Chronic Chikungunya arthralgia reduces functionality, quality of life and occupational performance: descriptive cross-sectional study

Artralgia crônica por Chikungunya reduz funcionalidade, qualidade de vida e performance ocupacional: estudo descritivo transversal

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ABSTRACT

BACKGROUND AND OBJECTIVES: Chikungunya virus (CHIKV) chronic polyarthralgia deteriorates general functionality and work productivity. The objective of this study was to evaluate functionality, pain, quality of life, and sleep quality of individuals with chronic CHIKV arthralgia and correlate them with clinical symptoms, work productivity, and activity impairment.

METHODS: This is a descriptive cross-sectional study with 61 chronic CHIKV arthralgia patients. Functionality was assessed using the Health Assessment Questionnaire (HAQ). Pain intensity and interference were measured by using the Visual Analog Scale (VAS) and the Brief Pain Inventory Short Form (BPI), respectively. Quality of life and sleep were evaluated using the Short Form 36 Health Survey (SF-36) and the Pittsburgh Sleep Quality Index (PSQI), respectively. Work Productivity and Activity Impairment (WPAI) questionnaire was used to assess the effects of health in general symptoms on work.

RESULTS: Low and moderate level of function was present in 39.4% and 55.7% of the sample, respectively. Moderate pain (5.57 ± 2.25), poor sleep quality (47.54%), and sleep disturbances (42.63%) were also observed. Pearson correlations showed significant correlation between absenteeism and presenteeism with HAQ scores (p = 0.03; r = 0.39 and p = 0.01; r = 0.43, respectively), BPI interference (p = 0.02; r = 0.41 and p = 0.001; r = 0.58, respectively) and SF-36 physical score (p = 0.007; r = -0.49 and p = 0.01; r = 0.58, respectively). Activity impairment showed a significant correlation with HAQ (p = 0.01; r = 0.44), BPI interference (p = 0.006; r = 0.5), SF-36 physical score (p = 0.01; r = -0.6) and SF-36 total score (p = 0.01; r = -0.44). Overall work productivity loss only correlated with BPI interference (p = 0.04; r = 0.37).

CONCLUSION: These results suggest that CHIKV chronic arthralgia showed bilateral moderate pain in large joints that impacts activities of daily life, work productivity, and functional activity.

Keywords: Arbovirus infections, Chronic pain, Disability evaluation, Sleep.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A poliartralgia crônica do vírus Chikungunya (CHIKV) deteriora a funcionalidade e a produtividade do trabalho. O objetivo deste estudo foi avaliar funcionalidade, dor, qualidade de vida e sono de indivíduos com artralgia crônica por CHIKV correlacionada com sintomas clínicos, produtividade do trabalho e comprometimento das atividades.

MÉTODOS: Trata-se de um estudo transversal descritivo com 61 pacientes crônicos de artralgia da CHIKV. A intensidade e a interferência da dor foram medidas usando a Escala Analógica Visual (EAV) e o *Brief Pain Inventory Short Form* (BPI), respectivamente. A qualidade de vida e o sono foram avaliados usando o *Short Form 36 Health Survey* (SF-36) e o *Pittsburgh Sleep Quality Index* (PSQI), respectivamente. O questionário *Work Productivity and Activity Impairment* (WPAI) foi usado para avaliar os efeitos dos sintomas gerais da saúde no trabalho.

RESULTADOS: Foi observado um nível de funcionalidade baixo em 39,4% e moderado em 55,7% da amostra. Nível de dor moderada (5,57 ± 2,25), má qualidade do sono (47,54%) e dis-

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HIGHLIGHTS

- Chronic chikungunya reduces functionality and causes moderate pain and poor sleep quality.
- Clinical symptoms impact daily living activity, work productivity, and activity impairment.
- Functionality, pain, and sleep correlate with occupational performance.

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túrbios do sono (42,63%) também foram observados. O teste de Pearson apresentou correlação significativa entre absenteísmo e presenteísmo com as pontuações de *Health Assessment Questionnaire* (HAQ) (p = 0,03; r = 0,39 e p = 0,01; r = 0,43 respectivamente), interferência do BPI (p = 0,02; r = 0,41 e p = 0,001; r = 0,58 respectivamente) e score físico do SF-36 (p = 0,007; r = -0,49 e p = 0,01; r = 0,58, respectivamente). O comprometimento da atividade mostrou uma correlação significativa com o HAQ (p = 0,01; r = 0,44), interferência do BPI (p = 0,006; r = 0,5), pontuação física do SF-36 (p = 0,01; r = -0,6) e pontuação total do SF-36 (p = 0,01; r = -0,44). A perda geral de produtividade no trabalho correlacionou-se apenas com a interferência do BPI (p = 0,04; r = 0,37).

CONCLUSÃO: Esses resultados sugerem que a artralgia crônica da CHIKV apresenta dor moderada bilateral em grandes articulações com impacto nas atividades de vida diária, produtividade no trabalho e atividade funcional.

Descritores: Avaliação da deficiência, Dor crônica, Infecções por arbovírus, Sono.

INTRODUCTION

Recent outbreaks of some arboviruses diseases, including Dengue, Zika, and Chikungunya (CHIKV), in different countries of the Americas[1] attracted worldwide attention. Brazil shows more than 94% of confirmed cases of CHIKV in the Americas and declared a public health emergency[2]. Chikungunya is an arboviral disease considered a neglected tropical disease[3] spread predominantly by the Aedes aegypti and Ae. Albopictus mosquitoes.

After an incubation period of 2-7 days, 95% of infected people will develop acute symptoms that consist of high fever, headaches, rash, myalgia, and severe joint pain[3]. Approximately 50% of patients recover within a few weeks, but the other 50% develop chronic inflammatory rheumatism with chronic persistent pain, fatigue, and different degrees of disability for years[4]. Chronic widespread and incapacitating polyarthralgia can last months to years after the infection[3].

Theeveloppment risk of persistent arthralgia and musculoskeletal pain relates to the severity and period of infection[3,5], gender, age, diabetes mellitus, hypertension, dyslipidemia, and previous rheumatic disease[6]. These persistent symptoms impair functional, psychological, and social aspects of daily routine, work productivity[5], physical and emotional health, and sleep quality[7]. However, the impacts of chronic CHIKV polyarthralgia on general health, morbidity, and mortality are still unknown. Thus, interventions for CHIKV infection-related rheumatic and musculoskeletal disorders need more evidence[8] to support efficient and safe treatments.

Arthralgia, fatigue, sleep disturbances, and stiffness affect occupational performance not only for physically demanding jobs but also in non-manual office workers[9]. The quality of work is the capacity that employees have to carry out their professional tasks following job requirements[11]. A positive work performance needs physical and mental abilities, while several diseases may interfere negatively. The consequences of chronic CHIKV arthralgia could cause absence from work (absenteeism) and reduce productivity at work (presenteeism) that increases the costs for the individuals and society[9]. Understanding the symptoms that most affect the functionality and work productivity will significantly contribute to future decision-making on an appropriate rehabilitation program and public health policies.

Given the high prevalence of individuals with chronic CHIKV arthralgia in Brazil, it was hypothesized that low performance at work and low productivity are related to significant social, occupational, and individual impairment.

The objective of this study was to evaluate the functionality, pain, quality of life, and sleep of individuals with chronic CHIKV arthralgia correlated with clinical symptoms, work productivity, and activity impairment.

METHODS

To present a complete and adequate reporting of this study and improve the quality of reporting, the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) checklist was followed[10].

Study design and setting

A descriptive cross-sectional observational study with a convenience sample of 61 patients with chronic CHIKV arthralgia was conducted from February to July of 2019 in the Laboratory of Clinical and Epidemiological Research/Onofre Lopes Hospital, Natal, Brazil. Participants were recruited from digital media or referred by health care services from February 4 to February 22 in 2019. Data collection occurred from February 25 to July 5 in 2019. During the period of the study, a total of 61 patients were recruited and all completed the entire study protocol.

Participants were informed verbally and in writing about the objectives and procedures according to resolution 466/12 of the Brazilian National Health Council and signed the Free and Informed Consent Term (FICT). This study was approved by the institutional ethics committee from the Federal University of Rio Grande do Norte (number: 2.932.953).

The inclusion criteria consisted of (a) rheumatologist diagnosis of CHIKV according to the Brazilian Society of Rheumatology criteria for diagnosis and treatment of CHIKV[12]; (b) active chronic phase of chikungunya fever (more than 3 months with persistent symptoms); (c) ability to understand study objectives and answer the questions; (d) no physical therapy or rehabilitation program for 3 months before the study; (e) no use of corticosteroids, analgesics and/or anti-inflammatory drugs during the week of evaluation; and (f) live in the epidemic area of Natal, Rio Grande do Norte, Brazil. Exclusion criteria included (a) physical and/or organic difficulties that compromise questionnaire applications; (b) neurological or psychiatric diseases, and limb amputation.

Variables and measurement

Sociodemographic characteristics (gender, age, schooling, profession, marital status, and race) and clinical data (time of

CHKV, functionality, pain, quality of life, sleep quality, work productivity and activity impairment) were collected. Three physical therapists participated in the data collection. All researchers have 15 years of previous experience with rheumatic diseases management and previous training for the evaluation protocol.

Questionnaires were self-completed by the respondent and administered individually. In case of difficulties, an experienced researcher directly communicated with the participants. To prevent risk of bias in the design, conduction and analysis of data, only two researchers were assigned for patient evaluation. Another researcher not involved in evaluation made the statistical analysis. No quality scales were used, and all questionnaires were previously used and validated for arthritis patients.

Functionality

Health Assessment Questionnaire (HAQ)[13] evaluates patients with rheumatoid arthritis (RA), osteoarthritis, and other rheumatologic conditions[14,15]. Few studies with CHKV used this questionnaire to measure functional status[6,14,15], but it is an interesting tool for measuring disability due to persistent arthralgia. Questions are rated on a scale of 0 to 3 and assess specific activities of daily living, including getting up, getting dressed, eating, walking, bathing, grabbing, and doing errands. The average of all scores is taken to rate disability as 0 = no difficulty, 0-1 = mild disability, 1-1.5 = moderate disability and > 1.5 = severe disability. High scores indicate an important impact of the disease on functional status.

Pain

The Visual Analog Scale (VAS) is a continuous scale comprised of 100 mm in length, anchored by 2 verbal descriptors, "no pain" (score of 0) and "worst imaginable pain" (score of 100)[16]. VAS was self-completed by the respondent according to the question: "what is the level of pain originated by CHKV?". Higher score indicates greater pain intensity.

The Brief Pain Inventory Short Form (BPI) is a self-administered questionnaire developed to assess the severity of pain and the impact of pain on daily function[17,18]. It presents 15 items, including 2 multi-item scales to measure pain and its impact on functionality and well-being. BPI includes the three pain severity items (pain worst, pain average and pain now) and the seven interference items (how pain interferes with activity, mood, relationship with others, walking ability, work, enjoyment of life and sleep). This questionnaire includes a body figure aimed at describing the location of pain. This information was used to show the intensity of pain in different parts of the body. A figure of body pain distribution was made (Figure 1).

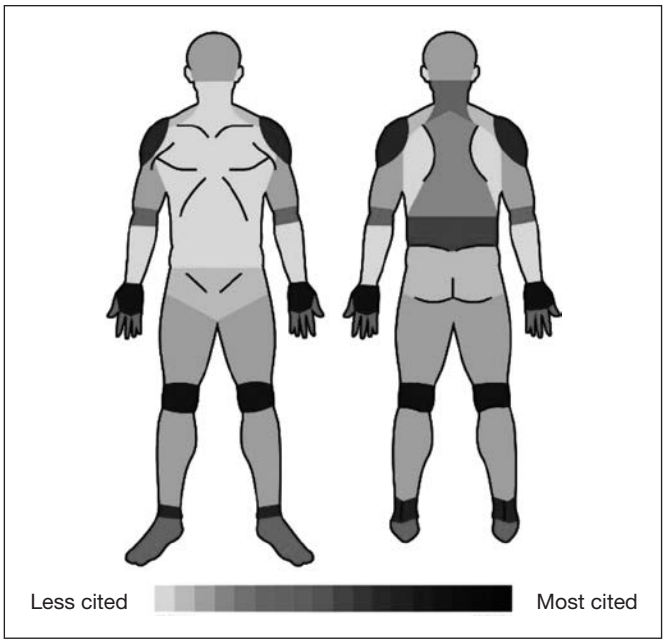

Figure 1. Map of pain

The Short Form 36 Health Survey (SF-36) evaluates quality of life related to chronic diseases and other medical conditions[13,19]. The SF-36 consists of 36 items grouped into eight scales to assess eight dimensions of quality of life. The eight domains (subscales) of the SF-36 are marked on a scale of 0-100 comprising: physical activity, health problems resulting in limitations, body pain, difficulties in performing daily life activities, general health, vitality, emotional state, mental health, well-being, stress and social activity[19]. A higher score indicates better health conditions.

The Pittsburgh Sleep Quality Index (PSQI)[20] investigates good sleepers and poor sleepers. This study assessed sleep quality over a 1-month time interval. PSQI consists of 19 self-rated questions and 5 questions that should be answered by bedmates or roommates. Those 19 questions are categorized into 7 components, graded on a score that ranges from 0 to 3. The total score for these 7 components yields one global score, which ranges from 0 to 21, where the highest score indicates worse sleep quality[20].

The Brazilian version of the Work Productivity and Activity Impairment (WPAI) questionnaire evaluates the effect of specific symptoms severity on work productivity and non-work activities[11]. The WPAI consists of six questions assessing the impact of the disease on work and other daily activities during the previous 7 days[21]. WPAI evaluates the employment status, the extent of absenteeism, presenteeism, and impairment in daily activities attributable. WPAI has 6 questions, each with unique response options, and higher scores (range 0–100%) indicate a more significant impact of health. This questionnaire is commonly used in patients with arthritis, ankylosing spondylitis and other chronic pain diseases[13,22].

Statistical analysis

Analyses were performed using the SPSS software (V.19.0, Chicago, USA) and Graph Pad Prism 5. The pain map was made using Photoshop CS5 and Illustrator 2019. Quantitative variables were expressed as means and standard deviations (SD), and sociodemographic data was expressed by percentage. The Shapiro-Wilk test was applied to assess the normality of the distribution of the data.

The pain map derived from the frequency of pain reports of the 61 participants through the homunculus contained in the BPI (Figure 1). The color standardization followed the red color palette. The color palette was divided into 10 equal parts representing 10% each sub-division. Thus, the most cited areas with higher pain averages (according to VAS) received darker stains, while less cited areas with lower pain averages had lighter stains. This graphical representation allows easy understanding and communication of the results obtained, enhancing the ability to detect and comprehend variations between patients with a difference in the etiology of peripheral pain. It is a mnemonic tool since larger parts are easily remembered and might help to build a typical image of pain in CHIKV chronic polyarthralgia.

Pearson correlation coefficients were estimated for the correlation between work productivity and clinical variables ($0 < r \leq 0.19$ very low correlation; $0.2 \leq r \leq 0.39$ low correlation; $0.4 \leq r \leq 0.59$ moderate correlation; $0.6 \leq r \leq 0.79$ high correlation; $0.8 \leq r \leq 1.0$ very high correlation)23. Statistical significance was $p \leq 0.05$.

RESULTS

All participants completed the full outcomes and were included for the analysis. Table 1 shows the sociodemographic data. Mean age was 47.74±10.67 years, and the time of CHIKV was 2.84±0.90 years. CHIKV patients showed a significant low functionality with a low level of functional status in 39.4% and moderate in 55.7% of the sample. A mean of pain described a moderate pain (5.57± 2.25), and the most cited points of pain were knees, wrists, ankles, and shoulders (Figure 1). Poor sleep quality was present in 47.54% and sleep disturbance in 42.63% of the patients.

Indicators of work productivity calculated by WPAI are described in table 2. Correlations between work productivity and clinical variables were showed in table 3. Using Pearson correlation test, absenteeism and presenteeism showed a low ($r = 0.39$, $p = 0.03$) and moderate significant correlation with HAQ ($r = 0.43$; $p = 0.01$). Absenteeism and presenteeism showed a moderate correlation with BPI interference ($r = 0.41$, $p = 0.02$; $r = 0.58$; $p = 0.00$, respectively). Absenteeism showed a negative moderate correlation with SF-36 physical score ($r = -0.49$, $p = 0.007$). A moderate positive correlation was observed for presenteeism with SF-36 physical score ($r = 0.58$; $p = 0.01$).

Overall work productivity loss showed a negative moderate correlation with age ($r = -0.49$, $p = 0.007$), a moderate correlation with HAQ ($r = 0.44$, $p = 0.01$), SF-36 total score ($r = -0.44$, $p = 0.01$) and BPI interference ($r = 0.5$, $p = 0.006$). Overall work productivity loss showed a low correlation with sleep quality index ($r = 0.27$, $p = 0.03$) and a high negative correlation with SF-36 physical score ($r = -0.6$, $p = 0.001$). Activity impairment only showed a low correlation with BPI interference ($r = 0.37$, $p = 0.04$).

One-tailed post hoc sample size analysis returned an actual power of 0.89, considering $\alpha = 0.05$ and a moderate effect size of 0.35.

Table 1. Sociodemographic and clinical variables of CHIKV patients

Variables	CHIKV patients
Age (years)	47.26 ± 10.72
Time of CHIKV (years)	2.84 ± 0.90
Functionality (HAQ total)	1.15 ± 0.48
HAQ Classification (%)	
Low	39.4
Moderate	55.7
High	4.9
Pain intensity (VAS)	5.57 ± 2.25
Pain severity (BPI)	20.36 ± 8.11
Pain interference (BPI)	39.05 ± 16.71
Quality of life (SF-36)	
Physical status	38.78 ± 10.23
Mental status	43.70 ± 10.69
Total status	39.67 ± 9.60
Quality of sleep (PSQI, %)	
Good	9.83
Poor	47.54
Sleep disturbance	42.63
Gender (%)	
Female	77.42
Male	22.58
Marital Status (%)	
Single	32.78
Married	50.82
Divorced	11.48
Widowed	4.92
Income* (%)	
1 Minimum Wage	31.14
2 to 3 Minimum Wage	36.06
4 Minimum Wage or more	18.03
Unreported	14.77
Schooling (%)	
Elementary	16.38
Secondary	39.34
University	39.34
Unreported	4.94

Clinical variables described with mean and standard deviation. CHIKV = Chikungunya patients; HAQ = Health Assessment Questionnaire; VAS = Visual Analog Scale; BPI = Brief Pain Inventory Short Form; SF-36 = Short Form 36 Health Survey; PSQ = Pittsburgh Sleep Quality Index; *Brazilian National Minimum Wage, US$ 257 per month.

Table 2. Work productivity of Chikungunya patients.

WPAI	Employed (n = 29)	Unemployed (n = 32)
	% (p25 – p75)	% (p25 – p75)
Absenteeism	0 (0 - 20.55)	N/A
Presenteeism	60 (35 - 70)	N/A
Overall work productivity loss	40 (23.14 - 60)	N/A
Activity impairment	70 (40 - 85)	55 (32.5 - 80)

WPAI = Work Productivity and Activity Impairment. Data in 25th and 75th percentile.

Table 3. Correlations between work productivity and clinical variables

Variables	Absenteeism		Presenteeism		Overall work productivity loss		Activity impairment	
	r	p	r	p	r	p	r	p
Age (years)	0.1	0.30	-0.19	0.32	-0.49	0.007*	-0.19	0.31
Time of CHIKV (years)	0.63	0.97	0.007	0.97	0.007	0.97	-0.10	0.62
Functionality (HAQ)	0.39	0.03*	0.43	0.01*	0.44	0.01*	0.12	0.52
Pain intensity (VAS)	0.05	0.76	-0.03	0.85	-0.13	0.48	-0.24	0.19
Pain severity (BPI)	0.09	0.61	0.13	0.47	0.02	0.90	-0.07	0.71
Pain interference (BPI)	0.41	0.02*	0.58	0.001*	0.5	0.006*	0.37	0.04*
Quality of life (SF-36 Physical)	-0.49	0.007*	-0.46	0.01*	-0.6	0.001*	-0.27	0.14
Quality of life (SF-36 Mental)	-0.17	0.35	-0.16	0.4	-0.17	0.37	-0.28	0.13
Quality of life (SF-36 Total)	-0.27	0.15	-0.32	0.08	-0.44	0.01*	-0.36	0.05
PSQI	0.05	0.76	0.17	0.19	0.27	0.03*	0.2	0.28

*Denote significant correlation. HAQ = Health Assessment Questionnaire; VAS = Visual Analog Scale; BPI = Brief Pain Inventory Short Form; SF-36 = Short Form 36 Health Survey, PSQI = Pittsburgh Sleep Quality Index.

DISCUSSION

This study exposes the impact of chronic CHIKV arthralgia on work productivity and activity impairment. Several aspects of CHIKV patients were described according to the level of functionality, pain, quality of life, and sleep quality. Many of these clinical variables significantly correlate with absenteeism, presenteeism, overall work productivity loss, and activity impairment. Chronic CHIKV patients showed an important decrease in functionality, moderate pain, and sleep disturbances. Knees, wrists, ankles, and shoulders were the most mentioned points of chronic pain. These data suggest chronic disabling that interferes in activities of daily living, work productivity, and activity impairment. This is the first report to correlate chronic CHIKV arthralgia with work activities.

Previous investigations of functional aspects suggest a moderate level of disability and a moderate level of pain[14]. Disability and pain in CHIKV patients were similar to the levels seen in rheumatic arthritis, fibromyalgia, and other rheumatic diseases[4]. Joint pains are the most common symptoms in chronic CHIKV patients[24]. Persistent arthralgia promotes low functionality, low sleep quality, and mood disturbances, including depression and anxiety[13,25]. The effect of the rehabilitation treatment on work disability in CHIKV was not yet published. CHIKV could be considered as a neglected tropical disease, potentially affecting over 1 billion people, but rehabilitation programs and recommended protocols for improving functionality are scarce[26]. Strategies are necessary for managing work in the short and long term of the disease.

The Work Productivity and Activity Impairment questionnaire measures the effect of health and symptom severity on work productivity and non-work activities[22]. The results obtained for WPAI showed that the patient with chronic CHIKV arthralgia has a more significant impact on health and symptom severity, on work productivity and non-work activities.

Other rheumatic diseases also interfere in work activities. A previous study reported a correlation of RA disease activity, functional capacity, and quality of life with working impairment[23]. Patients with fibromyalgia reported chronic muscle pain, fatigue, sleep disturbances, and emotional distress that interfere in activities of daily life and impaired ability to work[27]. Other authors[28] found a work productivity decay in seronegative spondyloarthropathy and a correlation with clinical outcomes. CHIKV revealed similar effects when compared with other rheumatic diseases.

This study had a series of limitations. For ethical reasons, the use of drugs was not stopped during the study. But even with the use of drugs, it was possible to show the impact of chronic CHIKV arthralgia. The modest sample size is another limitation due to the CHIKV criteria, but even with a sample of 61 participants, it was possible to show significant correlations between variables. However, these results point out the need for additional studies on rehabilitation programs to restore the ability to maintain functionality and productivity both at and outside work with quality of life in patients with chronic CHIKV arthralgia. Brazil is a protagonist in cases of CHIKV and studies about the impact of chronic CHIKV arthralgia are rare. Thus, further studies with larger samples could support health care policies and clinical strategies for endemic areas, aiming to improve quality of life and physical function.

CONCLUSION

This study suggests that chronic CHIKV arthralgia promotes functional disorders, moderate musculoskeletal pain, and sleep disturbances with a significant correlation with negative impact on daily life activities, work productivity, and activity impairment.

AUTHORS' CONTRIBUTION

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Data Collection, Methodology, Writing - Preparation of the original
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