

The impact of ocular manifestations of rheumatoid arthritis on the health-related quality of life and the functional ability of black Africans

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Abstract Objectives To determine the patterns, predictors and overall impact of ocular manifestations of rheumatoid arthritis (RA) on the health-related quality of life and disability index.

Methods A total of 50 Nigerian patients with RA were studied. Full ocular evaluation was done to determine the presence of each defined ocular manifestation of RA. All patients completed the Medical Outcome Study 36-Item Short Form Health Survey (SF-36) and the Health Assessment Questionnaire-Disability Index (HAQ-DI) questionnaires.

Results The mean \pm SD age of the patients was 47.2 ± 12.5 years. A total of 42 cases of ocular diseases were found in 23 (46%) patients. Keratoconjunctivitis sicca was found in 15 (30%) patients; cataract, 13 (26%); scleritis/episcleritis, 4 (8%); disk edema, 4 (8%); glaucoma, 3 (6%); ulcerative keratitis, 1 (2%); vitreitis, 1 (2%); and macula edema, 1 (2%) patient. There is an association of the presence of ocular manifestations with the physical component summary (PCS) [$T = -3.398$, $P = 0.001$] and the mental component summary (MCS) [$T = -2.616$, 0.012] of the SF-36 but not with the HAQ-DI ($T = 1.685$, 0.099). Following multiple regression analysis, the predictors of the presence of ocular manifestations were age greater than 45 years and positive anti-citrullinated protein antibody. Following linear regression analyses, Steinbrocker's functional class independently predicted the PCS while both Steinbrocker's functional class and female sex predicted the MCS.

Conclusions The development of ocular disorders associated with RA is associated with a significant negative impact on the quality of life of the patients.

Keywords Rheumatoid arthritis · Ocular manifestations · Quality of life

Abbreviations

RA Rheumatoid arthritis
KCS Keratoconjunctivitis sicca

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| | |
|--------|--------------------------------------------------------|
| ACPA | Anti-citrullinated protein antibody |
| CDAI | Clinical Disease Activity Index |
| HAQ-DI | Health Assessment Questionnaire-Disability Index |
| HRQoL | Health-related quality of life |
| SF-36 | Medical Outcome Study 36-Item Short Form Health Survey |
| PF | Physical functioning |
| RP | Role physical |
| BP | Bodily pain |
| GH | General health |
| VT | Vitality |
| SF | Social functioning |
| RE | Role emotion |
| MH | Mental health |
| PCS | Physical component summary |
| MCS | Mental component summary |
| HCQ | Hydroxychloroquine |
| CQ | Chloroquine |
| bDMARD | Biologic disease modifying antirheumatic drug |

Introduction

Rheumatoid arthritis (RA) is the most common autoimmune inflammatory arthritis in the world. While the primary target tissue is the synovial joint, RA may be associated with a large spectrum of extra-articular manifestations some of which are associated with the eye [1]. Extra-articular manifestations of RA may be seen in up to 43% of patients, and the presence of these disorders have been associated with worse disease course and increased mortality [2]. Ocular manifestations are among the most frequent extra-articular manifestations of RA as they are seen in close to 40% of patients, and they impact heavily on the quality of life of the patient [3]. RA is responsible for the largest proportion of eye disorders due to a systemic autoimmune disease [4]. As in the joints, collagens and proteoglycans form important components of the eye, especially in the cornea and sclera. This structural similarity may pave way for the common attacks on the eye seen in patients with RA. The pathologic changes characterizing the ocular manifestations of RA mimic some of the immune-mediated processes of the systemic disease. These

include the deposition of immune complexes, attacks of collagenases such as the matrix metalloproteinases elaborated by macrophages and neutrophils, the deployment of the complement cascade, cytokines and various components of the adaptive immunity [5].

While studies have identified keratoconjunctivitis sicca (KCS) as the most common ophthalmic disease due to RA, other manifestations such as episcleritis, scleritis, episcleral nodulosis, ulcerative keratitis, retinal vasculitis, retinal detachment, uveitis, disk edema, vitreitis and macula edema are often found [1, 3, 6]. Also, because of the frequent long-term use of glucocorticoids in the treatment of RA, ocular complications such as posterior subcapsular cataract and glaucoma may develop [7, 8]. Rheumatoid factor and anti-citrullinated protein antibody (ACPA) are commonly tested in an attempt to diagnose RA, and both tests are now a component of the 2010 American College of Rheumatism/European League Against Rheumatism Classification Criteria for RA. Seropositivity for these tests has been linked with an increased risk of developing extra-articular disease [9]. Importantly, ACPA is an immunologic marker with reported association with the occurrence of ocular manifestations of RA [3]. ACPA is a serologic test with specificity greater than 95% for RA, and it has been shown to be linked with a more severe disease [10].

There has been an increase in the number of reports of RA from West Africa in the last decade [11, 12]. These reports have shed light on the falsehood of the erstwhile belief that RA and other systemic autoimmune connective diseases are rare in Africa. While various extra-articular manifestations of RA have been documented in patients from this region, the extent and the distribution of ophthalmic disorders due to RA and its treatment have not been reported. We studied the pattern of ocular manifestations in RA patients attending a specialist rheumatology clinic in a teaching hospital in Southwest Nigeria.

Materials and methods

A cross-sectional study of 50 patients with 100 eyes was conducted at the rheumatology clinic of the Lagos State University Teaching Hospital (LASUTH). Inclusion criteria are: the fulfillment of the 2010 American College of Rheumatology/European League Against Rheumatism Classification Criteria for RA [13] and

age of 18 years or older. Exclusion criteria include the coexistent diagnosis of another connective tissue disease or overlap syndrome, previous radiotherapy, presence of a cancer, sarcoidosis, hepatitis C or HIV. Demographic and clinical information was collected from each patient by an interviewer-administered questionnaire and from the hospital records. Details collected include the age at onset of RA symptoms, duration of illness, clinical and laboratory findings at the time of diagnosis, treatment received, disease activity at the time of diagnosis and disease activity at the time of study. All patients were tested for rheumatoid factor by nephelometry and anti-citrullinated protein antibody (ACPA) by enzyme-linked immunosorbent assay.

Each patient was assessed for defined ocular manifestations of RA which include keratoconjunctivitis sicca, episcleritis, scleritis, ulcerative keratitis, vitreitis, retinal vasculitis, retinal detachment, disk edema and macula edema [1, 3]. Eye changes with known association with steroid use were also documented. These include glaucoma and cataract. Visual acuity assessment was done for both near (35 cm) and distance (6 m) both unaided and aided (pinhole/spectacle correction). Near visual acuity was measured using the British *N* near chart at 35 cm, while distance acuity was measured using literate or illiterate Snellen's chart at 6 m. Visual impairment was defined according to the World Health Organization classification [14]. Anterior segment examination was conducted using a pen torch in both dim and bright illumination and with slit lamp biomicroscopy. Posterior segment was examined using direct ophthalmoscope and binocular indirect ophthalmoscope or slit lamp biomicroscope with 90D lens. Patients with significant media opacity were dilated using guttae 1% tropicamide with 2.5% phenylephrine hydrochloride for adequate assessment of the posterior segment and peripheral retina. Intraocular pressure was measured using Perkins applanation tonometry. Tear production was measured by Schirmer's test (using Whatman filter paper) and ocular staining with fluorescein stain.

The disease activity scores at diagnosis and at the time of study were recorded in terms of the Clinical Disease Activity Index (CDAI). Functional status was determined using the Steinbrocker functional classification. Class I represents complete ability to carry out all the usual duties without handicaps; class II, adequate for normal activities despite handicap of

discomfort or limited motion of one of the joints; class III, limited to little or none of the duties of usual occupation or self-care; class IV, incapacitated, largely or wholly bed-ridden or confined to wheel chair with little or no self-care. Disability was assessed using the Health Assessment Questionnaire-Disability Index (HAQ-DI), and health-related quality of life (HRQoL) was assessed using the Medical Outcome Study 36-Item Short Form Health Survey (SF-36). The HAQ-DI is divided into eight domains that yield a global score ranging from 0 (no disability) to 3 (maximum disability) [15]. The least clinically important change in HAQ-DI score has been determined to be approximately 0.22 [16]. The SF-36 consists of 36 items that are combined into 8 domains of HRQoL which are physical functioning (PF), role physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role emotion (RE) and mental health (MH). These eight scales can be combined into two summary scores: the physical component summary (PCS) and the mental component summary (MCS). SF-36 scores range from 0 to 100 with the higher scores denoting better HRQoL [17]. Ethical approval was obtained from the Health Research and Ethics Committee of LASUTH.

Statistical analysis

All data obtained were analyzed using Statistical Package for Social Sciences, IBM SPSS statistics® 2012 version 20.0 for windows by IBM USA, Armonk, NY 10,504. Continuous variables were summarized and presented as means and standard deviations where the distribution is normal or median and range where the distribution is skewed. All categorical variables were summarized as frequencies and percentages. Pearson's Chi-square test was used to test the association between ocular manifestations and each categorical variable, while Student's *t* test or Mann-Whitney *U* test was used in the case of continuous variables. The association between the presence of ocular manifestations and the outcome scores was tested for with Student's *t* test. Multiple logistic regressions were computed to determine the predictors of ocular manifestations in patients with RA. Multiple linear regressions were computed for the predictors of PCS and MCS. The limit of statistical significance was set at *P* values < 0.05.

Results

As shown in Table 1, a total of 50 patients were studied. Among them, 42 (84%) were females giving a female-to-male ratio of 5.25:1. The mean age of the patients was 47.2 ± 12.5 years. The ages ranged from 28 to 74 years. The patients were all residents of Lagos who were mostly educated as 43 (96%) of them had at least primary school education. The dominant functional class was the Steinbrocker class II as 21 (42%) patients fell into it. Only 4 (8%) patients fell into the class IV of functional status. RF and ACPA were positive in 38 (76%) and 30 (60%) patients, respectively. While at the point of diagnosis all patients had at least low disease activity; at the point of assessment, 6 (12%) were in remission. The median duration of disease is 4.5 years (range 0.5–30 years).

As shown in Table 2, a total of 42 cases of ocular diseases were found in 23 (46%) patients. Keratoconjunctivitis sicca was the most frequent ocular manifestation of RA as it was found in 15 patients. No cases of retinal vasculitis or retinal detachment were found. The most frequent eye disease associated with treatment complication found in this study is cataract which was identified in 13 patients. At least mild vision impairment was present in 25 (50%) patients, while 3 (6%) patients had profound visual impairment.

There is a statistically significant difference in the mean ages between the patients with (51.9 years) and without (44.0 years) ocular manifestations (Table 3). Similarly, the duration of disease is longer among patients with ocular disease (84 months vs 36 months, $P = 0.044$). Other factors with significant association with the presence of ocular manifestations include positive ACPA and disease activity (CDAI) at the time of assessment ($P < 0.05$ in each case). There is no significant difference in the RF positivity rate between the patients with and those without ocular manifestations.

Statistically significant differences were found in the means of the two summary scores of the SF-36 (PCS and MCS) between the patients with and without ocular manifestations (Table 4). These HRQoL indices were generally higher among the patients without ocular manifestations. All individual subsets of the SF-36 were higher among the patients without eye disorders, while the differences reached statistical significance in PF, RP, RE, SF and BP. The HAQ-DI

Table 1 Demographic and clinical characteristics of the patients

| Characteristics | Frequency <i>n</i> = 50 | Percentage |
|------------------------|-------------------------|------------|
| Age group (years) | | |
| 20–29 | 2 | 4 |
| 30–39 | 11 | 22 |
| 40–49 | 20 | 40 |
| 50–59 | 6 | 12 |
| 60–69 | 9 | 18 |
| 70–79 | 2 | 4 |
| Sex | | |
| Female | 42 | 84 |
| Male | 8 | 16 |
| Level of education | | |
| No formal education | 2 | 4 |
| Primary education | 2 | 4 |
| Secondary education | 4 | 8 |
| Tertiary education | 39 | 78 |
| Postgraduate education | 3 | 6 |
| Marital status | | |
| Single | 3 | 6 |
| Married | 31 | 62 |
| Divorced | 5 | 10 |
| Widowed | 7 | 14 |
| Separated | 4 | 8 |
| Occupation | | |
| Civil servant | 22 | 44 |
| Trader | 14 | 28 |
| Artisan | 6 | 12 |
| Clergy | 1 | 2 |
| Retired | 4 | 8 |
| Unemployed | 3 | 6 |
| Socioeconomic status | | |
| Low income | 15 | 30 |
| Middle income | 33 | 66 |
| High income | 2 | 4 |
| Tribe | | |
| Yoruba | 34 | 68 |
| Igbo | 9 | 18 |
| Hausa | 1 | 2 |
| Others | 6 | 12 |
| Religion | | |
| Christianity | 44 | 88 |
| Islam | 6 | 12 |
| Alcohol consumption | | |
| Yes | 8 | 16 |
| No | 42 | 84 |

Table 1 continued

| Characteristics | Frequency <i>n</i> = 50 | Percentage |
|---------------------------|-------------------------|------------|
| Ever smoked? | | |
| Yes | 7 | 14 |
| No | 43 | 86 |
| Functional class | | |
| I | 17 | 34 |
| II | 21 | 42 |
| III | 8 | 16 |
| IV | 4 | 8 |
| Rheumatoid factor | | |
| Positive | 38 | 76 |
| Negative | 12 | 24 |
| ACPA | | |
| Positive | 30 | 60 |
| Negative | 20 | 40 |
| Methotrexate use | 41 | 82 |
| Hydroxychloroquine use | 25 | 50 |
| Sulfasalazine use | 16 | 32 |
| Prednisolone use | 44 | 88 |
| CDAI at diagnosis | | |
| Low disease activity | 8 | 16 |
| Moderate disease activity | 7 | 14 |
| High disease activity | 27 | 54 |
| CDAI at present | | |
| Remission | 6 | 12 |
| Low disease activity | 24 | 48 |
| Moderate disease activity | 11 | 22 |
| High disease activity | 9 | 18 |

n number, ACPA anti-citrullinated protein antibody, CDAI Clinical Disease Activity Index

indicated a trend of higher disability among patients with ocular manifestation ($P > 0.05$).

Regression models evaluated the independent associations of the presence of ocular manifestations, HAQ-DI, PCS and MCS (Table 5). The independent variables adjusted for in each model were drawn from the factors with significant associations on bivariate analyses. Considering the variables age greater than 45 years, positive ACPA, disease duration greater than 2 years and CDAI at present, the logistic regression model for predicting the presence of ocular manifestations was statistically significant ($\pi^2 = 16.0$, $P = 0.003$). The model explained 36.6% (Nagelkerke R^2) of the variance in presence of ocular

manifestations and correctly classified 74.0% of cases. Following linear regression analyses, Steinbrocker's functional class independently predicted the PCS while both Steinbrocker's functional class and female sex predicted the MCS.

Discussion

The body of evidence in support of various aspects of an important systemic autoimmune rheumatic disease such as RA can hardly be thought of as to have been bolstered by a reassuring amount of research from West Africa. The scarcity of rheumatologists in this region is fundamental to the low rate of diagnosis of RA [18]. The diagnosis, treatment and research into ocular manifestations of RA cross-subspecialty lines as an ophthalmologist may encounter these conditions and fail to recognize the background systemic disease, while a rheumatologist may be preoccupied with the other aspects of RA and overlook the smoldering morbidity due to the disease or its treatment in the eyes.

Our finding of a prevalence of ocular manifestations of 46% in RA is higher than the findings ranging from 12 to 39% from other studies [1, 3, 19]. This is attributable to the inclusion of cases of cataract and glaucoma, which are the conditions that have been associated with the long-term use of glucocorticoids, in our study. We, however, did not find significant difference in the prevalence of ocular manifestations between patients who were on prednisolone at the time of the study and those who were not. This is because all our patients were placed on steroids in addition to the DMARDs at the start of their treatment and since this study did not look at the length of use of prednisolone, we may not be able to detect the relevance of cumulative use and the chances of ocular manifestation. The known ocular toxicities associated with anti-malaria use such as corneal deposits and pigmentary retinopathy were not found among our patients. Likewise, the use of hydroxychloroquine (HCQ) was not found to be associated with the presence of ocular manifestations. HCQ is considered to be safer than chloroquine (CQ) as up to 95% of patients on CQ will develop corneal deposits as opposed to approximately 10% of patients on HCQ [20]. As with earlier studies [1, 3, 19, 21–25], KCS is the most frequent eye condition found in our study and

Table 2 Pattern of ocular manifestations

| | |
|------------------------------------------------------------------|--------------|
| Patients with ocular manifestations (%) | 23 (46) |
| Patients without ocular manifestations (%) | 27 (54) |
| Ocular manifestations (%) | |
| Scleritis/episcleritis | 4 (8) |
| Retinal vasculitis | 0 (0) |
| Keratoconjunctivitis sicca | 15 (30) |
| Ulcerative keratitis | 1 (2) |
| Vitreitis | 1 (2) |
| Retinal detachment | 0 (0) |
| Disk edema | 4 (8) |
| Macula edema | 1 (2) |
| Cataract | 13 (26) |
| Glaucoma | 3 (6) |
| Distribution of ocular manifestations, per patients affected (%) | |
| Unilateral | 5 (21.7) |
| Bilateral | 18 (78.3) |
| Schirmer's test score, mm (SD) | |
| Mean value in patients with eye involvement | 6.3 (6.2) |
| Mean value in patients without eye involvement | 18.6 (10.1) |
| Visual acuity, LogMAR (Snellen equivalent) | |
| Mean value in patients with eye involvement | 0.70 (6/30) |
| Mean value in patients without eye involvement | 0.10 (6/7.5) |
| Vision impairment (%) | |
| None | 25 (50.0) |
| Mild | 17 (34.0) |
| Moderate | 2 (4.0) |
| Severe | 2 (4.0) |
| Profound | 1 (2.0) |
| Near total | 3 (6.0) |
| Total blindness | 0 (0.0) |

n number, *SD* standard deviation

its predominance most likely underlies the detected association of the presence of ocular manifestations with factors such as advancing age [26] and duration since the onset of RA [22, 27]. Since KCS was found in 36% of the patients, it means that 65% of patients with ocular manifestations had KCS either alone or with other manifestations. KCS emerges with declining secretory function of the main and accessory lacrimal glands. As the lacrimal glands atrophy and undergo cirrhotic changes, there is a shrinkage of the middle layer of the precorneal lacrimal film turning viscid in the advanced stages [28]. The two types of dry eyes that have been described are the aqueous deficient and the evaporative types. Typically, RA and other autoimmune causes of sicca symptoms are

associated with the aqueous deficient variant [29]. KCS is a consequence of an onslaught of immune attacks on exocrine glands. While the severity of the KCS does not parallel the height of the aggression of RA, it is several times more common in the female patient and it presents with eye redness, burning or gritty sensation, photophobia or reduced vision [21].

The high proportion of patients with cataract (31%) and glaucoma (7.1%) should prompt the rheumatologist to pay more attention to the ocular complications of RA treatment in the Nigerian patients. While cataract and glaucoma are the two most common causes of blindness in Nigeria as they are seen in 1.8 and 0.7%, respectively, of persons aged 40 years or older [30]; these figures are a far cry from the high rates of

Table 3 Comparison of clinical and serologic characteristics between patients with and without ocular manifestations*

| | Presence of ocular manifestations | | <i>P</i> ^π |
|----------------------------------------------|-----------------------------------|-------------|---------------------------|
| | Yes | No | |
| Age groups (years) | | | |
| 20–29 | 0 (0.0) | 2 (7.4) | 0.284 |
| 30–39 | 5 (21.7) | 6 (22.2) | |
| 40–49 | 8 (34.8) | 12 (44.4) | |
| 50–59 | 3 (13.0) | 3 (11.1) | |
| 60–69 | 5 (21.7) | 4 (14.8) | |
| 70–79 | 2 (8.7) | 0 (0.0) | |
| Age, mean ± SD | 51.9 ± 13.5 | 44.0 ± 10.7 | 0.049 [§] |
| Sex | | | |
| Male | 2 (8.7) | 6 (22.2) | 0.261 |
| Female | 21 (91.3) | 21 (77.8) | |
| Duration of disease (months), median [range] | 84 [6–360] | 36 [2–240] | 0.044 [#] |
| Steinbrocker's functional class | | | |
| I | 6 (26.1) | 11 (40.7) | 0.064 |
| II | 10 (43.5) | 11 (40.7) | |
| III | 3 (13.0) | 5 (18.5) | |
| IV | 4 (17.4) | 0 (0.0) | |
| Rheumatoid factor | | | |
| Positive | 18 (78.3) | 20 (74.1) | 0.730 |
| Negative | 5 (21.7) | 7 (25.9) | |
| ACPA | | | |
| Positive | 19 (82.6) | 11 (40.7) | 0.002 |
| Negative | 4 (17.4) | 16 (59.3) | |
| CDAI at present | | | |
| Remission | 0 (0.0) | 6 (22.2) | 0.028 |
| Low disease activity | 11 (47.8) | 13 (48.1) | |
| Moderate disease activity | 7 (30.4) | 4 (14.8) | |
| High disease activity | 5 (21.7) | 4 (14.8) | |
| CDAI at diagnosis | | | |
| Remission | 0 (0.0) | 0 (0.0) | 0.066 |
| Low disease activity | 1 (5.0) | 7 (31.8) | |
| Moderate disease activity | 4 (20.0) | 3 (13.6) | |
| High disease activity | 15 (75.0) | 12 (54.5) | |
| Ever user of prednisolone for RA | | | |
| Yes | 23 (100.0) | 27 (100.0) | 1.000 |
| No | 0 (0.0) | 0 (0.0) | |
| Current prednisolone use | | | |
| Yes | 18 (78.3) | 26 (96.3) | 0.082 |
| No | 5 (21.7) | 1 (3.7) | |
| Prednisolone dose, mean ± SD | 10.9 ± 3.6 | 11.6 ± 4.9 | 0.615 [§] |
| Hydroxychloroquine use | 11 (22.0) | 14 (28.0) | 0.938 |

Bold fonts represent statistically significant *P* value

P *P* value, *SD* standard deviation, *ACPA* anti-citrullinated protein antibody, *CDAI* Clinical Disease Activity Index

^π*P* value determined by Chi-square test unless otherwise stated

[§]*P* value determined by *t* test

[#]*P* value determined by Mann–Whitney *U* test

*Values are stated in number (percentage) unless otherwise indicated

Table 4 Comparison of quality of life measures between patients with and without ocular manifestations

| | Presence of ocular manifestations | | <i>T</i> | <i>P</i> |
|--------|-----------------------------------|-------------|----------|-------------------|
| | Yes | No | | |
| HAQ-DI | 1.2 ± 0.5 | 0.7 ± 0.4 | 1.685 | 0.099 |
| PF | 49.1 ± 21.7 | 74.6 ± 24.1 | − 3.187 | 0.003 |
| RP | 32.6 ± 14.2 | 77.9 ± 39.6 | − 3.782 | < 0.001 |
| RE | 42.0 ± 14.7 | 79.5 ± 36.6 | − 3.349 | 0.002 |
| VT | 56.7 ± 15.1 | 64.2 ± 17.6 | − 1.588 | 0.119 |
| MH | 67.5 ± 16.9 | 70.8 ± 17.0 | − 0.680 | 0.500 |
| SF | 51.1 ± 14.1 | 68.3 ± 23.8 | − 2.064 | 0.045 |
| BP | 42.2 ± 23.7 | 66.1 ± 25.7 | − 3.367 | 0.002 |
| GH | 57.8 ± 23.1 | 59.8 ± 22.3 | − 0.306 | 0.761 |
| PCS | 45.4 ± 17.0 | 69.6 ± 22.7 | − 3.398 | 0.001 |
| MCS | 54.3 ± 23.5 | 70.7 ± 20.3 | − 2.616 | 0.012 |

Bold fonts represent statistically significant *P* value

T T value, *P P* value, *HAQ-DI* Health Assessment Questionnaire-Disability Index, *PF* physical functioning, *RP* role physical, *RE* role emotion, *VT* vitality, *M* mental health; *SF* social functioning, *BP* bodily pain, *GH* general health, *PCS* physical component summary, *MCS* mental component summary

Table 5 Multivariate analyses for the predictive factors of the presence of ocular manifestation, PCS and MCS

| | Presence of ocular manifestations | | PCS | | MCS | |
|---------------------------------------|-----------------------------------|----------------|-----------------------|----------------|-----------------------|----------------|
| | Adjusted OR (95% CI) | <i>P</i> value | Beta coefficient (SE) | <i>P</i> value | Beta coefficient (SE) | <i>P</i> value |
| Age greater than 45 years | 4.00 (1.01, 38.23) | 0.049 | − 6.90 (5.92) | 0.250 | | |
| ACPA | 0.13 (0.03, 0.56) | 0.006 | | | | |
| Disease duration greater than 2 years | 1.97 (0.48, 8.11) | 0.347 | | | | |
| CDAI at present | 1.82 (0.47, 7.07) | 0.385 | − 14.40 (7.69) | 0.068 | − 13.73 (6.88) | 0.053 |
| Steinbrocker functional class | | | − 13.98 (4.08) | 0.001 | − 9.86 (3.66) | 0.010 |
| Female sex | | | | | − 18.60 (6.66) | 0.008 |
| Average Schirmer's score | | | 0.24 (0.33) | 0.466 | 0.54 (0.30) | 0.079 |
| Ocular manifestation | | | 8.87 (6.76) | 0.197 | 2.88 (6.00) | 0.633 |

Bold fonts represent statistically significant *P* value

PCS physical component summary, *MCS* mental component summary, *OR* odds ratio, *SE* standard error, *ACPA* anti-citrullinated protein antibody, *CDAI* Clinical Disease Activity Index

occurrence of cataract and glaucoma in our patients with RA. Nigerian patients often have to stay on steroidal medications for several years and rheumatologists commonly report glucocorticoid dependence among these patients. Ordinarily, many of these patients are candidates for treatment with biologic disease modifying antirheumatic drugs (bDMARDs)

which are unaffordably expensive in Nigeria. Since most Nigerians have no health insurance coverage, access to bDMARDs is elusive limiting the treatment options greatly. This restricts the choices which may be completely exhausted even in the very few patients who could afford the drugs.

Apart from age greater than 45 years, a positive ACPA status is the only other predictor of ocular manifestations of RA in our study. A strong association has been reported between ACPA and ocular disorders in RA [3, 24, 31]. This may be due to the suspected pathogenic role that has been accredited to ACPA [32, 33]. All parts of the eye are susceptible to the inflammation induced by the autoimmune process at the center of which are the T helper cells 1 (TH1). However, the inflammation may be dominated by cytokines or antibodies which are steered by TH2 cells [29].

The impacts of RA on the HRQoL and the functional ability of the patient are substantial. These have been shown to be negatively affected by the presence of extra-articular manifestations of RA [34]. We found higher degrees of disability among patients with ocular manifestations. While the mean HAQ-DI score among patients with ocular manifestations was 0.5 points higher without reaching statistical significance, it is clinically indispensable since the minimum clinically important change in HAQ-DI has been determined to be 0.22 [16] and a 0.25 increase has been associated with a 30% increase in the likelihood to be unemployed [35]. In this study, we found significantly higher HRQoL scores in both the physical and mental components among patients without ocular manifestations. While much comparison cannot be made due to the lack of literature on this patient-reported outcome among patients with ocular manifestations of RA, patients with overall extra-articular disease have been determined to show a similar pattern [34]. The same study has shown that the disability index measured by HAQ-DI predicted the HRQoL of RA patients measured by the SF-36. We further deduced that the Steinbrocker functional class predicted both PCS and MCS. Additionally, the female sex also predicted the mental (emotional) quality of life. These results indicate that the overall quality of mental state, unlike the physical HRQoL, is notably determinable by the patients' gender in addition to the functional status.

Conclusion

The West African patients with RA suffer heavily from the constraints of limited treatment options and are prone to a high burden of ocular morbidities either

due to RA or the prolonged treatment with glucocorticoids. Keratoconjunctivitis sicca is the most frequent ocular manifestation of RA and it is seen in more than a third of the patients. The development of ocular disorders associated with RA is associated with a significant negative impact on the quality of life of the patients.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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