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ORIGINAL ARTICLE

Efficacy of Biologic Agents for Management of Rheumatoid Arthritis

Biswas Abul Hassan[1*]

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*Corresponding Author

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ABSTRACT

Introduction: *Rheumatoid arthritis is a chronic autoimmune inflammatory disease that can lead to progressive joint destruction, functional disability, and reduced quality of life if not adequately controlled. Biologic disease-modifying antirheumatic drugs have transformed the management of moderate-to-severe rheumatoid arthritis. This study was conducted to assess the efficacy of biologic agents in the management of rheumatoid arthritis.* ***Methods & Materials:*** *This cross-sectional descriptive study was conducted in the Department of Medicine of Shaheed Suhrawardy Medical College and Hospital, Dhaka, Bangladesh, from July 2021 to June 2022 to assess the efficacy of biologic agents in the management of rheumatoid arthritis. A total of 106 adult patients diagnosed with rheumatoid arthritis who received at least one biologic disease-modifying antirheumatic drug and had complete baseline and approximately 6-month follow-up records were included through consecutive review of medical records. Data were analyzed using SPSS version 26.0.* ***Results:*** *The mean age was 52.1 ± 11.4 years, 73.6% were female, and 75.5% had high baseline disease activity with a mean DAS28-ESR of 5.9 ± 0.8. Adalimumab (32.1%) and etanercept (26.4%) were the most commonly used biologic agents, and 81.1% received concomitant methotrexate. After 6 months, DAS28-ESR decreased from 5.9 to 3.4, ESR from 48.6 to 24.8 mm/hr, CRP from 21.4 to 8.7 mg/L, and HAQ-DI from 1.7 to 0.9. 35.8% of patients achieved remission, all reductions were statistically significant (paired t-test, $p < 0.001$). 22.6% achieved low disease activity, and 88.7% continued treatment, while serious infection occurred in only 2.8% of patients.* ***Conclusion:*** *The present study showed that biologic agents are highly effective in treating rheumatoid arthritis, producing significant improvements in disease activity, inflammatory parameters, and functional ability. Biologic therapy, used mainly in combination with methotrexate, has shown notable reductions in DAS28-ESR, ESR, CRP, and HAQ-DI scores, and more than half of the patients attained either remission or low disease activity.*

Keywords: *Rheumatoid Arthritis, Biologics, Synovial Inflammation*

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1. *Assistant Professor, Department of Medicine, City Medical College Khulna, Khulna, Bangladesh (ORCID: 0009-0006-3571-0768)*

INTRODUCTION

Rheumatoid arthritis (RA) is a chronic, progressive autoimmune disease characterized by persistent synovial inflammation, joint destruction, pain, stiffness, and functional disability. Beyond the musculoskeletal system, RA is associated with significant extra-articular manifestations, including cardiovascular, pulmonary, and hematologic complications, which contribute to increased morbidity and mortality. Globally, RA affects approximately 0.5–1% of the adult population, with women being affected two to three times more frequently than men, and the disease often begins during the most productive years of life, imposing a substantial socioeconomic burden on patients, families, and healthcare systems [1,2]. The pathogenesis of RA involves a complex interaction between genetic susceptibility, environmental triggers, and dysregulated immune responses. Pro-inflammatory cytokines such as tumor necrosis factor-alpha (TNF-α), interleukin-6 (IL-6), and pathways involving T and B lymphocytes play pivotal roles in maintaining synovial inflammation and promoting cartilage degradation and bone erosion [2,3]. Early and sustained suppression of inflammation is therefore essential to prevent irreversible structural damage and preserve physical function. Conventional synthetic disease-modifying antirheumatic drugs (csDMARDs), particularly methotrexate, remain the cornerstone of initial RA management. However, a considerable proportion of patients either fail to achieve adequate disease control or develop intolerance to csDMARD therapy [4]. The introduction of biologic disease-modifying antirheumatic drugs (bDMARDs) has revolutionized RA treatment by specifically targeting key immune mediators involved in disease pathogenesis. Available biologic agents include TNF inhibitors (adalimumab, etanercept, infliximab, golimumab, certolizumab pegol), IL-6 receptor inhibitors (tocilizumab, sarilumab), T-cell co-stimulation modulators (abatacept), and B-cell depleting therapy (rituximab) [3,5]. Randomized controlled trials and long-term observational studies have shown that these therapies might increase remission rates, reduce disease activity scores, improve physical function, and inhibit radiographic progression compared with csDMARDs alone [6,3]. A systematic literature review informing the 2022 EULAR recommendations concluded that both biologic and targeted therapies provide significant efficacy in patients with inadequate response to csDMARDs, particularly when combined with methotrexate [6]. Combination therapy has been associated with superior clinical response, higher treatment retention, and better structural outcomes than biologic monotherapy [7]. Current international guidelines emphasize a

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treat-to-target strategy, aiming for sustained remission or low disease activity. The 2022 EULAR recommendations advise that patients with persistent disease activity despite optimized csDMARD therapy should receive a biologic or targeted synthetic DMARD, taking into account efficacy, safety, comorbidities, and patient preferences [3]. Similar principles are supported by the American College of Rheumatology, reflecting the central role of biologic therapy in contemporary RA management [8]. Preclinical studies in collagen-induced arthritis models demonstrated that biologic agents significantly reduced synovial inflammation, cartilage destruction, and bone erosion, supporting their therapeutic potential in rheumatoid arthritis [9]. Despite these advances, important challenges remain. Approximately 30–40% of patients demonstrate inadequate response to the first biologic agent, and issues related to infections, immunogenicity, long-term safety, treatment sequencing, and cost continue to influence therapeutic decisions [5,10]. This study was conducted to assess the efficacy of biologic agents in the management of rheumatoid arthritis.

METHODS & MATERIALS

This cross-sectional descriptive study was conducted in the Department of Medicine of Shaheed Suhrawardy Medical College and Hospital, Dhaka, Bangladesh from July 2021 to June 2022 to assess the efficacy of biologic agents in the management of rheumatoid arthritis. A total of 106 adult patients diagnosed with rheumatoid arthritis who received at least one biologic disease-modifying antirheumatic drug and had complete baseline and approximately 6-month follow-up records were included through consecutive review of medical records. Patients with incomplete records, follow-up of less than 6 months, or biologic therapy for other rheumatologic conditions were excluded. Data were collected using a structured data collection sheet and included sociodemographic characteristics, disease duration, rheumatoid factor and anti-CCP status, type of biologic agent used, concomitant methotrexate therapy, and clinical and laboratory parameters at baseline and 6 months. Outcome measures included disease activity assessed by DAS28-ESR, inflammatory markers (ESR and CRP), functional status assessed by the Health Assessment Questionnaire Disability Index (HAQ-DI), EULAR clinical response, remission or low disease activity status, treatment continuation, and adverse events. Data were entered and analyzed using SPSS version 26.0, and results were presented using frequencies, percentages, means, and standard deviations. Ethical approval was obtained from the institutional ethical review committee, and confidentiality of patient information was strictly maintained throughout the study.

RESULTS

The mean age of the participants was 52.1 ± 11.4 years, with the largest proportion in the 50–59 years age group (34.0%). Females constituted 73.6% (n=78) of the study population, and 60.4% (n=64) were from urban areas (*Table I*).

Table I

Baseline socio-demographic characteristics of the study participants (*n* = 106).

Variables	Frequency	Percentage
Age (years)		
18–39	18	17.0
40–49	32	30.2
50–59	36	34.0
≥60	20	18.8
Total	106	100.0
Mean ± SD	52.1 ± 11.4	
Sex		
Female	78	73.6
Male	28	26.4
Total	106	100.0
Residence		
Urban	64	60.4
Rural	42	39.6
Total	106	100.0

Most patients had long-standing disease, with 43.4% (n=46) having RA for 5–10 years and 34.0% (n=36) for more than 10 years. Rheumatoid factor and anti-CCP positivity were observed in 77.4% and 83.0% of patients, respectively. A high baseline disease activity was present in 75.5% (n=80), with a mean DAS28-ESR of 5.9 ± 0.8 (*Table II*).

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Table II
Baseline disease characteristics before initiation of biologic therapy (*n* = 106).

Disease characteristics	Frequency	Percentage
Disease duration (years)		
<5	24	22.6
5–10	46	43.4
10	36	34.0
Total	106	100.0
Mean ± SD	8.6 ± 4.3	
Factor Positivity*		
Rheumatoid factor positive	82	77.4
Anti-CCP positive	88	83.0
Baseline disease activity (DAS28-ESR)		
Moderate (3.2–5.1)	26	24.5
High (>5.1)	80	75.5
Total	106	100.0
Mean DAS28-ESR	5.9 ± 0.8	

**Multiple response*

Adalimumab was the most frequently prescribed biologic agent (32.1%, n=34), followed by etanercept (26.4%, n=28) and tocilizumab (18.9%, n=20). The majority of patients (81.1%, n=86) received biologic therapy in combination with methotrexate.

Table III
Pattern of biologic agents used for rheumatoid arthritis (*n* = 106*).

Biologic agent	Frequency	Percentage
Adalimumab	34	32.1
Etanercept	28	26.4
Tocilizumab	20	18.9
Rituximab	16	15.1
Abatacept	8	7.5
Combined with methotrexate	86	81.1

**Multiple response*

Biologic therapy produced a marked improvement in disease activity and inflammatory markers, thus showing efficacy. The mean DAS28-ESR decreased from 5.9 ± 0.8 to 3.4 ± 1.0, ESR from 48.6 ± 16.2 to 24.8 ± 11.5 mm/hr, and CRP from 21.4 ± 8.9 to 8.7 ± 5.4 mg/L. Functional disability also improved significantly, with the HAQ-DI score declining from 1.7 ± 0.5 to 0.9 ± 0.4. All reductions were statistically significant (paired t-test, p < 0.001) (*Table IV*).

Table IV
Changes in disease activity and inflammatory markers after 6 months of biologic therapy (N = 106).

Parameter	Baseline (Mean ± SD)	6 months (Mean ± SD)	p-value*
DAS28-ESR	5.9 ± 0.8	3.4 ± 1.0	<0.001
ESR (mm/hr)	48.6 ± 16.2	24.8 ± 11.5	<0.001
CRP (mg/L)	21.4 ± 8.9	8.7 ± 5.4	<0.001
HAQ-DI score	1.7 ± 0.5	0.9 ± 0.4	<0.001

**Paired t-test.*

After 6 months of treatment, 50.9% (n=54) achieved a good EULAR response, while 32.1% (n=34) had a moderate response. Remission was achieved in 35.8% (n=38), and an additional 22.6% (n=24) reached low disease activity, resulting in 58.4% (n=62) attaining the therapeutic target (*Table V*).

Table V
Clinical response and disease activity according to EULAR criteria after 6 months (*n* = 106).

Clinical response	Frequency	Percentage
Good response	54	50.9
Moderate response	34	32.1
No response	18	17.0
Total	106	100.0
Disease activity*		
Remission (DAS28 <2.6)	38	35.8
Low disease activity (2.6–3.2)	24	22.6
Overall remission or low disease activity	62	58.4

**Multiple response*

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Adverse events were generally mild. Injection-site reactions occurred in 11.3% (n=12), upper respiratory infections in 9.4% (n=10), and gastrointestinal symptoms in 7.5% (n=8). Serious infections requiring hospitalization were uncommon (2.8%, n=3). Only 4.7% (n=5) discontinued therapy due to adverse events, while 88.7% (n=94) remained on biologic treatment at 6 months (*Table VI*).

Table VI
Adverse events and treatment continuation during follow-up (*n* = 106*).

Outcome	Frequency	Percentage
Injection-site reaction	12	11.3
Upper respiratory tract infection	10	9.4
Gastrointestinal symptoms	8	7.5
Herpes zoster	2	1.9
Serious infection requiring hospitalization	3	2.8
Discontinuation due to adverse events	5	4.7
Treatment continuation at 6 months	94	88.7

**Multiple response*

DISCUSSION

In the present study, the mean age of the participants was 52.1 ± 11.4 years, and 73.6% were female, reflecting the known female predominance of rheumatoid arthritis (RA). Smolen et al. reported that RA commonly affects women two to three times more frequently than men and is usually diagnosed in middle age, which supports the demographic pattern observed in our cohort [1]. Similarly, Choy et al. found that 74.2% of patients were female with a mean age of 56.3 years among RA patients receiving biologic therapy in a UK multicenter observational study [11]. The close similarity between their findings and our results suggests that the study population is representative of patients typically selected for biologic treatment. Regarding disease characteristics, our patients had a mean disease duration of 8.6 ± 4.3 years, with 77.4% rheumatoid factor positive and 83.0% anti-CCP positive. Baseline disease activity was high, with a mean DAS28-ESR of 5.9 ± 0.8, and 75.5% of patients had high disease activity. In the British Society for Rheumatology Biologics Register, Kihara et al. reported a mean disease duration of 11.2 years and a mean baseline DAS28 of 6.1 ± 1.1 in patients treated with tocilizumab [12]. Compared with that cohort, patients in this study had slightly shorter disease duration but a similarly severe level of baseline disease activity. The pattern of biologic use in our study showed that adalimumab was used in 32.1%, etanercept in 26.4%, tocilizumab in 18.9%, rituximab in 15.1%, and abatacept in 7.5% of patients, while 81.1% received concomitant methotrexate. Alten et al. reported that methotrexate was used concomitantly in 78.4% of abatacept-treated patients in the ASCORE study [13]. The slightly higher rate in our study suggests strong adherence to guideline-based combination therapy, which is associated with improved clinical response and treatment persistence. A major finding of this study was the significant improvement in disease activity and inflammatory markers after 6 months of biologic therapy. The mean DAS28-ESR decreased from 5.9 to 3.4, representing a reduction of 2.5 points. ESR declined from 48.6 to 24.8 mm/hr, CRP from 21.4 to 8.7 mg/L, and HAQ-DI from 1.7 to 0.9. All reductions were statistically significant (paired t-test, $p < 0.001$). Kihara et al. observed a reduction in DAS28 from 6.1 to 3.5 at 6 months among tocilizumab users, while Choy et al. reported improvement in DAS28 from 5.7 to 3.8 and HAQ-DI from 1.6 to 1.1 after biologic treatment [11,12]. Compared with these studies, our cohort demonstrated a comparable reduction in disease activity and an even slightly greater improvement in functional disability, suggesting that biologic therapy was highly effective in restoring physical function in our patients. In terms of clinical response, 50.9% achieved a good EULAR response, 32.1% a moderate response, and 35.8% achieved remission (DAS28 <2.6). Wang et al. reported that 58.9% of patients achieved a good EULAR response after 24 months of golimumab therapy [14]. Although their remission-related outcomes were somewhat higher, their follow-up duration was considerably longer than the 6 months used in our study. Therefore, achieving remission in more than one-third of patients within only 6 months indicates a robust early therapeutic effect. Safety outcomes were also encouraging. In our study, serious infection requiring hospitalization occurred in 2.8%, discontinuation due to adverse events in 4.7%, and 88.7% remained on treatment at 6 months. Simon et al., in a 10-year international post-marketing study, reported hospitalized infections in approximately 3–4% of biologic-treated RA patients and demonstrated an overall acceptable safety profile [15]. Alten et al. reported a 2-year treatment retention of 47% for abatacept [13]. Direct comparison is limited because of the much longer follow-up in their study, but our short-term continuation rate of 88.7% suggests excellent early tolerability and adherence.

LIMITATIONS

This study was limited by its retrospective design, single-center setting, and relatively small sample size, which may reduce the generalizability of the findings. The short follow-up period of 6 months did not allow assessment of long-term efficacy, radiographic progression, or delayed adverse events of biologic therapy.

CONCLUSION

The present study demonstrated that biologic agents are highly effective in the management of rheumatoid arthritis, resulting in substantial improvements in disease activity, inflammatory markers, and functional status. Treatment with biologic therapies, predominantly in combination with methotrexate, led to marked reductions in DAS28-ESR, ESR, CRP, and HAQ-DI scores, while more than half of the patients achieved remission or low disease activity.

RECOMMENDATION

Biologic agents can be considered as an important treatment option for patients with moderate-to-severe rheumatoid arthritis who have an inadequate response to conventional DMARDs. Regular monitoring of disease activity and functional status is recommended to optimize treatment outcomes and ensure safe long-term use. Further large-scale prospective studies with longer follow-up are suggested to assess sustained efficacy, safety, and predictors of treatment response in the local population.

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CONFLICT OF INTEREST
None declared

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