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(RESEARCH ARTICLE)

Clinical characteristics of rheumatoid arthritis in Benghazi, Libya

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Abstract

Background: Rheumatoid arthritis RA is a chronic autoimmune disease characterized by persistent synovial inflammation with subsequent joint destruction and systemic complications. Despite the improvement in research globally regarding RA, there is still a scarcity of epidemiological data in North Africa, specifically in Libya. This study aims to investigate the characteristics of RA within the Benghazi region for demographic, familial, and clinical associations.

Methods: This cross-sectional study included 301 RA patients from Benghazi and its surrounding areas. The data collection was done through structured face-to-face interviews at hospitals and clinics. The inclusion criteria included adults, ≥18 years of age, with a confirmed diagnosis of RA by a rheumatologist. Demographic variables, disease onset age, familial history, and comorbidities were noted. All the statistical analyses were done using SPSS software, descriptive statistics, and chi-square tests accordingly.

Results: Most RA patients lived in Benghazi city, which accounts for 70.1%, and 29.9% were from suburban areas. There was a marked female preponderance: 95.3% females and 4.7% males. The age group affected most was between 41-60 years, with maximum cases diagnosed between 41-50 years (31.24%). In familial aggregation, 31.2% of the patients described at least one parent with RA, and 51.2% had no family history. Besides, the most common autoimmune condition in relatives was diabetes mellitus at 23.3%, followed by RA at 21.3%.

Conclusion: The current study showed gross female preponderance, peaked incidence in the middle-aged, and remarkable familial association-a fact that runs mainly through their parents. However, though genetic predisposition seems to play a vital role, reasonably large numbers do not show familial links, indicating a great environmental influence too. Such findings point out the need for further genetic as well as environmental research on RA in Libya with regards to early detection and tailored therapeutic intervention.

Keywords: Rheumatoid arthritis; Epidemiology; Benghazi-Libya; Autoimmune disease; Familial aggregation; Gender disparity

1. Introduction

Rheumatoid arthritis (RA) is a chronic, systemic autoimmune disease characterized by persistent synovial inflammation, leading to progressive joint damage and systemic manifestations. This condition, affecting approximately 1% of the global population, represents a substantial burden on individual health and healthcare systems worldwide (Aletaha & Smolen, 2018; Chopra & Abdel-Nasser, 2008). The pathogenesis of RA is complex, involving an intricate interplay of genetic predisposition and environmental triggers that disrupt immune tolerance, resulting in the

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activation of inflammatory pathways within the synovium (Aletaha et al., 2010). Clinically, RA presents with a diverse range of symptoms, including articular manifestations such as pain, stiffness, and swelling, typically affecting the small joints of the hands and feet symmetrically. Beyond the joints, the systemic nature of the disease can result in a variety of extra-articular manifestations (EAMs), which may involve the cardiovascular, pulmonary, integumentary, and ocular systems, contributing to significant morbidity and mortality (Zielinski et al., 2019). The management of RA requires a multifaceted approach, encompassing pharmacological interventions such as disease-modifying antirheumatic drugs (DMARDs) and non-pharmacological strategies to alleviate symptoms and slow disease progression. Despite advances in therapeutic options, there remains a need for further investigation into the underlying mechanisms of RA and the development of novel strategies for early diagnosis and personalized treatment. This article provides a comprehensive review of the current understanding of the epidemiology, pathogenesis, clinical presentation, and management of RA, emphasizing recent advancements and identifying key areas for future research. This study aims to investigate the epidemiological characteristics of rheumatoid arthritis (RA) in Benghazi, Libya, including its gender and age prevalence, age at diagnosis, familial aggregation, and the influence of family history on RA incidence.

2. Material and methods

This study employed a cross-sectional survey design to investigate the epidemiology of rheumatoid arthritis (RA) within the Benghazi metropolitan area and its surrounding suburbs in Libya. Data collection was conducted through face-to-face interviews at local hospitals and clinics. The study area was chosen to capture a representative sample of the urban and peri-urban population with a diagnosis of RA. The target population for this study comprised adults aged 18 years and older who had received a confirmed diagnosis of RA from a certified rheumatologist, irrespective of their residency status within Benghazi or its environs. Participants were excluded if they had a confirmed diagnosis of a different type of arthritis. A total of 301 participants were recruited via convenience sampling. Data collection occurred between February and May 2024. The study was conducted in accordance with the ethical principles for medical research involving human subjects. Prior to the commencement of data collection, ethical approval was obtained from the Institutional Review Board at the University of Benghazi, Faculty of Biomedical Sciences. Informed consent was a prerequisite for participation, obtained by a dedicated consent form as part of the face-to-face interview. Participants were informed about the voluntary nature of the study, their right to withdraw at any time, and the confidentiality of their responses. A structured questionnaire, developed specifically for this study and pilot-tested prior to the study launch, was used to collect data. The questionnaire included both closed-ended questions (e.g., yes/no, multiple-choice) and open-ended questions to allow for a comprehensive capture of participant experiences. The questionnaire was organized into thematic sections covering demographics such as age, gender and socioeconomic status, medical history including other comorbidities, family history of autoimmune diseases, lifestyle factors such as smoking and exercise, RA-specific symptoms, mental health history, treatment history, and relevant laboratory test results, such as presence of rheumatoid factor and anti-CCP antibodies. Data entry was performed using Microsoft Excel to ensure accurate recording and organization of survey responses. Statistical analyses were conducted using SPSS software (version [specify version]). Descriptive statistics, including means, frequencies, and percentages, were used to characterize the sample. Chi-square tests were performed to examine associations between variables, and a significance level of $*p* < 0.05$ was used for statistical inference. All analysis related to the aims were included in the study.

3. Results

The geographic distribution of rheumatoid arthritis (RA) patients in this study revealed that the majority were residents of Benghazi city (n = 211, 70.1%), while 90 participants (29.9%) resided in areas external to Benghazi (Figure 1). Figure 1 displays this distribution among the surveyed participants. This geographic distribution reflects the population density of the study region, which has more inhabitants within the main city center. Further, as the majority of the interviews were conducted within clinics in Benghazi city, it may have led to greater recruitment from the city population compared to those further away.

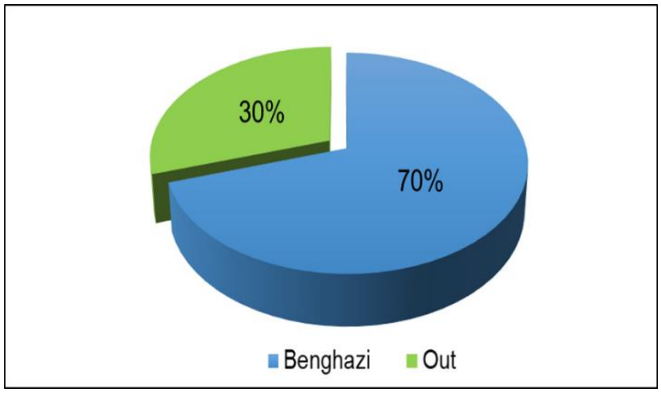

Figure 1 Geographic distribution of rheumatoid arthritis (RA) patients

As show in in [fig 1] the proportion residing within Benghazi city and those residing in surrounding areas. (n=301).

Our analysis of gender among rheumatoid arthritis (RA) patients revealed a highly uneven distribution, with a large female majority (95.3%, n=287) compared to a small male representation (4.7%, n=14), as shown in [Fig. 2]. This significant gender imbalance underscores the need for further investigation into the factors contributing to RA's higher prevalence in women.

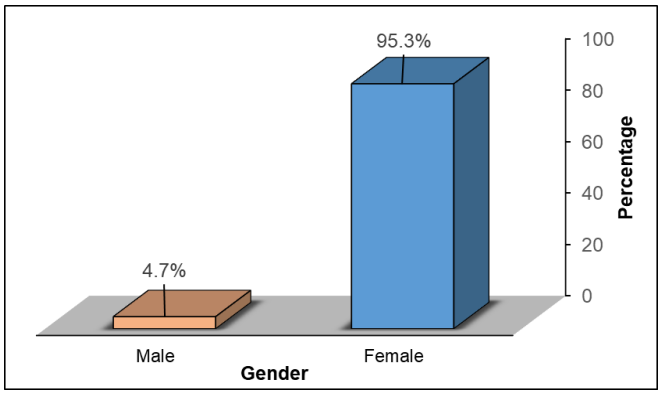

Figure 2 Gender distribution and dynamics among RA s patients in Benghazi city

Our study revealed a non-uniform age distribution among rheumatoid arthritis (RA) patients. The majority of cases were concentrated in the middle-aged groups, with the highest prevalence in the 51-60 year range (31%) and the 41-50 year range (30%). The 31-40-year age group also represented a notable portion of the population (12%). Smaller proportions of cases were found in the 61-70 year (15%), and 21-30 year (5%) groups. The youngest and oldest age groups (11-20, 71-80, and 81-90 years) collectively represented only 7% of the sample [Fig 3].

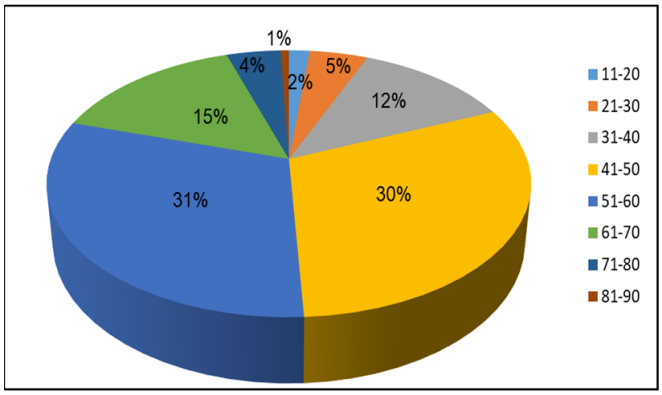

Figure 3 Age distribution among surveyed rheumatoid d arthritis patients

Analysis of RA diagnoses age among surveyed patients revealed a peak in middle-aged individuals [Fig 4]. The 41-50 age group showed the highest frequency at 31.24% (n=94), followed by the 31-40 age group at 20.5% (n=62), and then the 51-60 age group at 19.6% (n=59). In comparison, the youngest (1-30 years) and oldest (61-90 years) groups had lower RA diagnosis frequencies. This data underscores the age-related nature of RA onset in this patient population in Benghazi, Libya.

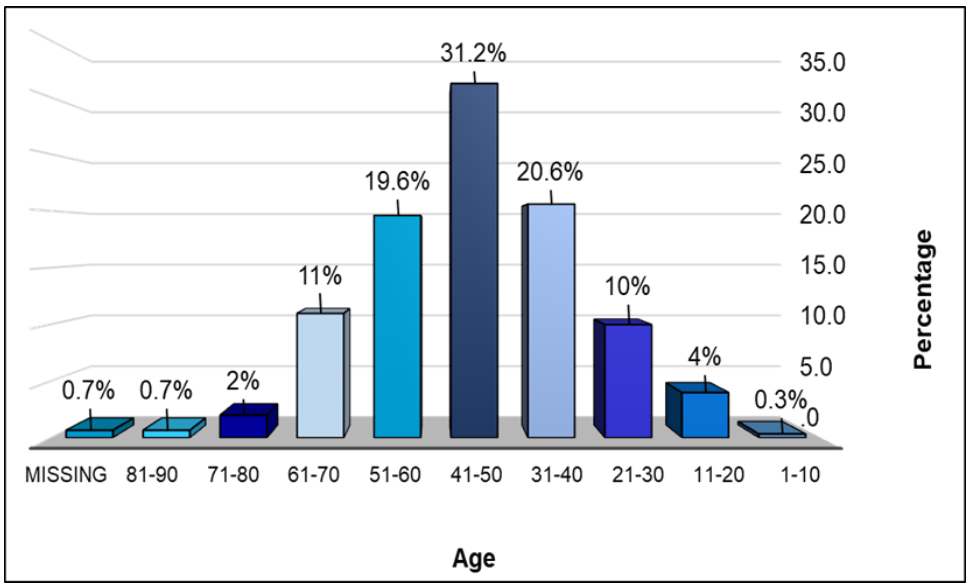

Figure 4 Diagnosed age of RA disease among surveyed patients

Our study explored the familial connections of rheumatoid arthritis (RA) in our surveyed patient population [Fig. 5]. We found that patients most frequently reported a parent with the disease (31.2%, n=94). The presence of RA was less frequent among siblings (9%, n=27), other relatives (5%, n=15), and grandparents (3.7%, n=11). However, a large percentage of the patients, specifically 51.2% (n=154), reported having no known family history of RA. This suggests that while there may be a family association in some cases, such as through parents, a significant proportion of cases lack clear familial links, pointing towards a possible role of environmental or other non-genetic factors in disease development. The need for further research on genetic and environmental factors is clearly suggested by our findings.

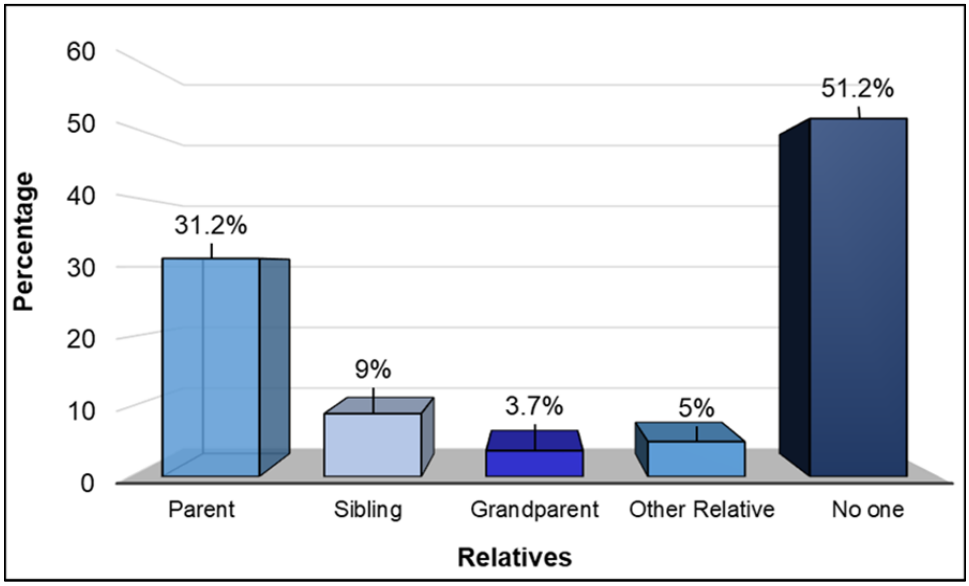

Figure 5 The effects of family history on the incidence of RA.

Our investigation into the family history of patients with rheumatoid arthritis (RA) revealed that diabetes mellitus (DM) was the most frequently reported autoimmune disease among their relatives, with 23.3% (n=70) of participants

indicating its presence [Fig. 5]. RA itself was the second most common, affecting 21.3% (n=64) of their families. Other autoimmune conditions, specifically systemic lupus erythematosus (SLE), psoriasis, and hypertension (HT) were significantly less prevalent (1.3% to 0.3%, n=4-1). Despite these findings, over half of the study population (51.2%) reported no family history of any autoimmune disease. This indicates that while familial autoimmunity is a factor, many RA cases develop without a clearly identifiable family connection, likely due to an interplay between genetic and environmental risk factors.

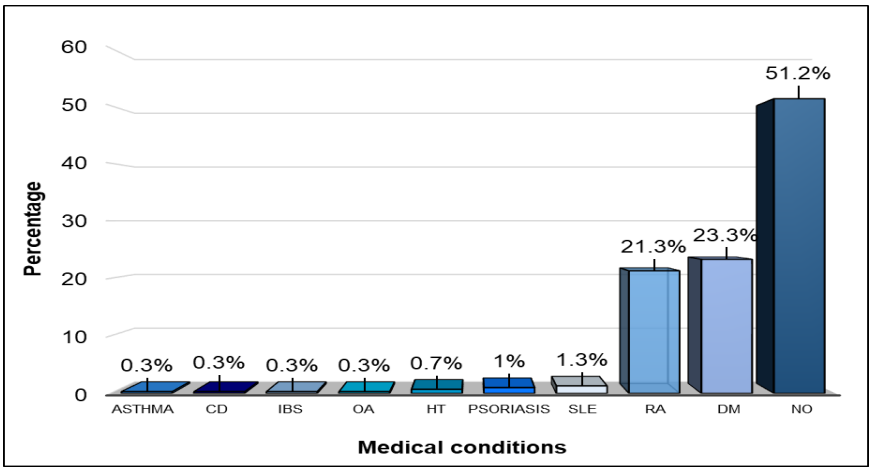

Figure 6 Prevalence of RA and autoimmune diseases among families

4. Discussion

RA is a chronic autoimmune disease affecting the quality of life of afflicted individuals and putting a significant burden on healthcare systems worldwide. The present study aimed to investigate some of the RA epidemiological features concerning geographic distribution, gender, age prevalence, age at diagnosis, familial aggregation, and the role of family history in the development of the disease in Benghazi, Libya. Our findings indicate that 70.1% of RA patients reside in Benghazi city, while 29.9% are from suburban and rural areas. This trend probably reflects the population density and access to healthcare services. The availability of specialized medical care is usually better in urban areas than in rural areas, which may account for the higher concentration of diagnosed cases in the city compared to rural areas (Alamanos et al., 2006). This may be further modulated by environmental and lifestyle factors, such as air pollution and dietary habits (Klareskog et al., 2006; Alpízar-Rodríguez et al., 2021). There was a strong predominance of females among RA patients, 95.3%. This is in agreement with the global trends, where the ratio of women to men suffering from RA is two to four times (Crowson et al., 2012). The reasons behind this gender disparity are not fully understood but are thought to involve hormonal, genetic, and immune system differences. For example, estrogen and other sex hormones can affect the immune system and thus predispose women to autoimmune diseases such as RA (Cutolo et al., 2014; Moulton et al., 2020). Regarding age, RA was diagnosed most in the age group 41–60 years, which agrees with global findings that the disease usually develops during the fourth to sixth decade of life (Gabriel, 2001). In our investigation, the most frequent diagnosis age of RA is 41-50 years with 31.24%, then 31-40 years old with 20.5%, and 51-60 years old with 19.6%. Lower prevalence among younger, aged 1-30 years, and older, aged 61-90 years, follows established epidemiological patterns of the disease (Venetsanopoulou et al., 2022). Immune system aging, cumulative environmental exposures, and hormonal changes likely all contribute to the midlife onset of RA (Firestein, 2003; Sparks et al., 2020). Regarding age, RA was most frequently diagnosed within the age group 41–60, which agrees with the global data indicating that the disease commonly appears during the fourth to sixth decades of life (Gabriel, 2001). In our study, the age group 41–50 had the highest frequency of RA diagnoses, 31.24%, followed by the age groups 31–40, 20.5%, and 51–60, 19.6%. This finding is in concordance with the established epidemiological pattern of lower prevalence of RA among younger, 1–30 years, and older, 61–90 years, individuals (Venetsanopoulou et al., 2022). Immune system aging, cumulative environmental exposure, and hormonal changes are some of the reasons that contribute to the middle-age onset of RA (Firestein, 2003; Sparks et al., 2020). Family history is one of the known risk factors for RA. While this study found 31.2% of the patients had at least one parent with RA, 9% had affected siblings, 5% had other affected relatives, and 3.7% had affected grandparents. However, 51.2% were found to report no family history of RA-a suggestion that although genetics play an important role in disease susceptibility, environmental and epigenetic components are equally or even more crucial in disease development (Gregersen et al., 1987; Jiang et al., 2021). The lower prevalence among siblings than parents suggests that early-life environmental exposures and lifestyle habits may contribute significantly to the risk of the disease (Too et al., 2012; Scherer et al., 2023). Environmental and lifestyle factors such as

smoking, infections, and gut microbiota imbalance, independent of genetic ones, have also been implicated in the etiology of RA among many others (Deane et al., 2017). Smoking has also been recognized as one of the major modifiable risk factors linked to the inception and severity of RA (Ishikawa & Terao, 2020). Future studies need to focus on how these interacting factors affect RA risk in the Libyan population. Interestingly, DM at 23.3% and RA at 21.3% were found to be the most common autoimmune diseases among relatives of RA patients. Other conditions, such as SLE and psoriasis, were reported at much lower percentages (0.3% to 1.3%). Additionally, 51.2% of the respondents did not have a family history of autoimmune diseases. While familial autoimmunity contributes to the risk of RA, many cases occur in individuals without a family history, highlighting the role of environmental and stochastic factors (Cooper et al., 2009). The clustering of RA with type 1 diabetes suggests shared pathogenic mechanisms, such as autoreactive T-cell activation and chronic inflammation (Turesson & Matteson, 2006; Zhang et al., 2022). The low prevalence rates in this population for SLE and psoriasis may reflect either genetic differences or variations in diagnostic practices. Recent genetic studies of RA have focused on the strong influence of HLA alleles, particularly HLA-DRB1, in disease susceptibility (Vetchinkina et al., 2021). PTPN22, STAT4, and TRAF1-C5 are genetic variants that are known to have effects on the susceptibility to RA (Hayashi et al., 2021). A study in 2024 further confirmed that genetic polymorphisms make a significant contribution to RA risk, especially in populations with a high prevalence of autoimmune diseases (Mastana et al., 2024). Moreover, it has been observed that genetic risk may be increased by environmental factors such as smoking, underlining the complex interplay between genes and the environment in the development of RA (Ishikawa & Terao, 2020; Huizinga et al., 2023). The study has brought to light some important insights into the epidemiology of RA among Benghazi, Libya, and identified the need for targeted screening and early intervention programs. Further studies are needed to determine population-specific genetic and environmental risk factors, explore novel biomarkers for early detection, and investigate the role of gut microbiota in RA pathogenesis. Longitudinal studies on environmental triggers in Libya might also provide an enhanced understanding of RA etiology and open avenues toward personalized treatment strategies. Such is according to Smolen et al. (2016) and Smolen et al. (2023).

5. Conclusion

In general, this agrees with the trends observed worldwide in RA epidemiology, where it has a high prevalence in middle-aged populations, and family history plays an important role in the susceptibility of individuals to this disease. Conversely, the substantial proportion of sporadic cases underlines the contribution of environmental and nongenetic factors to the disease process. The fact that RA and other autoimmune disorders, such as diabetes mellitus, often occur together suggests that these diseases share immune dysregulation pathways that should be further studied. Thus, region-specific environmental triggers, epigenetic effects, and new therapeutic targets need to be identified to enable optimal prevention, early detection, and personalized therapy in the future. Our findings give a detailed picture of RA epidemiology in Benghazi, Libya, confirming global patterns while revealing some unique regional characteristics. For instance, a high prevalence among middle-aged women, influences of both genetic and environmental contributions, and focusing of cases in urban areas highlight the important foci for targeted interventions. Findings like these really outline that studying the basic mechanisms of RA and its risk factors is highly important in investments of preventive measures and early diagnosis and treatment within the Libyan population.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

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

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