

A prospective study of estimation of musculoskeletal impairments in post chikungunya viral infection

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Abstract

Introduction: Chikungunya is an infection caused by the *Chikungunya virus* (CHIKV). Symptoms include fever and joint pains. These typically occur two to twelve days after exposure. Other symptoms may include headache, muscle pain, joint swelling, and a rash. Symptoms usually improve within a week; however, occasionally the joint pain may last for months or years. The risk of death is around 1 in 1,000. The very young, old, and those with other health problems are at risk of more severe disease. **Materials and Methods:** This study was conducted among total of 66 subjects who were infected by Chikungunya virus. This study was conducted in Department of General Medicine, Santhiram Medical College and hospital, Nandyal. Sample size was calculated by $n=4pq/L2$. Both males and females infected by chikungunya virus between age of 30 to 60 were included according to inclusion exclusion criteria. People with rheumatoid arthritis, gout and other red flag symptoms were excluded based on detailed history, clinical examination and relevant investigations. Written consent was taken from the subjects those willing to participate. The subjects were selected by simple random sampling. The outcome measures were musculoskeletal assessment chart primarily studying range of motion, Pain and oedema. Procedure After the protocol and ethical clearance, the procedure was started. Subjects were selected with age group between 30 to 60 from post Chikungunya viral infected according to the inclusion and exclusion criteria. The consent was taken from the selected subjects. **Results:** The obtained results showed a significant prevalence rate in all three components i.e. pain, ROM and oedema. Pain was found to be present in 81% of subjects, preceded with altered ROM. Presence of oedema was noted in smaller values. Oedema was absent in 43% of subjects. In that 32% subjects had grade 1 oedema, 16% subjects had grade 2 oedema and remaining 9% had grade 3 oedema. Female subjects were found to have more profound impairments with greater pain levels and altered ROM. **Conclusion:** Musculoskeletal impairments like pain, stiffness, oedema, impairment in joint range of motion, are present post chikungunya viral infection. Female subjects were found to have more pain and impaired ROM than the male subjects.

Keywords: Chikungunya, ROM, Oedema, Pain, rheumatoid arthritis

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Introduction

Chikungunya is an infection caused by the *Chikungunya virus* (CHIKV). Symptoms include fever and joint pains. These typically occur two to twelve days after exposure. Other symptoms may include headache, muscle pain, joint swelling, and a rash. Symptoms usually improve within a week; however, occasionally the joint pain may last for months or years. The risk of death is around 1 in 1,000. The very young, old, and those with other health problems are at risk of more severe disease. The virus is spread between people by two types of mosquitos: *Aedes albopictus* and *Aedes aegypti*. They mainly bite during the day. The virus may circulate within a number of animals including birds and rodents. Diagnosis is by either testing the blood for the virus's RNA or antibodies to the virus. The symptoms can be mistaken for those of dengue fever and Zika fever. It is believed most people become immune after a single infection. Long term musculoskeletal Sequelae of Chikungunya must be taken into account when dealing with disease because of its important effect on public and individual health. To study this fact the

prospective, large scale, long term studies with objective assessment of signs and symptoms attributed to disease are needed to optimally quantify and qualify this problem. Depending on frequency, duration and predictors of post Chikungunya chronic polyarthralgia, defined as joint pains lasting longer than 6 weeks or longer than 1 year. The post-acute and chronic stages are observed only in certain patients. Persistent musculoskeletal symptoms were reported in 54 to 79% of Chikungunya infected patients. The mechanism states that there is occultation through bite of infected mosquito Chikungunya virus enters directly in subcutaneous capillaries, infecting susceptible cells in skin such as macrophages, fibroblast or endothelial cell then free infected cells disseminate through blood stream to host organism to peripheral organ such as liver, spleen, muscles, joints where further replication occurs. Despite the robust innate and adaptive during acute phase which results in, viral clearance from blood a substantial portion of patient experience long lasting persistent joint pain. Three theories explained these phenomena [1]. Persistent infectious virus [2]. Persistent of viral nucleic acid [3]. Triggering persistent immune activation. The persistence of chikungunya viral RNA in joint associated tissues was associated with histopathological evidence of arthritis, synovitis and tendonitis. So for developing comprehensive treatment policy for CHIKV the complete information of musculoskeletal system involvement is required. Research in this

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area will improve the knowledge of understanding of this. The literature on long term surveillance after CHIKV infection is very much limited. More insight on this regard is necessary.

Materials and methods

This study was conducted among total of 66 subjects who were infected by Chikungunya virus. This study was conducted in Department of General Medicine, Santhiram Medical College, Nandyal. Sample size was calculated by $n=4pq/L2$. Both males and females infected by chikungunya virus between age of 30 to 60 were included according to inclusion exclusion criteria. People with rheumatoid arthritis, gout and other red flag symptoms were excluded based on detailed history, clinical examination and relevant investigations. Written consent was taken from the subjects those willing to participate. The subjects were selected by simple random sampling. The outcome measures were musculoskeletal assessment chart primarily studying range of motion, Pain and oedema. Procedure After the protocol and ethical clearance, the procedure was started. Subjects were selected with age group between 30 to 60 from post Chikungunya viral infected according to the inclusion and exclusion criteria. The consent was taken from the selected subjects. The individuals selected were evaluated using musculoskeletal assessment and were instructed with all the details about the assessment they were going to undergo. The patients were assessed for pain followed by observation, palpation, inspection for ROM and oedema. Patients were assessed for pain using VAS in which patient was asked to rate their pain on scale ranging from 0 to 10. Later subjects were evaluated for presence of oedema and graded accordingly. Lastly range of motion was taken for individual joint using goniometer.

Statistical Analysis: All the parameters were noted on assessment chart and final results were obtained using Instant software. Data on all outcome measures were calculated. The arithmetic mean, and the standard deviation was calculated for each outcome measure. Demographic variables, their pain ratings according to visual analogue scale, range of motion and grades of oedema were measured and analysed.

Results

A total of 66 subjects were taken for the study. Out of 66 subjects 42 were male and 24 were female with a percentage of 36% and 64% respectively. Age group of 30-60 years were taken. 11 were in the range of 30-40, 28 were in the range of 41-50 and remaining 27 were in the range of 51-60. Percentage wise 17% were in the age group between 30-40 yrs. 42% were between 41-50 yrs. And the remaining 41% were in the age group 51-60 yrs. of age. (Table no.1) Pain was the most recorded parameter. 19% of subjects had pain at rest with remaining rest 81% having pain on activity with a mean value of 1.66 and 7.19 having p values is <0.0001 . Pain was found to be significantly present. (table no.2) ROM was recorded of various joints including shoulder, elbow, wrist, hip, knee and ankle. Almost all joints showed significant prevalence of decreased Range. Following are the estimated noted individually. 31% showed decrease in flexion, 10% in extension, 30% in abduction, 14% in internal rotation and 15% in external rotation at shoulder. 46% showed decreased in flexion, 27% in supination and 27% in pronation at elbow. 38% of subjects showed decreased flexion, 36% showed decreased extension, 9% showed decreased radial deviation and rest 17% showed decreased ulnar deviation at wrist. 43%, 7%, 14%, 11%, 9%, 11% and 16% subjects showed decreased flexion, extension, abduction, adduction, medial rotation and external rotation respectively. The study showed that 100% subjects showed reduced ROM at knee. This signifies knee is the most affected joint. Out of 66 subjects 14% showed reduced dorsiflexion, 45% showed reduced plantar flexion, 28% showed altered inversion and 13% showed altered eversion at ankle. Out of 100%, 9% shoulder, 23% elbow, 21% wrist, 7% hip, 19% knee and 21% ankle joints ROM is reduced in the patients with the history of chikungunya viral infection. The interference of ROM overall is considered extremely significant. (table no.3). Oedema was absent in 43% subjects, in that 32% subjects had grade 1 oedema, 16% subjects had grade 2 oedema and remaining 9% subjects had grade 3 oedema. Mean were 0.77 where p value is <0.0001 , therefore the interference of oedema in the subjects were considered extremely significant. (table no.4)

Table 1: Sociodemographic Data of the Subjects (Chikungunya Patient) Participating in Study

Variables	Frequency (n)%
Gender	
Female	42 (63%)
Male	24 (37%)
Age Distribution	
30-40	11 (17%)
41-50	28 (43%)
51-60	27 (40%)
Occupation	
Farmer	22 (33%)
Teacher	9 (13%)
Gardener	17 (25.75%)
NGO Workers	4 (6%)
Sweepers	14 (21%)
Drugs	
Acetaminophen	23 (34%)
Nimesulide	11 (16%)
Naproxen	7 (10%)
Diclofenac	5 (7%)
Ibuprofen	5 (7%)
Piroxicam	2 (3%)
Repellents	13 (19%)

Table 2: Visual Analogue Scale (VAS)

Pain	Mean \pm SD	P Value
At Rest	1.66 \pm 1.043	<0.001
On Activity	7.19 \pm 1.056	<0.001

Table 3: Range of Motion (Overall)

ROM	Total (66)	Percentage (%)
Shoulder	8	12.12%
Elbow	21	31.81%
Wrist	9	28.78%
Hip	7	10.60%
Knee	18	27.27%
Ankle	19	28.78%

Table 4: Oedema

Oedema	Total
0	24
Grade 1	18
Grade 2	9
Grade 3	5
Mean \pm SD	0.77 \pm 0.9575
p Value	<0.0001
Interference	Extremely Significant

Discussion

Chikungunya is responsible for high grade fever, typically accompanied by maculopapular rash and severe, multi-joint arthralgia. The disease frequently evolves into a long-lasting, debilitating rheumatic disorder; which shares many clinical features with rheumatoid arthritis. This project was done in 6 months with sample size 66. This research was undertaken with the aim to study and estimate the musculoskeletal impairment in Chikungunya viral infection. This study was conducted on 66 subjects with post chikungunya viral infection.[2] The outcome measures for this study were musculoskeletal Assessment-visual analogue scale, range of motion and oedema. The result of this study showed there was significant pain and reduction in ROM of all joint with presence of oedema. The 19% subjects were having pain at rest and remaining 81% were having pain on activity, p value (0.0001). Female subjects were found to have more pain and affected joints than the male. In a previous study named Long term sequelae of Chikungunya Virus disease: A systemic review, author Van Aalst M found similar results. The results in that study also support the evidence of persisting arthralgia/arthritis (arthralgia/joint stiffness plus joint swelling) as frequently encountered problem. Also, Female gender, older age was found to be associated with persistent arthralgia in the same study. Out of 100%, 9% shoulder, 23% elbow, 21% wrist, 7% hip, 19% knee and 21% ankle joints ROM is reduced in the patients with the history of chikungunya viral infection. 57% subjects developed oedema. Fingers, wrist, elbows, knees, ankle and toes are the most frequently affected areas in post chikungunya viral infection. Therefore, result of this present study showed that there is musculoskeletal impairment in post chikungunya viral infections subjects. Also in a similar study named Chikungunya virus infection in Aruba, by author Ralph Huits stated similar findings with involvement of knees (66%), ankles (50%), fingers (52%), feet (46%), shoulders (36%), elbows (34%), wrists (35%), hips (31%), toes (28.1%), and spine (28.1%). Also, inflammatory signs, oedema and redness were frequent (71%, 39% and 21% respectively).[4] These findings majorly correlate with the findings of the current study adding to the efficacy of results obtained. There is important need for developing correct treatment and early rehabilitation programme for post chikungunya viral infected subjects to improve

activities of daily living and quality of life. If the musculoskeletal impairments remain untreated that would affect physical and psychological health and shows many irreversible changes in muscle strength, pain, posture, impingement syndrome. Hence early physiotherapy will help the patients to make pain free activities of daily living. There is definitive need for problem based therapeutic exercise programme for late musculoskeletal impairments after CHIKV infection. Similarly, Therapeutic exercise programme was specifically designed to address all possible health in adults with early Rheumatoid arthritis.

Conclusion

Musculoskeletal impairments like pain, stiffness, oedema, impairment in joint range of motion, are present post chikungunya viral infection. Female subjects were found to have more pain and impaired ROM than the male subjects.

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