maendeleo ya miundombinu ya huduma za afya ambayo itapunguza shida za udhihirisho wa viungo ma misuli katika wagonjwa waliowahi kupata COVID-19. Jukwaa hili litakupa tathmini ya matibabu. Ikiwa

utagunduliwa kuwa na shida zozote za kiafya, tutakuelekeza kwa dakitari kwa usimamizi wako na ufuatiliaji.

**Tamko la mshiriki**

Mimi, ..... (Nambari ya mshiriki), ninakubali kuwa mshiriki katika utafiti wa Dr. Miriam Kiyiapi. Nimeelezewa malengo ya utafiti, na maswali yangu yote yamejibiwa kwa kuridhika kwangu.

Tarehe..... Sahihi.....

Kwa maswali yoyote, wasiliana nami

Dr. Miriam Kiyiapi

+254712743561

miriamkiyiapi@students.uonbi.ac.ke

au wasimamizi juu ya utafiti huu:

Prof. Omondi Oyoo george.oyoo@uonbi.ac.ke

Dr. Peter Oyiro peteroyiro@uonbi.ac.ke

Dr. Frederick Wangai fkwangai@uonbi.ac.ke

Ikiwa una swali lolote juu ya haki zako, wasiliana na Dr. Beatrice Amugune, katibu wa KNH/UON-ERC kwa;

Nambari ya simu 020 726300-9 Ext 443555

Barua pepe uonknh_erc@uonbi.ac.ke

Au andika kwa;

Katibu, KNH-UoN ERC

P.O Box 20723 – 00202

KNH, Nairobi

# Appendix 3: The 1990 American College of Rheumatology Fibromyalgia Diagnostic Criteria

1. History of chronic widespread pain.

   Definition. Pain is considered widespread when all of the following are present: pain in the left side of the body, pain in the right side of the body, pain above the waist, and pain below the waist. In addition, axial skeletal pain (cervical spine or anterior chest or thoracic spine or low back) must be present. In this definition, shoulder and buttock pain is considered as pain for each involved side. "Low back" pain is considered lower segment pain.

2. Pain in 11 of 18 tender point sites on digital palpation.

   Definition. Pain, on digital palpation, must be present in at least 11 of the following 18 sites:

   Occiput: Bilateral, at the suboccipital muscle insertions.

   Low cervical: bilateral, at the anterior aspects of the intertransverse spaces at C5–C7.

   Trapezius: bilateral, at the midpoint of the upper border.

   Supraspinatus: bilateral, at origins, above the scapula spine near the medial border.

   Second rib: bilateral, at the second costochondral junctions, just lateral to the junctions on upper surfaces.

   Lateral epicondyle: bilateral, 2 cm distal to the epicondyles.

   Gluteal: bilateral, in upper outer quadrants of buttocks in anterior fold of muscle.

   Greater trochanter: bilateral, posterior to the trochanteric prominence.

   Knee: bilateral, at the medial fat pad proximal to the joint line.

Digital palpation should be performed with an approximate force of 4 kg.

For a tender point to be considered "positive" the subject must state that the palpation was painful. "Tender is not to be considered "painful."

# Appendix 4: Proposed PACS Criteria

**Required:**

- Timeline:
  - Viral prodrome† occurring after December 31st, 2019
  - Post-viral symptoms persisting > 3 weeks
- Clinical stabilization or resolution of the viral infection/prodrome*

**Major Criteria:**

- Positive PCR test **OR** Rapid antigen test with a viral prodrome **OR** Positive serology with a viral prodrome
- Viral prodrome involving symptoms more closely associated with COVID-19 infection, specifically anosmia, dysgeusia, or shortness of breath

**Minor Criteria:**

- Two of six core systems:
  - Constitutional (fatigue, fevers, dizziness, sleep disturbance, photosensitivity)
  - Cardiac (tachycardia, palpitations, chest pain/tightness)
  - Respiratory (shortness of breath, cough)
  - Gastrointestinal (abdominal pain, nausea, vomiting, diarrhea)
  - Musculoskeletal (joint pain, myalgias, tenderness)
  - Neurological (parasthesias, weakness)
- Moderate or greater decrease in functional status
- Viral prodrome not including anosmia, dysgeusia, or shortness of breath

**Exclusion Criteria:**

- Better explained by an alternative diagnosis, including pre-existing central sensitization syndromes

**PROBABLE:**

Patients must have 2 major criteria and 1 minor criterion **OR** 1 major criteria and 2 minor criteria.

**POSSIBLE:**

Patients must have 1 major criterion and 1 minor criterion **OR** 3 minor criteria.

**Stabilization/resolution characterized by symptom improvement x72 hours in the following, without NSAID or acetaminophen use: fever, chills, sweating, myalgia, diarrhea, cough, dyspnea, sore throat, chest tightness, nasal congestion, anosmia, dysguesia, fatigue, weakness, lightheadedness, headaches, nausea, or abdominal pain.*

*†Viral prodrome defined as: fever, chills, shortness of breath, anosmia, dysgeusia, muscle aches, fatigue, headache, congestion, cough, rhinorrhea, nausea, vomiting, or diarrhea.*

# Appendix 5a English: The SF 36 Questionnaire

## SF-36 QUESTIONNAIRE

**Name:**_____ **Ref. Dr:**_____ **Date:** _____

**ID#:** _____ **Age:** _____ **Gender: M / F**

Please answer the 36 questions of the **Health Survey** completely, honestly, and without interruptions.

**GENERAL HEALTH:**
**In general, would you say your health is:**
◯ Excellent ◯Very Good ◯Good ◯Fair ◯Poor

**Compared to one year ago, how would you rate your health in general now?**
◯ Much better now than one year ago
◯Somewhat better now than one year ago
◯About the same
◯Somewhat worse now than one year ago
◯Much worse than one year ago

**LIMITATIONS OF ACTIVITIES:**
The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

**Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports.**
◯Yes, Limited a lot ◯Yes, Limited a Little ◯No, Not Limited at all

**Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf**
◯Yes, Limited a Lot ◯Yes, Limited a Little ◯No, Not Limited at all

**Lifting or carrying groceries**
◯Yes, Limited a Lot ◯Yes, Limited a Little ◯No, Not Limited at all

**Climbing several flights of stairs**
◯Yes, Limited a Lot ◯Yes, Limited a Little ◯No, Not Limited at all

**Climbing one flight of stairs**
◯Yes, Limited a Lot ◯Yes, Limited a Little ◯No, Not Limited at all

**Bending, kneeling, or stooping**
◯Yes, Limited a Lot ◯Yes, Limited a Little ◯No, Not Limited at all

**Walking more than a mile**
◯Yes, Limited a Lot ◯Yes, Limited a Little ◯No, Not Limited at all

**Walking several blocks**
◯Yes, Limited a Lot ◯Yes, Limited a Little ◯No, Not Limited at all

**Walking one block**
◯Yes, Limited a Lot ◯Yes, Limited a Little ◯No, Not Limited at all

**Bathing or dressing yourself**

◯Yes, Limited a Lot ◯Yes, Limited a Little ◯No, Not Limited at all

**PHYSICAL HEALTH PROBLEMS:**

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

**Cut down the amount of time you spent on work or other activities**

◯Yes ◯No

**Accomplished less than you would like**

◯Yes ◯No

**Were limited in the kind of work or other activities**

◯Yes ◯No

**Had difficulty performing the work or other activities (for example, it took extra effort)**

◯Yes ◯No

**EMOTIONAL HEALTH PROBLEMS:**

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

**Cut down the amount of time you spent on work or other activities**

◯Yes ◯No

**Accomplished less than you would like**

◯Yes ◯No

**Didn't do work or other activities as carefully as usual**

◯Yes ◯No

**SOCIAL ACTIVITIES:**

**Emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?**

◯Not at all ◯Slightly ◯Moderately ◯Severe ◯Very Severe

**PAIN:**

**How much bodily pain have you had during the past 4 weeks?**

◯None ◯Very Mild ◯Mild ◯Moderate ◯Severe ◯Very Severe

**During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?**

◯Not at all ◯A little bit ◯Moderately ◯Quite a bit ◯Extremely

**ENERGY AND EMOTIONS:**
These questions are about how you feel and how things have been with you during the last 4 weeks. For each question, please give the answer that comes closest to the way you have been feeling.

**Did you feel full of pep?**
- ◯ All of the time
- ◯ Most of the time
- ◯ A good Bit of the Time
- ◯ Some of the time
- ◯ A little bit of the time
- ◯ None of the Time

**Have you been a very nervous person?**
- ◯ All of the time
- ◯ Most of the time
- ◯ A good Bit of the Time
- ◯ Some of the time
- ◯ A little bit of the time
- ◯ None of the Time

**Have you felt so down in the dumps that nothing could cheer you up?**
- ◯ All of the time
- ◯ Most of the time
- ◯ A good Bit of the Time
- ◯ Some of the time
- ◯ A little bit of the time
- ◯ None of the Time

**Have you felt calm and peaceful?**
- ◯ All of the time
- ◯ Most of the time
- ◯ A good Bit of the Time
- ◯ Some of the time
- ◯ A little bit of the time
- ◯ None of the Time

**Did you have a lot of energy?**
- ◯ All of the time
- ◯ Most of the time
- ◯ A good Bit of the Time
- ◯ Some of the time
- ◯ A little bit of the time
- ◯ None of the Time

**Have you felt downhearted and blue?**

- ◯ All of the time
- ◯ Most of the time
- ◯ A good Bit of the Time
- ◯ Some of the time
- ◯ A little bit of the time
- ◯ None of the Time

**Did you feel worn out?**

- ◯ All of the time
- ◯ Most of the time
- ◯ A good Bit of the Time
- ◯ Some of the time
- ◯ A little bit of the time
- ◯ None of the Time

**Have you been a happy person?**

- ◯ All of the time
- ◯ Most of the time
- ◯ A good Bit of the Time
- ◯ Some of the time
- ◯ A little bit of the time
- ◯ None of the Time

**Did you feel tired?**

- ◯ All of the time
- ◯ Most of the time
- ◯ A good Bit of the Time
- ◯ Some of the time
- ◯ A little bit of the time
- ◯ None of the Time

**SOCIAL ACTIVITIES:**

**During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?**

- ◯ All of the time
- ◯ Most of the time
- ◯ Some of the time
- ◯ A little bit of the time
- ◯ None of the Time

**GENERAL HEALTH:**
**How true or false is each of the following statements for you?**

**I seem to get sick a little easier than other people**
◯Definitely true ◯Mostly true ◯Don't know ◯Mostly false ◯Definitely false

**I am as healthy as anybody I know**
◯Definitely true ◯Mostly true ◯Don't know ◯Mostly false ◯Definitely false

**I expect my health to get worse**
◯Definitely true ◯Mostly true ◯Don't know ◯Mostly false ◯Definitely false

**My health is excellent**
◯Definitely true ◯Mostly true ◯Don't know ◯Mostly false ◯Definitely false

# Appendix 5b Kiswahili: Dodosa ya 36 Item Short Form Health Survey

Tafadhali yajibu maswali 36 yafuatayo ya utafiti wa afya kwa ukamilifu uaminifu:

**AFYA KWA UJUMLA**

1) Kwa ujumla ungeweza kusema afya yako ni
   Bora Zaidi
   Nzuri sana
   Nzuri
   Nzuri kiasi
   Mbaya

2) Ukilinganisha na mwaka uliopita, unaweza kusemaafya yako kwa ujumla iko vipi? Bora Zaidi sasa kuliko mwaka uliopita
   Nzuri Zaidi sasa kuliko mwaka uliopita
   Karibu sawa na mwaka uliopita Mbaya
   kiasi sasa kuliko mwaka uliopita Mbaya
   Zaidi sasa kuliko mwaka uliopita

**Mapungufu ya Shughuli**

Yafua ni shughuli ambazo unaweza kufanya kwa siku ya kawaida. Je, afya yako huathiri shughuli hizi? Kama inaa ni kwa njia ipi?

3) Shughuli kubwa kama kukimbia, kuinua vitu nzito, kushiriki katika michezo zenye nguvu?
   Ndio, imepungua sana
   Ndio, imepungua kidogo
   La haijapungua hata kidogo

4) Shughuli za wastani kama kusongeza meza, kusukuma utupu safi bowling au kucheza golf?
   Ndio, imepungua sana
   Ndio, imepungua kidogo
   La haijapungua hata kidogo

5) Kuinua au kubeba vyakula
   Ndio, imepungua sana
   Ndio,imepungua kidogo La
   haijapungua hata kidogo

6) Kupanda ngazi kadhaa
   Ndio, imepungua sana
   Ndio,imepungua kidogo La
   haijapungua hata kidogo

7) Kupanda ngazi kidogo
   Ndio, imepungua sana

Ndio,imepungua kidogo La
haijapungua hata kidogo

8) Kuinama, kupiga magoti au kusitisha
Ndio, imepungua sana
Ndio,imepungua kidogo
La haijapungua hata kidogo

9) Kutembea zaidi ya maili moja
Ndio, imepungua sana
Ndio,imepungua kidogo
La haijapungua hata kidogo

10) Kutembea vitalu kadhaa
Ndio, imepungua sana
Ndio,imepungua kidogo La
haijapungua hata kidogo

11) Kutembea kitalu kimoja
Ndio, imepungua sana
Ndio,imepungua kidogo La
haijapungua hata kidogo

12) Kuoga au kuvaa mwenyewe
Ndio, imepungua sana
Ndio,imepungua kidogo La
haijapungua hata kidogo

**Matatizo ya Afya ya Kimwili**

Katika wiki nne zilizopita je umekua na shida zifuatazo na kazi yako au shughuli zako za mara kwa mara za siku kwa sababu ya afya yako ya kimwili?

13) Kupunguza muda uliotumia kwenye kazi na shughuli zingine
Ndio Hapana

14) Kukamilisha mambo chini ya vile ungependa
Ndio Hapana

15) Kupunguza aina ya kazi au shughuli zingine
Ndio Hapana

16) Kuwa na ugumu wa kufanya kazi au shughuli zingine (kwa mfano ilichukua juhudi ziada)
Ndio Hapana

**Matatizo ya Afya ya Kihisia**

Katika wiki nne zilizopita, je, umekua na shida zifuatazo na kazi yako au shughuli zako za mara kwa mara kwa sababu ya shida kihisia (kama vile huzuni au wasiwasi)?

17) Kupunguza muda uliotumia kwenye kazi au shughuli zingine
Ndio Hapana

18) Kukamilisha kazi chini ya vile ungependa
Ndio Hapana

19) Kutofanya kazi au shughuli zingine kwa makini kama kawaida
Ndio Hapana

**Shughuli za Kijamii**

20) Je shida za kihisia zimeingia katika shughuli zako za kawaida kama kijamii na familia, marafiki, majirani au vikundi?
Hapana
Kwa kawaida
Kwa kiasi kidogo
Kwa kiasi kikubwa

21) Je, umekua na uchungu wa kimwili wa kiwango kipi kwa wiki nne zilizopita?
Hakuna
Kidogo sana
Kidogo
Wastani Kali
Kali sana

22) Katika wiki nne zilizopita, maumivu yaliingilia katika kazi yako ya kawaida kwa kiasi gani? (ni pamoja na kazi zote nje ya nyumba pamoja na kazi za nyumba)?

Hapana kabisa
Kidogo Wastani
Kiasi kidogo Kiasi
kikubwa
Nishati na Hisai

Maswali yafuatayo ni kuhusu jinsi unavyohisi na jinsi mambo yamekwa na wewe wiki nne zilizopita. Kwa kila swali tafadhali jibu na hisia iliyo karibu na jinsi ulivyohisi au unayohisi.

23) Je ulijiskia ukiwa na furaha Zaidi?
Kila wakati
Mara nyingi
Muda kidogo
Wakati mwingine
Muda kidogo sana wa wakati
Hakuna wakati

24) Je, umekuwa mtu mwenye
hofu? Kila wakati
Mara nyingi
Muda kidogo
Wakati mwingine
Muda kidogo sana wa wakati
Hakuna wakati

25) Je umejiskia ukiwa na huzuni kwamba hakuna chochote kile kilichoweza kukufurahisha?
Kila wakati Mara nyingi
Muda kidogo
Wakati mwingine
Muda kidogo sana wa
wakati Hakuna wakati

26) Je umejiskia mtulivu na mwenye amani?
Kila wakati
Mara nyingi
Muda kidogo
Wakati mwingine
Muda kidogo sana wa wakati
Hakuna wakati

27) Je umekua na jitihada
nyingi? Kila wakati
Mara nyingi
Muda kidogo
Wakati mwingine
Muda kidogo sana wa wakati
Hakuna wakati

28) Je umejiskia kuwa umevunjika moyo?
Kila wakati
Mara nyingi
Muda kidogo
Wakati mwingine
Muda kidogo sana wa wakati
Hakuna wakati

29) Je umejiskia
mzee? Kila wakati
Mara nyingi
Muda kidogo
Wakati mwingine
Muda kidogo sana wa wakati
Hakuna wakati

30) Je umekua mtu mwenye
furaha? Kila wakati
Mara nyingi
Muda kidogo
Wakati mwingine
Muda kidogo sana wa wakati
Hakuna wakati

31) Je umejiskia mchovu?
Kila wakati
Mara nyingi
Muda kidogo
Wakati mwingine
Muda kidogo sana wa wakati
Hakuna wakati
Shughuli za Kijamii

32) Kwamuda wa wiki nne zilizopita ni kiasi gani cha muda wa afya yako ya kimwili au matatizo ya kihisia yamepatei kuingihwa na shughuli zako za kijamii(kama vile kuwatembelea marafiki, ndugu)
Kila wakati
Mara nyingi
Wakati mwingine
Muda kidogo sana wa wakati
Hakuna wakati
Afya Ya Jumla

**Jinsi ya kweli au uongo ni kila moja ya kauli zifuatazo kwako**

33) Ninaonekana kuwa mgonjwa kwa urahisi Zaidi kuliko watu wengine
Hakika kweli
Zaidi ya ukweli
Sijui
Zaidi ya
uongo Hakiki
uongo

34) Nina afya kama mtu yeyote ninayemjua
Hakika kweli
Zaidi ya
ukweli
Sijui
Zaidi ya
uongo Hakiki
uongo

35) Natarajia afya yangu kuwa mbaya
Zaidi Hakika kweli
Zaidi ya
ukweli Sijui
Zaidi ya
uongo Hakiki
uongo

36) Afya yangu ni bora
zaidi Hakika kweli
Zaidi ya
ukweli Sijui
Zaidi ya
uongo Hakiki
uongo

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# Lead Supervisor & Chairman of Department Approval

This thesis is submitted with the approval of my Lead Supervisor and the Chairman of the Department of Clinical Medicine and Therapeutics:

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