

# Prevalence and spectrum of rheumatic and musculoskeletal diseases in a Lagos hospital community: an under-reported non-communicable disease in Africa

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## Abstract

**Background:** Rheumatic and Musculoskeletal Diseases (RMDs) previously known as the musculoskeletal (MSK) diseases are a major cause of chronic pain and functional disability. While there are few hospital based reports of RMDs and its individual conditions in Nigeria, community data of these conditions are even rarer.

**Objectives:** To determine the prevalence and spectrum of RMDs as well as the factors associated with MSK pain in Nigeria.

**Design:** This was a cross-sectional survey of staff and patients' relatives at a Lagos tertiary hospital.

**Methods:** We prospectively collected data on 350 respondents using a pre-tested interviewer-based study questionnaire and the Health Assessment Questionnaire-Disability Index (HAQ-DI) questionnaire. Clinical information was recorded and laboratory tests done for all participants. Data was analysed with descriptive statistics using Statistical Package for Social Sciences (SPSS) version 21. Ethical approval was obtained for the study.

**Results:** A total of 268 (76.6%) respondents completed the study comprising 176 (65.7%) females and 92 (34.3%) males with a mean age of 57.3±12.4 years (range 20-70 years). RMDs and MSK pain (current/past) were diagnosed in 59 (22%) and 162 (60.4%) respondents respectively most of whom were female (n=38, 64%) and middle aged (n=31, 52.5%). Osteoarthritis (25.5%), limited joint mobility (18.6%), lumbosacral spondylosis (10.1%) and DeQuervain's tenosynovitis (10.1%) were the most frequent RMDs. The median HAQ-DI was 0.8 (IQR 0.1-1.8) with significant disability (HAQ-DI≥1) in 57.5% of the subjects with RMDs. Respondents with MSK pain had higher proportions of truncal obesity (BMI>30) (n=89, 54.9%, p=0.016), family history of arthritis (n=93, 57.4%, p=0.001), abdominal obesity (n=97, 60%, p=0.002), hypertension (n=102, 63%, p=0.001),

elevated acute phase reactants (n=57, 35.2%, p=0.003) and hyperuricemia (n=61, 37.6%, p=0.001) than respondents without MSK pain with no significant predictors of MSK pain documented after multivariate regression analysis.

**Conclusions:** RMDs and MSK pain are common among Nigerians occurring in 22% and 60.4% respectively resulting in significant functional disability. Osteoarthritis was the most frequent presentation of MSK pain while obesity, hypertension, hyperuricaemia, positive family history of arthritis and elevated acute phase reactants were all associated with MSK pain.

**Key words:** Prevalence, Spectrum, Rheumatic musculoskeletal diseases, Community

## Introduction

The term "Rheumatic and Musculoskeletal Diseases"(RMDs) represent over a hundred conditions which include many types of arthritis and autoimmune inflammatory diseases that affect the bones, joints, connective tissue and other components of the musculoskeletal (MSK) system<sup>1</sup>. RMDs are Non-Communicable Diseases (NCDs) and patients with such conditions often present with MSK pain, joint swelling, joint stiffness, constitutional and organ-based symptoms as well as functional disability.

Studies have shown that, at any given time, 30–40% of the general population have MSK signs and symptoms such as pain, swelling or limited mobility<sup>1,2</sup>. In 2010, data from the World Health Organization's (WHO) Global Burden of Disease (GBD) study showed that the prevalence and burden of MSK conditions were exceptionally high throughout the world<sup>3</sup>. As a group, these conditions caused 21.3% of the total Years Lived with Disability (YLDs) globally<sup>3</sup>. Although, there is a growing prevalence of MSK disorders worldwide, probably due to population growth, ageing, low physical activity and obesity<sup>4</sup>, a recent meta-

analysis of 20 population and 7 hospital-based studies showed paucity of MSK prevalence data from Africa<sup>5</sup>.

In Nigeria, there are hospital based retrospective reports of isolated RMDs such as lupus, rheumatoid arthritis, Soft Tissue Rheumatism (STR), gouty arthritis, and osteoarthritis (OA) with very few published studies on the spectrum of these conditions in community settings<sup>6-9</sup>. The scarcity of data from sub-Saharan Africa may be attributable to a relative neglect of NCDs by policy makers as well as limited access to rheumatology and orthopaedic services. Thus, this study seeks to examine the prevalence and spectrum of RMDs as well as its associated functional disability among the non-patient community in a Lagos tertiary hospital.

## Materials and methods

This was a cross-sectional study done within a hospital community - the Lagos State University Teaching Hospital (LASUTH), Lagos – Nigeria over 6 months. Apart from its large non-patient population, the study area was chosen due to its strategic location in the densely populated city of Lagos. The typical non-patient population included: medical staff, allied health staff, academic and non-academic staff of College of Medicine as well as a large community of patients relatives. Verbal and written informed consent was obtained from every respondent using signature or thumbprint.

Non-probability convenient sampling method was used to recruit consenting respondents into the study. The minimum sample size was 156 based on a 12% prevalence figure obtained from a Kenyan pilot community study<sup>10</sup>, a confidence interval of 1.96 and a tolerable sampling error of 0.05<sup>11</sup>. Socio-demographics, clinical and MSK history (current pain or pain within the last one week) as well as physical examination findings were documented using pre-tested questionnaires. Blood samples were taken for serum uric acid and erythrocyte sedimentation rate while standard radiographs were done where indicated to confirm the diagnosis.

Pain intensity was assessed using the Numerical Rating Scale (NRS)<sup>12</sup> while functional disability was assessed using the Health Assessment Questionnaire Disability Index (HAQ-DI)<sup>13</sup>. The diagnosis of RMDs was based on relevant American College of Rheumatology (ACR) criteria<sup>14-20</sup>, Brighton criteria<sup>21</sup> and Southampton criteria<sup>22</sup>. Rheumatic conditions that could not be classified using above criteria were diagnosed clinically using case definitions developed by the authors.

The functional disability assessed by HAQ-DI was reported as median with interquartile range (IQR). Degree of disability was categorized with score  $\geq 1$  indicating significant disability as follows: mild ( $>0$  but  $<1$ ), moderate (1-2) and severe ( $>2$ )<sup>13</sup>. Pain intensity was assessed using NRS and reported as; no pain (NRS-0), mild (NRS 1-3), moderate (NRS 4-6) and severe (NRS 7-10)<sup>12</sup>.

Data analysis was done using IBM SPSS version 21. Socio-demographics and prevalence figures for MSK pain and clinically diagnosed RMDs were summarized as percentages. Bivariate statistics was used to compare categorical variables between respondents with MSK pain and subjects without MSK pain. Multivariate logistic regression was used to determine independent predictors of MSK pain in the study subjects with  $p < 0.05$ . The study was approved by the ethics committee of the Lagos State University Teaching Hospital (LASUTH).

## Results

### Socio-demographic characteristics of the study subjects

Two hundred and sixty eight adults consented and completed the interview-based questionnaires. The mean age of all subjects was  $57.3 \pm 12.4$  years with a range from 20 to 78 years. Majority of the subjects were female ( $n=176$ , 65.7%), middle aged ( $n=140$ , 52.2%), civil servants ( $n=110$ , 41%) and had tertiary education ( $n=108$ , 40.3%). The socio-demographic characteristics of the study population are as shown in Table 1.

**Table 1: Socio-demographics characteristics of the study population**

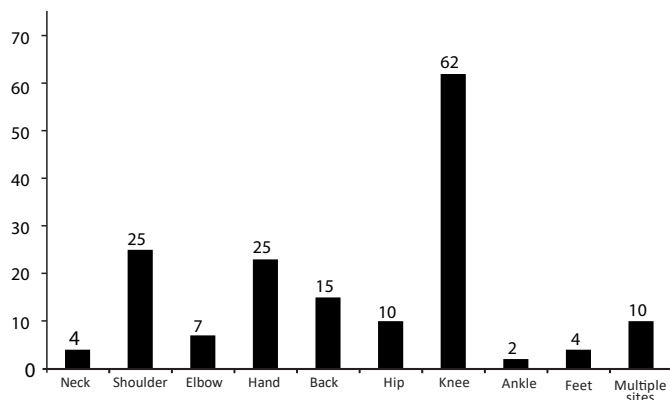
Variables	All subjects (n=268)	Subjects with MSK pain (n=162)	Subjects without MSK pain (n=106)	P-value
	No. (%)	No. (%)	No. (%)	
Male	92(34.3)	50(39.6)	42(30.9)	0.140
Female	176(65.7)	112(60.4)	64(69.1)	
Family history of MSK conditions	93(34.7%)	91(56.2)	2(1.9)	0.001
Age range (years)				0.847
18-45	38(14.2)	24(14.8)	14(13.2)	
46-64	141(52.6)	83(51.2)	58(54.7)	
≥ 65	89(33.2)	55(34)	34(32.1)	
Occupation				0.359
Private sector worker	95(35.4)	64(39.5)	31(29.2)	
Civil servants	110(41.0)	61(37.7)	49(46.2)	
Trading	26(9.7)	14(8.7)	12(11.3)	
Retired	21(7.8)	12(7.4)	9(8.5)	
Others	10(3.7)	8(5.0)	2(1.9)	
Artisan/Apprentices	6(2.2)	3(1.9)	3(2.8)	
Religion				0.392
Christianity	162(60.4)	104(64.1)	58(54.7)	
Islam	101(37.7)	54(33.3)	47(44.3)	
Others	5(1.9)	4(2.5)	1(1.0)	
Marital status				0.001
Single	70(26.1)	34(21.0)	36(34.0)	
Married	174(65.0)	110(67.9)	64(60.4)	
Widowed	20(7.5)	16(9.9)	4(3.8)	
Separated/divorce	4(1.4)	2(1.2)	2(1.8)	
Education				0.154
Primary	79(29.5)	42(25.9)	37(34.9)	
Secondary	51(19.1)	33(20.4)	18(17.0)	
Tertiary	108(40.2)	72(44.4)	36(34.0)	
None	30(11.2)	15(9.3)	15(14.1)	
Smoking history	19(7.1)	10(6.2)	9(8.5)	0.470
Alcohol history	48(17.9)	28(17.3)	20(18.9)	0.741
Generalised hypermobility	85(31.7)	70(43.2)	15(14.2)	0.003
History of hypertension	118(44.2)	102(63)	16(15.1)	0.001
History of diabetes	48(17.9)	29(17.9)	19(17.9)	0.428
Abdominal obesity	125(46.7)	97(60.0)	26.4(8.3)	0.002
Hyperuricemia	73(27.2)	61(37.7)	12(11.3)	0.001
Elevated acute phase reactants	67(25)	57(35.2)	10(9.4)	0.003
Obesity by BMI definition	146(54.4)	89(54.9)	57(53.7)	0.005
History of trauma	57(21.3)	29(17.9)	28(26.4)	0.096

N= Frequency; %=Percentage; MSK=Musculoskeletal

## Prevalence and associations of musculoskeletal pain in the study subjects musculoskeletal pain

As shown in Table 1, 162 subjects had MSK pain among 268 subjects recruited, accounting for the period prevalence of 60.4%. Current MSK pain was documented in 75.9% of subjects with MSK. Subjects with MSK pain were predominantly middle aged females, married, and significantly older than subjects without MSK pain {Median (IQR) years-42(31-55) vs 34(25-46),  $P=0.001$ }. Family history of MSK conditions, hypertension, elevated acute phase reactants, hyperuricemia, abdominal obesity and generalised hypermobility were significantly more frequent in subjects with MSK pain than those without pain. As shown in Figure 1, knee, shoulder and hand were the common sites of MSK pain in decreasing order.

**Figure 1:** Sites of musculoskeletal pain in subjects with MSK pain



## Clinically diagnosed Rheumatic Musculoskeletal Diseases (RMDs)

As shown in Table 2, 59 subjects from the 268 subjects with MSK pain had clinically diagnosed RMD, giving a period prevalence of 22% with females constituting 44 (74.6%). Osteoarthritis (n=15, 6.7%) was the most frequent condition documented in our study subjects. This was followed in decreasing order by limited joint mobility (n=11, 4.1%), lumbosacral spondylosis (n=6, 2.2%), de Quervain's tendinitis (n=6, 2.2%), carpal tunnel syndrome (n=5, 1.9%) and adhesive capsulitis (n=4, 1.5%). Taken together, soft tissue rheumatism was the most common RMD as it represented 62.7% of the subjects with RMDs.

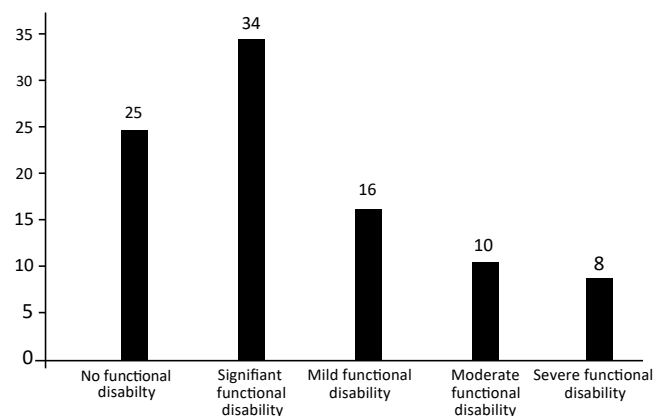
**Table 2:** Frequency and pattern of Rheumatic Musculoskeletal Diseases (RMDs)

Rheumatic Musculoskeletal Disease	Frequency (n)	Percentage of RMDs (n=59)	Percentage of all subjects (n=268)
Osteoarthritis	15	25.4	6.7
Limited joint mobility	11	18.6	4.1
Lumbosacral spondylosis	6	10.1	2.2
Adhesive capsulitis	4	6.7	1.5
Finger tenosynovitis	5	8.4	1.9
de Quervain's tenosynovitis	6	10.1	2.2
Rotator cuff tendinitis	1	1.6	0.4
Carpal tunnel syndrome	5	8.4	1.9
Subacromial bursitis	2	3.3	0.7
Plantar fasciitis	1	1.6	0.4
Cervical spondylosis	1	1.6	0.4
Fibromyalgia	1	1.6	0.4
Lateral epicondylitis	1	1.6	0.4

## Pain severity and functional disability in study subjects with MSK pain and RMDs

The majority of subjects (n=67, 65.4%) with current MSK pain reported moderate intensity of their pain. The median NRS for pain severity in subjects with current pain was 4(IQR 3-5), also suggesting moderate intensity of pain. As shown in Figure 2, the median HAQ-DI was 0.8(IQR 0.1-1.8), indicating mild disability from RMDs overall though significant disability (HAQ-DI $\geq$ 1) was found in 57.5% of the subjects with RMDs.

**Figure 2:** Functional disability in subjects with rheumatic musculoskeletal disease



## Predictors of MSK pain in study subjects

The results of chi-square analysis showed that family history of MSK conditions, generalised hypermobility, hypertension, hyperuricemia and abdominal obesity were significantly associated with presence of MSK pain. However, further tests of these independent variables using logistic regression with presence of MSK pain as outcome variable showed no significant independent predictors of MSK pain.

## Discussion

This cross-sectional study showed that 60.4% of our study subjects self-reported either past or current MSK pain. This prevalence is higher than previous prevalence reports from other African studies<sup>8,23</sup>. A hospital based study from Sagamu, South Western Nigeria, found a prevalence rate of 15.1% out of 3,124 patients seen at the Medical Outpatient Department (MOPD) during the study period<sup>8</sup> while Singwe-Ngandeu *et al*<sup>23</sup> found 536 cases of RMDs (9.4%) out of 12,494 patients referred to the MOPD of General Hospital, Yaoundé over a one year period.

The distribution of MSK pain across socio-demographic lines in our study showed that it was more prevalent in females, middle aged subjects, private sector workers and civil servants. In addition, majority of subjects with MSK pain were married and had tertiary education. Although, not statistically significant, the possible explanation for this socio-demographic distribution may be due to metropolitan nature of the study site and study population which included predominantly staff of the medical school and hospital including patient's relatives.

Most of our subjects reported knee as the commonest site of their MSK pain. Notably, there have been conflicting reports on the commonest site of MSK pain reported in most studies, while some reported knee as the most frequent site<sup>24,25</sup>, a North Central Nigeria study documented low back as the most affected MSK pain site<sup>7</sup>. These contrasting findings may be due to differences in occupation, lifestyle as well as background RMD in the populations studied.

As in previous African studies<sup>7,8,23</sup>, osteoarthritis was the most prevalent condition observed in our study subjects while lumbosacral spondylosis was the next in the series particularly when STR are counted individually. In a meta-analysis study conducted in Iran, osteoarthritis (16.9%), chronic low back pain (15.7%) and STR (4.6%) were observed in decreasing order as the commonest RMDs among 19,786 respondents<sup>26</sup>. Similarly, the 2004-2010 India bone and joint decade, after excluding non-specific MSK symptoms, found osteoarthritis (4.39%) and STR as the first and second most prevalent MSK condition respectively, among 55,000 subjects surveyed in their study population<sup>27</sup>. Similarly, taken together, all STR accounted for 62.7% of RMD in our study, making OA, the second most frequent condition. (n=15, 25.4%).

The bivariate data analysis showed that family history of MSK conditions, history of hypertension, obesity,

abdominal obesity, hyperuricemia, elevated acute phase reactant and widespread hypermobility were associated with MSK pain. Further analysis using a multivariate logistic regression model did not find independent predictors of MSK pain. These finding contrasts with the previous Nigerian study which showed that family history of MSK symptoms and male sex were independently associated with MSK diseases among Nigerian subjects<sup>7</sup>. Elsewhere in Mexico, older age, physically demanding work and female sex were documented predictors of MSK symptoms<sup>28</sup>. Although, the predictors of MSK pain identified in various studies vary, most have not shown consistent association with MSK pain<sup>29</sup>.

MSK diseases are one of the leading causes of disability worldwide<sup>2-4</sup> and reports from South America and Asia showed high burden of disability due to RMD<sup>30</sup>. In this study, the median HAQ-DI was 0.8, indicating mild disability. In Africa, there is paucity of reports on physical disability in subjects with RMD. Despite the high disability (significant HAQ-DI =57.5%) reported in this study and by Laatar *et al*<sup>25</sup> in Tunisia (significant HAQ-DI =60%), the report from Jos, Nigeria was a far cry from our figure as the significant functional disability in their study population was only 14.7%<sup>7</sup>.

This variation in functional disability in various studies may be attributable to non-uniformity of disability assessment tools used in various studies and differences in understanding and cultural interpretation of HAQ questions by the subjects. The associated co-morbid conditions such as diabetes, hypertension, and obesity identified in our subjects may also contribute to the burden of disability.

## Limitations

This was a cross-sectional study done among a non-patient community in the hospital, implying a quasi-community study. Therefore, it is neither a true hospital-based study nor a community survey. Thus its findings should be interpreted with caution for a general population. We suggest further testing of our findings with a large population-based study or a hospital based cohort study with a large sample size.

In conclusion, MSK pain is common in a Lagos tertiary hospital community and the knee was the most frequently affected site. MSK pain was common in females, middle aged and married persons and those with a family history of MSK conditions. History of hypertension, hyperuricemia, generalised hypermobility, obesity, abdominal obesity and elevated acute phase reactants were associated with MSK pain. While osteoarthritis was the commonest diagnosed RMD, high physical disability and moderate intensity of pain were also recorded in our subjects.

There is a need to increase awareness at all levels about the burden and impact of RMDs in Africa, a continent already grappling with the twin menace of infectious diseases and poverty. Government investment in rheumatic and musculoskeletal disease education both for healthcare workers and the general population is

paramount in reducing MSK burden. Access to rheumatic and musculoskeletal services should be improved in sub-Saharan Africa, where there is dearth of rheumatology manpower and lack of diagnostic and management tools<sup>31</sup>.

## References

1. Al Maini M, Adelowo F, Al Saleh J, Al Weshahi Y, Burmester G, *et al.* The global challenges and opportunities in the practice of rheumatology; White paper by the World Forum on Rheumatic and Musculoskeletal Diseases. *Clin Rheumatol.* 2015; **34**: 819-829.
2. Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. *Bull World Health Org.* 2003; **81**:246-256.
3. Hoy DG, Smith E, Cross M, Sanchez-Riera L, *et al.* The global burden of musculoskeletal conditions for 2010: an overview of methods. *Ann Rheum Dis.* 2014; **73**: 982-989.
4. Vos T, Abajobir AA, Abbafati C, Abbas KM, Abate KH, *et al.* Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet.* 2017; **390**: 1211–59.
5. Usenbo A, Kramer V, Young T, Musekiwa A. Prevalence of arthritis in Africa: A systematic review and meta-analysis. *PLoS One.* 2015; **10**(8):e0133858. doi:10.1371/journal.pone.0133858.
6. Adelowo OO, Bello MKN. Systemic autoimmune diseases: Not so rare in Black Africans. *Rheumatology (Sunnyvale)* 2014; **4**: 130. doi:10.4172/2161-1149.1000130.
7. Uhumwangho CU, Adelowo OO, Dungwom PS, Imoh LC, Ani C, *et al.* Prevalence of musculoskeletal diseases in a semi-urban Nigerian community: results of a cross-sectional survey using COPCORD methodology. *Clin Rheumatol.* 2017; **36**:11:2509-16.
8. Oguntona SA, Edunjobi AS, Olatunde AO. Prevalence of rheumatic diseases in rheumatology outpatient practice of a tertiary hospital. *Int Res J Med Biomed Sci.* 2016; **1**(2):11-18.
9. Adelowo OO. Arthritis in adult Nigerians. *Nigerian Med Pract.* 1985; **10** (3): 69-72.
10. Ekwom PE, Oyoo GO, Ongore D. Prevalence of musculoskeletal pain in Nairobi, Kenya: results of a phase 1, stage 1COPCORD study. Abstracts of the 7th Congress of the African League of Associations for Rheumatology (AFLAR) and the 23rd Congress of the South African Rheumatism and Arthritis Association (SARAA). April 3–6, 2013. Durban, South Africa. *Clin Rheumatol.* 2013; **32** (Suppl 2):S121–S152.
11. Kish L. Survey sampling. John Wiley and Sons, New York. 1965.
12. Ferreira-Valente MA, Pais-Ribeiro L, Jensen MP. Validity of four pain intensity rating scales. *Pain.* 2011; **152**:2399-2404.
13. Bonnie B, Fries JF. The Stanford Health Assessment Questionnaire: dimensions and practical applications. *Health Qual Life Outcomes.* 2003; **1**:20. <http://doi.org/10.1186/1477-7525-1-20>.
14. Altman R, Alarcon G, Appelrouth D, Bloch D, Borenstein D, Brandt K, *et al.* The American College of Rheumatology criteria for the classification and reporting of osteoarthritis of the hand. *Arthritis Rheum.* 1990; **33**:1601-10.
15. Altman R, Alarcon G, Appelrouth D, Bloch, D. Borenstein, K. Brandt, *et al.* The American College of Rheumatology criteria for the classification and reporting of osteoarthritis of the hip. *Arthritis Rheum.* 1991; **34**:505-514.
16. Altman R, Asch E, Bloch D, Bole G, Borenstein D, Brandt K, *et al.* Development of criteria for the classification and reporting of osteoarthritis of the knee. *Arthritis Rheum.* 1986; **29**:1039-49.
17. Wallace SL, Robinson H, Masi AT, Decker JL, McCarty DJ, *et al.* Preliminary criteria for the classification of the acute arthritis of primary gout. *Arthritis Rheum.* 1977; **20**:895-900.
18. Masi AT, Rodnan GP, Medsger Jr TA, Altman R, D'Angelo W, Fries J. Subcommittee for scleroderma criteria of the American Rheumatism Association Diagnostic and Therapeutic Criteria Committee. Preliminary criteria for the classification of systemic sclerosis (scleroderma). *Arthritis Rheum.* 1980; **23**(5):581-590.
19. Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C, *et al.* The American College of Rheumatology 1990 criteria for the classification of fibromyalgia report of the multicenter criteria committee. *Arthritis Rheum.* 1990; **33**:160-172.
20. Aletaha D, Neogi T, Silman AJ, Funovits J, Felson DT, *et al.* Rheumatoid arthritis classification criteria: an American College of Rheumatology/European League Against Rheumatism collaborative initiative. *Arthritis Rheum.* 2010; **62**(9):2569-81.
21. Grahame R, Bird HA, Child A. The revised (Brighton 1998) criteria for the diagnosis of benign joint hypermobility syndrome (BJHS). *J Rheumatol.* 2000; **27**(7):1777-79.
22. Keith P, Karen WB, Cathy L, *et al.* The Southampton examination schedule for the diagnosis of musculoskeletal disorders of the upper limb. *Ann Rheum Dis.* 2000; **59**:5–11.
23. Singwe-Ngandeu M, Meli J, Ntsiba H, Noue'doui C, Yollo AV, Sida MB, Muna WF. Rheumatic diseases in patients attending a referral hospital in Yaounde, Cameroon. *East Afr Med J.* 2007; **84**(9):404-409.
24. Nzambi JP, Malemba JJ, Lebughe LP, Mpembele E, Mulenga C, *et al.* The epidemiology of rheumatic disorders in a rural area of the Democratic Republic of Congo (DRC): A COPCORD study. *Afr J Rheumatol.* 2017; **5**(2):64-69.

25. Laatar A, Hajem S, Kerkeni S, Chekili S, Belhassine B, *et al*. Prevalence of musculoskeletal complaints and disability in Tunisia: a WHO-ILAR COPCORD study. *Ann Rheum Dis*. 2005; **64**(suppl 3):1791.
26. Davatchi F, Sandoughi M, Moghimi N, Jamshidi A, Banihashemi A, Zakeri Z, Abdollahi B. Epidemiology of rheumatic diseases in Iran from meta-analysis of four COPCORD studies. *Intern J Rheum Dis*. 2016; **19**: 1056–62.
27. Chopra A. Disease burden of rheumatic diseases in India: COPCORD perspective. *Indian J Rheum*. 2015; **10**: 70 -77.
28. Peláez-Ballestas I, Alvarez-Nemegyei J, Loyola-Sánchez A, Escudero ML. Prevalence and factors associated with musculoskeletal disorders and rheumatic diseases in indigenous Maya-Yucateco people: a cross-sectional community-based study. *Clin Rheumatol*. 2016; **35** (Suppl 1): S15–S23 DOI 10.1007/s10067-015-3085-9.
29. Chopra A, Abdel-Nasser A. Epidemiology of rheumatic musculoskeletal disorders in the developing world. *Best Pract Res Clin Rheumatol*. 2008; **22**:583–604.
30. Guevara-Pacheco SV, Feican-Alvarado A, Delgado-Pauta J, Lliguisaca-Segarra A, Peláez-Ballestas A. Prevalence of disability in patients with musculoskeletal pain and rheumatic diseases in a population from Cuenca, Ecuador. *J Clin Rheumatol*. 2017; **23**(6):324-329.
31. Mody GM. Rheumatology in Africa—challenges and opportunities. *Arthritis Res Therapy*. 2017; **19**:49 DOI 10.1186/s13075-017-1259-3.