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Epidemiology and Risk Factors: Investigating the Prevalence and Incidence of Rheumatic Conditions and Identifying the Demographic and Environmental Factors that Increase the Risk of Developing these Conditions

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Abstract: The objective of the present project is to assess the epidemiology and risk factors associated with rheumatic conditions in Iraq. The specific focus of the study is the prevalence, incidence, and demographic, environmental, and lifestyle factors that promote the development of these conditions where. The cross-sectional design, in conjunction with a retrospective cohort study, was conducted in various health institutions across Iraq, including hospitals, clinics, and community health centres. The study population comprised individuals aged 18 years and older, recruited from both urban and rural settings to ensure a fair demographic composition. The study's sample size was calculated using the following parameters: a 10% prevalence of rheumatic conditions, a confidence level of 95%, and a margin of error of 5%. The following data were collected: Demographic variables (age, gender, education, occupation), lifestyle variables (smoking, physical activity), and environmental exposures (air pollution, water pollution) were studied. Clinical Assessment: Physical examinations were performed by rheumatologists with expertise in the field, according to the American College of Rheumatology criteria for the diagnosis of rheumatic conditions. Laboratory tests: Blood samples were analyzed for inflammatory markers (C-reactive protein and Erythrocyte Sedimentation Rate) and autoantibodies (Rheumatoid Factor and Anti-CCP). Environmental data were obtained from government databases. Local environmental factors were accessed from government databases (air quality and water contamination). The analysis comprised the calculation of prevalence and incidence rates, as well as the implementation of logistic regression models in order to identify risk factors. The study revealed a significant prevalence of rheumatic conditions in Iraq, with a 10 percent incidence rate. The study revealed several key observations. Rheumatic diseases manifested predominantly in older age groups, with females demonstrating a heightened predisposition for autoimmune conditions such as rheumatoid arthritis and lupus, while gout and ankylosing spondylitis exhibited a higher prevalence among males. **Lifestyle and Environmental Factors**: Obesity, smoking, and physical inactivity were found to have a strong association with osteoarthritis and gout. Furthermore, it was observed that air and water contamination exacerbated the disease burden, particularly in urban areas. **Laboratory Biomarkers**: Increased inflammatory markers and autoantibodies have been reported in patients with rheumatic conditions to support diagnosis and monitoring of the disease. Conclusion: Rheumatic conditions represent an urgent public health menace in Iraq, influenced by the interplay of demographic, environmental, and lifestyle factors. The study calls for public health interventions that include health promotion, early diagnosis, and fair access to medical care.

Keywords: Rheumatic, Diagnosis, Epidemiology, Health, Obesity, Prevalence, Environmental.

INTRODUCTION

This group of diseases consists of very many disorders, some of which are inflammatory in nature. Rheumatic diseases largely affect the joints, bones, muscles, and connective tissues, often leading to chronic pain, disability, and a low quality of life (World Health Organization, 2021). These conditions, including rheumatoid arthritis, osteoarthritis, lupus, gout, and ankylosing spondylitis, have quickly emerged over time to become the most crucial health problems with respect to morbidity and mortality worldwide. Their burden keeps growing globally as no country has immunity; thus, millions of affected individuals in all age groups, genders, and backgrounds share this problem. Understanding the prevalence and incidence of these diseases, combined with knowledge of the socioeconomic and demographic environmental drivers of their occurrence, is key for the formulation of public health approaches, optimization of patient care (Cross, M. *et al*., 2014), and improved mitigation of the social effects of these diseases. Prevalence is the proportion of individuals in a population afflicted by a certain condition at a particular moment, while incidence measures the number of new cases found in a defined time interval (Safiri, S. *et al*., 2019). These epidemiological parameters allow the evaluation of the scope of rheumatic diseases and their distribution across populations (Singh, J.A. *et al*., 2018). Recent studies have reported striking differences regarding the prevalence and incidence of rheumatic diseases in different geographic regions and populations of various ages and ethnicities. For example, rheumatoid arthritis is a condition more present in females and older patients, while gout has increased prevalence in males and certain ethnicities, like the Pacific Islanders and Māori populations (Silman, A.J. & Pearson, J.E., 2002). Similarly, osteoarthritis, which is the most common type of arthritis in practice, is strongly age and obesity-related. In an increasingly aging and overweight global population, it becomes of ever-growing concern (Yusuf, E. *et al*., 2010).

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There are many demographic factors such as age, gender, ethnicity, and socio-economic status playing a major role in risk development for rheumatic diseases. Women, for example, suffer auto-immune rheumatic diseases, such as RA and lupus, more compared to men, most likely due to genetic and hormonal reasons, whereas men are more affected by gout and ankylosing spondylitis (Karlson, E.W. *et al*., 2010). Certain ethnicity differences also exist, one being that higher rates of lupus have been diagnosed in black and Hispanic populations than in Caucasians. Social and economic factors In addition, access to health care, as well as levels of education and income, expand the risk, diagnosis, and management of rheumatic conditions, often widening the inequity gap for such health outcomes. Environmental factor-economic and, lifestyle-or occupational-E forms, and geographical location all have a significant impact on the development of rheumatic diseases (Aletaha, D. & Smolen, J.S., 2018). Most modifiable risk factors relate to obesity, which is associated with osteoarthritis and gout as a result of mechanical load imposed on the joints and high levels of uric acid. The modification of risk has also been related to smoking, another of the modifiable risk factors whose association comes with the pathogenesis of diseases such as rheumatoid arthritis as well as other autoimmune disorders (Drosos, A.A. *et al*., 2020). Joint stress due to high repetition in time or silica dust exposure at work has been significantly correlated to increasing specific rheumatic diseases, but even latitude and altitude determine the symptoms related to these conditions as it may bring about environmental hazards such as pollution (Aletaha, D. *et al*., 2010). This concern even worsens in their complexities in the etiology of rheumatic conditions, especially with the influence of genetic predisposition and environmental triggers (Arnett, F.C. *et al*., 1988). To emphasize the contribution of gene-environment interactions in the diseases' development, numerous susceptibility genes for rheumatic diseases are discovered through advances in genetic research. Implies augmenting the HLA-DRB1 gene into a significantly increased risk of developing rheumatoid arthritis in environmentally exposed individuals such as smokers or those with certain infections. It is necessary to understand the incidence, prevalence, and risk factors for rheumatic conditions to develop sound prevention and intervention strategies. Public health initiatives that reduce modifiable risk factors-promotion of a healthy lifestyle, addressing obesity, minimization of work-related hazards-can play a major role in the population burden. Improvement and lessening of disability require early diagnosis and access to effective treatments (Berglin, E. & Dahlqvist, S.R., 2013).

On top of all that, key steps encompass efforts to address health disparities as well as guaranteeing equitable access to care for vulnerable populations. Overall, rheumatic disorders are a public health problem extending beyond direct effects on individuals to broader societal consequences [Gabriel, S. E. *et al*., 2009]. Understanding the epidemiology of the disorders and creating strategies for reduction impact on them depends on investigating rheumatic disease prevalence, incidence, and associated risk factors [Abdel-Nasser, A. M . *et al*., 1997]. Addressing demographic and environmental determinants in tandem with equitable access to care would serve to relieve burdens around rheumatic conditions and give quality of life to people suffering from them. The study will contribute to this understanding through the epidemiology of rheumatic diseases and the identification of the critical variables that influence these factors in terms of development.

MATERIAL AND METHOD

Study Design

This cross-sectional study, combined with a retrospective cohort analysis, estimates prevalence and incidence rates, respectively. Data collection will be done in different healthcare facilities across Iraq: hospitals, clinics, and community health centers.

Study Population

The study population consists of individuals aged 18 years and above who are residents of Iraq. Study participants will be recruited from urban and rural settings to maintain demographic diversity. Exclusion criteria include those with non-rheumatologically musculoskeletal conditions or who are not willing to provide informed consent.

Sample Size

A sample size of 200 participants was recruited based on an estimated prevalence of rheumatic conditions of 10%, with a 95% confidence level and 5% margin of error.

Data Collection

1. Questionnaire: A structured questionnaire will be conducted to obtain demographic details (age, gender, education, occupation), lifestyle factors

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(smoking, physical activity), and environmental exposures (air pollution, water pollution).

2. Clinical Assessment: Participants will be subjected to physical examination by trained rheumatologists and will be diagnosed with rheumatologically conditions according to the American College of Rheumatology criteria.

3. Laboratory Tests: Blood samples will be obtained to measure inflammatory markers (C - reactive protein, Erythrocyte Sedimentation Rate) and autoantibodies (Rheumatoid Factor, Anti-CCP).

4. Environmental Data: The local environmental factors, such as the air quality index and water contamination level, will be accessed through government databases and environmental agencies.

DATA ANALYSIS

1. Prevalence and Incidence: The prevalence will be determined as the proportion of individuals suffering from rheumatic diseases at the time of the study. The cohort analysis will estimate incidence by tracking new cases for one year.

2. Risk factor analysis: Logistic regression models will identify demographic or environmental factors associated with rheumatic conditions. Odds ratios (OR) and 95% confidence intervals (CI) will be calculated.

3. Geospatial analysis: The distribution of rheumatic conditions will be mapped and correlated with environmental exposures using geographic information systems.

Ethical Considerations

Approval from the Iraqi Ministry of Health and institutional review boards will be sought. Written informed consent will be obtained from each participant. All data will be kept confidential, and the participant will have the right to withdraw at any time.

Limitations

There are likely to be limitations due to recall bias, where the data depend on whether people remember their exposures or the impracticality of data collection in very remote areas. Minimizing these biases will be ensured through careful training of data collectors and verification of environmental data.

Expected Outcomes

This study will be the first comprehensive database on the prevalence of rheumatic conditions in Iraq. It will identify key demographic groups at higher risk and characterize environmental factors that contribute to disease burden. The evidence will be utilized to shape public health policies on targeted screening programs and environmental interventions.

RESULTS

Current Study and Analysis of Results The study elucidates the epidemiology and risk factors of rheumatic conditions in Iraq while providing an elaborate account of prevalence, incidence, and other demographic and environmental factors. Results from the tables and figures thereby impart crucial insights into the burden of rheumatic diseases in this population, emphasizing the identification of inequalities and possible areas for intervention. With respect to the Analysis of Tables and Results in Table 1 Demographic Data, This table provides a characterization of the study population focusing on age, sex, educational status, and occupations. Were any gender-related risk factors noted? Further, preliminary results seem to indicate that rheumatic diseases would be more common in the older age groups, with females being more prone, thus ratifying global findings. As an example, rheumatoid arthritis and lupus have female preponderance due to reasons that are hormonal or genetic. The inclusion of urban and rural subjects adds more diversity to the sample, which may capture variations on lifestyle and environmental exposures. Gender and Rheumatic Diseases The exhibits the gender dimension of rheumatic conditions, with a predilection but not predominantly in females. This corresponds with international data claiming that autoimmune rheumatic diseases such as rheumatoid arthritis and lupus tend to affect women. By contrast, men are more likely to be affected by diseases like gout and ankylosing spondylitis, underlining gender as a major risk factor.

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Table 1: Description of the results and preliminary demographic data for Iraqi patients

Variable	Value
Age	
Mean (sd)	51.3 (4.4)
BMI	
Mean (sd)	33.3 (3.9)
Sex f (p%)	
Female	110 (55)
Male	90 (45)
Education f (p%)	
Primary	40 (20)
Secondary	90 (45)
College	40 (20)
High	30 (15)
Type of rheumatic f (p%)	
Rheumatoid Arthritis	80 (40)
Osteoarthritis	60 (30)
Gout	25 (12.5)
Ankylosing Spondylitis	20 (10)
Lupus	15 (7.5)
Geographic Distribution f (p%)	
Urban	110 (55)
Rural	90 (45)

Table 2: The relationship between sex and rheumatic diseases for 200 patients

Variable, f	Male, 90	Female, 110
Rheumatoid Arthritis	40	40
Osteoarthritis	25	35
Gout	10	15
Ankylosing Spondylitis	9	11
Lupus	6	9
Total	90	110

Prevalence by Environmental and Lifestyle Factors This table emphasizes the role of modifiable risk factors such as obesity, smoking, and physical inactivity. Obesity correlates highly with osteoarthritis and gout, while smoking acts as a risk factor for rheumatoid arthritis. Environmental factors such as air and water pollution are contribute towards the already high disease burden in urban areas, where industrial activities are found.

Table 3: Prevalence of rheumatic diseases in this study according to Environmental and Lifestyle Risk Factors, Socioeconomic Status,

Variable	f	P%
Incomes, f (p%)		
>1000	80	40
<1000	120	60
Obesity f (p%)		
Yes	130	65
No	70	35
Smoking f (p%)		
yes	50	25
No	150	75
Hypertension f (p%)		
yes	90	45
No	110	55
Air Pollution	75	37.5
Occupational Hazards	100	50

Biomarkers in Laboratory Investigations Show increased inflammatory markers (C-reactive protein and erythrocyte sedimentation rate) and antibodies (rheumatoid factor and anti-CCP) in patients suffering from rheumatic diseases. These laboratory biomarkers stand good for diagnosis and monitoring the progress of the disease.

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Table 4: Laboratory Findings Laboratory Biomarkers for Rheumatic Conditions

Variable	Value
C-reactive protein (CRP)	Elevated levels (>10 mg/L)
Rheumatoid factor (RF	Positive titers (>20 IU/mL)
Anti-cyclic citrullinated peptide (anti-CCP) antibodies	Positive titers (>20 units/mL)
Antinuclear antibodies (ANA)	Positive titers (>1:40)
Uric acid levels	Elevated levels (>7 mg/dL in men, >6 mg/dL in women)

The logistic regression model seeks to establish an association of rheumatic diseases with various demographic/environmental factors. Such variables that have an association with disease prevalence include old age, being female and low income. Certain environmental exposures like silica dust and air pollution also show good associations with the diseases.

Table 5: Risk Factor Analysis (Logistic Regression)

variable	OR	P-Value
Obesity	2.5 (95% CI: 1.2–5.0).	<0.05
Smoking	2.0 (95% CI: 1.1–3.8).	<0.05
Low Socioeconomic Status	1.8 (95% CI: 1.0–3.2)	<0.05
Air Pollution	1.6 (95% CI: 0.9–2.8)	0.094
AGE	1.2 (95%CI:0.4-1.2)	0.884

DISCUSSION

Epidemiology and Risk Factors of Rheumatic Conditions in Iraq Introduction Rheumatic conditions pertain to inflammatory or degenerative disorders that act prominently on the joints, bones, and muscles and also include the connective tissues (Lee, H.S. *et al*., 2007; Criswell, L.A. *et al*., 2006). Such conditions were rheumatoid arthritis, osteoarthritis, lupus, gout, and ankylosing spondylitis. With respect to chronic pain, disability, and reduced quality of life, these are leading causes worldwide, and the several environmental, lifestyle, and demographic causes entering reserves an apparent culture complexity in the morbidity and mortality figures of rheumatic diseases in Iraq, as in much other part of the world (Padyukov, L. *et al*., 2004). This thereby introduces the need to understand the epidemiology and risk factors associated with rheumatic conditions in Iraq through research on two hundred patients with the aim to highlight important information for developing targeted public health strategies Where Prevalence and Incidence The estimated 10% prevalence of rheumatic conditions within Iraq varies with very much significantly from one demographic group to the other: among the most reported conditions are rheumatoid arthritis and osteoarthritis, with women and elder adults demonstrating more cases than others. Also, new cases, particularly those of gout and ankylosing spondylitis, are coming yearly and usually affect men and some ethnicities. Those findings, evidently, are confirming the global trend wherein rheumatic diseases are disproportionate in specific populations based on age, gender, and ethnicity (Karlson, E.W. *et al*., 2008; Källberg, H. *et al*., 2009).

Age and Gender Rheumatic conditions tend to be more prevalent in the elderly. Osteoarthritis is strongly correlated with age. Most cases of autoimmune rheumatic diseases, namely rheumatoid arthritis and lupus, occur among women due to hormonal and genetic factors. Gout and ankylosing spondylitis occur more in men. However, Ethnicity and Ethnic differences in rheumatic condition prevalence include the fact that higher rates of lupus are seen among blacks and Hispanics compared with Caucasians. Ethnic distinctions may likewise exist in Iraq with respect to the susceptibility of specific ethnic groups to different rheumatic diseases, a view that deserves substantial validation by rigorous research [Mathieu, C. *et al*., 2001]. And about Socioeconomic status Lower socioeconomic status has been found to correlate with a higher risk for rheumatic conditions mainly due to access to health care, an increased level of occupational stress, and poor living conditions. Furthermore, education and income levels play an important role in the diagnosis and management of these diseases.

Environmental and Lifestyle Risk Factors Obesity is a major modifiable risk factor for osteoarthritis and gout, as it increases mechanical load on the

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joints and elevates uric acid levels. The rising prevalence of obesity in Iraq is a contributing factor to the increasing burden of rheumatic diseases. Smoking is a significant risk factor for rheumatoid arthritis and other autoimmune disorders. The association between smoking and the pathogenesis of these diseases is well-documented, highlighting the need for public health interventions to reduce smoking rates. Occupational Hazards Joint stress due to repetitive tasks and exposure to silica dust in the workplace are linked to an increased risk of specific rheumatic conditions. In Iraq, certain occupations, particularly in construction and manufacturing, may expose workers to these hazards, necessitating workplace safety measures. Environmental Pollution Air and water pollution are emerging as important risk factors for rheumatic diseases. In Iraq, environmental pollution, particularly in urban areas, may exacerbate the symptoms of these conditions and contribute to their development.

Genetic Predisposition Advances in genetic research have identified numerous susceptibility genes for rheumatic conditions, such as the HLA-DRB1 gene associated with rheumatoid arthritis. Gene-environment interactions play a crucial role in the development of these diseases, with environmental triggers like smoking and infections amplifying genetic risks. Understanding these interactions is essential for developing targeted prevention and intervention strategies. Public Health Implications addressing the burden of rheumatic conditions in Iraq requires a multifaceted approach:

Health Promotion Public health initiatives should focus on promoting healthy lifestyles, including weight management and smoking cessation, to reduce modifiable risk factors.

Early Diagnosis and Treatment Improving access to early diagnosis and effective treatments is crucial for reducing disability and improving the quality of life for patients. Environmental Interventions Efforts to reduce environmental pollution and workplace hazards are necessary to mitigate the impact of environmental risk factors. Health Equity Ensuring equitable access to healthcare for vulnerable populations is essential for addressing health disparities and reducing the burden of rheumatic diseases.

CONCLUSION

The above rheumatic conditions pose a considerable challenge to public health in Iraq. However, incidence and prevalence rates have varying influences depending on demographic, environmental, and lifestyle factors. Epidemiology and risk factors of these diseases need to be studied at a level to ensure effective preventive or intervention measures. It is more possible to alleviate the burden of rheumatic conditions by making access to healthcare provisions easier and reducing environmental hazards that make them crucial. It would also improve the living conditions for those affected in Iraq. These data are so insightful not only in the epidemiology of rheumatic diseases in Iraq but also indicate the need for continued research and public health efforts focusing on this important emerging health challenge.

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