COVID-19 VACCINE IN EGYPTIAN PATIENTS WITH SYSTEMIC LUPUS ERYTHEMATOSUS, RHEUMATOID ARTHRITIS AND OTHER RHEUMATIC DISEASES

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ABSTRACT:

Background: *There is a huge debate about the COVID vaccination in the rheumatic patients. Is it safe? Is it effective? COVID vaccine proved to decrease COVID 19 infection in general population.*

Aim of the work: *To study the clinical efficacy and adverse effects of COVID 19 vaccine in Egyptian patients with systemic lupus erythematosus (SLE), rheumatoid arthritis (RA) and other rheumatic patients. And to identify the impact of steroids and biologic intake on COVID infection, severity and the vaccine response in these patients.*

Patients & Method: *Data of 129 rheumatic patients were recorded including medications, COVID vaccination data. Comparison between SLE, RA and other rheumatic patients was done regarding vaccine side effects, infection before and post vaccination. Patients receiving steroids were compared with those without steroid intake regarding vaccine side effects, pre and post vaccine infection. The same was done regarding biologics.*

Results: *There were 48 SLE patients, 54 RA patients and 27 patients with other rheumatic diseases (psoriatic arthritis, scleroderma and dermatomyositis). There was statistically significant decrease of COVID infection after vaccination (P<0.001). With decreased hospitalization and ICU admission from 0 to 6.45%. No statistically significant difference between SLE, RA and other rheumatic patients regarding side effects, infection before or after vaccination. Patients on steroids and those on biologics didn't show difference from those without steroids or biologics regarding the side effects, infection before or after vaccine*

Conclusions: *COVID vaccine is tolerable and effective in decreasing COVID infection and severity in patients with SLE, RA and other rheumatic patients.*

Keywords: *COVID vaccine, SLE, RA.*

INTRODUCTION:

COVID vaccines are approved by WHO in the 2021 in many countries and was considered a key pillar of public health and the WHO estimates that vaccine immunization currently prevents 4–5 million deaths every year[1]. COVID vaccines are acting in different mechanism and finally it leads to increase and activate the immune system to produce antibody against the COVID 19 virus[2]. Building immunity post vaccination occasionally can cause side effects. Side effects which are reported by World Health Organization, including fatigue, fever, headaches, pain at the injection site, nausea, and diarrhea[3].

The rheumatic disease patients were excluded from first vaccination program

fearing of flares of the rheumatic disease, or decreases the efficacy of received vaccine by immunosuppressive medications[4].

The European Alliance of Associations for Rheumatology (EULAR) Coronavirus Vaccine (COVAX) physician-reported registry delineates the safety and efficacy of SARS-CoV-2 vaccines in patients with rheumatic diseases. The majority of patients tolerated their vaccination well with rare reports of inflammatory rheumatic diseases flare and very rare reports of serious adverse effects[5].

Until now, few studies discussed the efficacy and safety of COVID vaccine in the Egyptian rheumatic disease patients. And so, we aim to compare the efficacy and safety of COVID vaccines in the different rheumatic disease patients

AIM OF THE WORK:

To study the clinical efficacy and adverse effects of COVID 19 vaccine in Egyptian patients with systemic lupus erythematosus (SLE), rheumatoid arthritis (RA) and other rheumatic patients. And to identify the impact of steroids and biologic intake on COVID infection, severity and the vaccine response in these patients.

PATIENTS AND METHODS:

This is a cross-sectional study included 129 patients with rheumatic diseases; all were recruited from Internal medicine and Rheumatology department of Ain Shams University hospitals.

The study was approved by the ethical committee of scientific research, faculty of medicine, Ain Shams University. Written informed consent was obtained from all patients included in this study, after explanation of the study and its aim.

All patients data were recorded including age, sex, smoking, type of rheumatic disease and disease duration, medications concerning with steroids & biologic therapy, other comorbidities, type and number of vaccine doses received, local and systemic side effects of COVID vaccine, previous COVID infection, post vaccination infection, incidence of flare, the time of this flare in relation with the vaccine. Comparison between SLE, RA and other rheumatic patients was done regarding the vaccine side effects, infection before and after vaccination. Then all patients divided according to steroid intake into group receiving steroids and the other group doesn't receive steroids. Comparison between both groups was done regarding the vaccine side effects, infection before and after vaccination. The same was done regarding biologics.

Collected data were tabulated and statistically analyzed using the statistical package for social sciences (SPSS) version 17.0. Variables were presented as frequencies and percentages, mean ± standard deviation and range. A comparison was done using Chi-square and ANNOVA tests. P value 0.05 was considered significant.

RESULTS:

We had 129 patients, 48 patients had SLE, 54 patients had RA and 27 patients had other rheumatic disease (Ankylosing Spondylitis, psoriatic arthritis, scleroderma and dermatomyositis). Their ages ranged from 18-27 years and 101 (78.29%) Patients were female. Eighty-nine (68.99%) were on steroids. Biologic therapy was received by 34 (26.3) patients. 40% (54) of the patients received BBIBP-CorV (Sinopharm, Beijing, China), 24 patients (18.6%) received CoronaVac (Sinovac, Beijing, China), and 20 patients (15.5, 17 %) received BNT162 (Pfizer BioNTech, New York, NY, USA) and ChAdOx1 (AstraZeneca, Oxford, UK) respectively. Finally, 5 patients (3.8 %) received Sputnik V (Gamaleya, Moscow,

Russian) & 4 (3.5%) received Ad26.COV2-S (Johnson & Johnson, New Brunswick, NJ, USA). Most of the patients 87 (67.44) received 2 doses of COVID 19 vaccine. Nineteen (14.73) patients finished the vaccine schedule and 22 (17.05) received only one dose. One patient received 4 doses of the COVID vaccine. (Table 1)

Seventy-two (55.8%) patients experienced side effects. Body aches was the commonest side effect (41.8%), headache (39.5%), fever and swelling at site of injection (29.4%), pain at site of injection (28.6%). Nine patients developed flare of the rheumatic disease after receiving the vaccine. Three patients of them developed flare after fist dose of vaccine, 3 after the second dose and 3 after the third dose. (Table 1)

Table (1): descriptive data of the studied patients (129).

Item		No	%
Type of Vaccine	Pfizer	20	15.50
	Sinopharm	54	41.86
	Sinovac	24	18.60
	AstraZeneca	22	17.05
	Sputnic	5	3.88
	Johnson	4	3.10
Vaccine Doses	One	22	17.05
	Two	87	67.44
	Three	19	14.73
	Four	1	0.78
Side effects	Side effects	72	55.81
	Pain	37	28.68
	Swelling	38	29.46
	Redness	34	26.36
	Fever	38	29.46
	Headache	51	39.53
	Bonyesaches	54	41.86
	Rhinorrhea	7	5.43
	Nasal Congestion	6	4.65
	Pharyngitis	5	3.88
	Chest Pain	1	0.78
	Cough	1	0.78
	Dyessnea	4	3.10
	Hemoptysis	0	0.00
	Abdominal Pain	1	0.78
	Diarrhea	5	3.88
	Peripheral neuropathies	3	2.33
Flare	Yes	9	6.98
	No	120	93.02
Time flare	1st	3	33.33
	2nd	3	33.33
	3rd	3	33.33

Among all the studied patients, there was statistically significant decrease of COVID infection from 24.03% to 4.65% after vaccine intake with P value <0.001 (table 1). Also, there was decrease of hospitalization of infected patients from 9.68% to 0%, with decrease in the need for ICU admission from 6.45% to 0% after vaccination although being non-significant (Table 2).

Table (2): Comparison between the incidence of COVID 19 infection and place of COVID infection treatment before and after vaccination in all patients.

Total		Before		After		Chi-Square	
		N	%	N	%	X^2	P-value
COVID Infection	Yes	31	24.03	6	4.65	18.174	<0.001*
	No	98	75.97	123	95.35		
Treatment	Home	26	83.87	6	100.00	1.119	0.572
	Hospital	3	9.68	0	0.00		
	ICU	2	6.45	0	0.00		

ICU: Intensive care unit, **N:** Number, **χ^2:** Chi-square test, **P**: probability value, ***:** $p<0.05$ is statistically significant, ****:** $p\leq0.001$ is statistically highly significant.

We didn't find significant difference between SLE, RA and other rheumatic patients regarding incidence of COVID infection, hospitalization and ICU admission before and after vaccination (Table 3).

Table (3): Comparison between SLE, RA and other rheumatic patients regarding the incidence of COVID infection and the place of treatment before and after vaccination

		R Disease						Chi-Square	
		SLE (48)		RA (54)		Others (27)			
		N	%	N	%	N	%	X^2	P-value
COVID Infection Before	Yes	12	25.00	9	16.67	10	37.04	4.131	0.127
	No	36	75.00	45	83.33	17	62.96		
COVID Infection After	Yes	4	8.33	0	0.00	2	7.41	4.564	0.102
	No	44	91.67	54	100.00	25	92.59		
P-value		0.055		0.005*		0.022*			
Treatment Before	Home	10	83.33	8	88.89	8	80.00	5.493	0.240
	Hospital	0	0.00	1	11.11	2	20.00		
	ICU	2	16.67	0	0.00	0	0.00		
Treatment After	Home	4	100.00	-	-	2	100.00	-	-
	Hospital	0	0.00	-	-	0	0.00		
	ICU	0	0.00	-	-	0	0.00		
P-value		1.000		-		0.729			

SLE: Systemic lupus erythematosus, **RA:** Rheumatoid arthritis, **ICU:** Intensive care unit, **N:** Number, **χ^2:** Chi-square test, **P**: probability value, ***:** $p<0.05$ is statistically significant, ****:** $p\leq0.001$ is statistically highly significant.

Comparing the reported side effects among these patients revealed that no statistically significant difference between SLE, RA and other rheumatic diseases including the flare of the disease (Table 4).

Table (4): Comparison between SLE, RA and other rheumatic patients regarding side effects and the flare after COVID vaccination

		Rheumatic Diseases						Chi-Square	
		SLE (48)		RA (54)		Others (27)			
		N	%	N	%	N	%	X^2	P-value
	Pain	13	27.08	17	31.48	7	25.93	0.367	0.832
	Swelling	13	27.08	17	31.48	8	29.63	0.237	0.888
	Redness	12	25.00	15	27.78	7	25.93	0.104	0.949
	Fever	14	29.17	15	27.78	9	33.33	0.270	0.874
	Headache	17	35.42	25	46.30	9	33.33	1.808	0.405
	Bony aches	18	37.50	26	48.15	10	37.04	1.510	0.470
	Rhinorrhea	1	2.08	3	5.56	3	11.11	2.747	0.253
	Nasal Congestion	1	2.08	3	5.56	2	7.41	1.276	0.528
	Pharyngitis	1	2.08	2	3.70	2	7.41	1.322	0.516
	Chest Pain	0	0.00	1	1.85	0	0.00	1.400	0.497
	Cough	1	2.08	0	0.00	0	0.00	1.701	0.427
	Dyspnea	1	2.08	2	3.70	1	3.70	0.263	0.877
	Hemoptysis	0	0.00	0	0.00	0	0.00	-	-
	Abdominal Pain	0	0.00	1	1.85	0	0.00	1.400	0.497
	Diarrhea	1	2.08	2	3.70	2	7.41	1.322	0.516
	Other (Peripheral neuropathies)	1	2.08	1	1.85	1	3.70	0.292	0.864
Chi-Square		N	%	N	%	N	%	X^2	P-value
Flare	Yes	4	8.33	2	3.70	3	11.11	1.739	0.419
	No	44	91.67	52	96.30	24	88.89		
Time flare	1st	2	50.00	0	0.00	1	33.33	6.000	0.199
	2nd	2	50.00	0	0.00	1	33.33		
	3rd	0	0.00	2	100.00	1	33.33		

SLE: Systemic lupus erythematosus, **RA:** Rheumatoid arthritis, **N:** Number, **χ^2:** Chisquare test, **P**: probability value, ***:** $p<0.05$ is statistically significant, ****:** $p\leq0.001$ is statistically highly significant.

In all patients, there was no significant difference between patients on steroids and those without steroid intake regarding the side effects, incidence of infection before or after vaccine. (Table 5)

Table (5): Comparison between patients on steroids and those without steroid intake regarding vaccine side effects, infection before and after COVID vaccination

		Steroids						T-Test	
		Yes (89)			No (40)			t	P-value
N of side effect	Range	2	-	10	1	-	9	0.135	0.893
	Mean ±SD	4.915	±	2.052	4.846	±	2.148		
Chi-Square		N		%	N		%	X^2	P-value
Side effect	Yes	46		52.81	26		65.00	1.670	0.196
	No	43		47.19	14		35.00		
COVID Infection Before	Yes	21		23.60	10		25.00	0.030	0.863
	No	68		76.40	30		75.00		
COVID Infection After	Yes	5		5.62	1		2.50	0.605	0.437
	No	84		94.38	39		97.50		

N: Number, **χ^2:** Chi-square test, **t**: independent sample t test, **P**: probability value, ***:** $p<0.05$ is statistically significant, ****:** $p\leq0.001$ is statistically highly significant, **SD:** Standard Deviation.

Similarly, those on biologics didn't show significant difference from those without biologics regarding the side effects, incidence of infection before or after vaccine. (Table 6)

Table (6): Comparison between patients on biologics and those without biologics intake regarding vaccine side effects, infection before and after COVID vaccination.

		Biologics						T-Test	
		Yes (34)			No (95)			t	P-value
N of side effect	Range	1	-	9	1	-	10	0.514	0.609
	Mean ±SD	5.118	±	2.088	4.821	±	2.081		
Chi-Square		N		%	N		%	X^2	P-value
Side effect	Yes	17		50.00	56		58.95	0.816	0.366
	No	17		50.00	39		41.05		
COVID Infection Before	Yes	8		23.53	23		24.21	0.006	0.936
	No	26		76.47	72		75.79		
COVID Infection After	Yes	1		2.94	5		5.26	0.304	0.581
	No	33		97.06	90		94.74		

N: Number, χ^2**:** Chi-square test, **t**: independent sample t test, **P**: probability value, ***:** $p<0.05$ is statistically significant, ****:** $p\leq0.001$ is statistically highly significant, **SD:** Standard Deviation.

There was statistically significant positive correlation between the disease duration and the COVID infection before vaccination. (Table 7)

Table (7): Correlation between the disease duration of the rheumatic disease and the incidence of side effects and COVID infection before and after COVID vaccination

		DD (Years)				T-Test	
		N	Mean	±	SD	t	P-value
Side effect	Yes	73	8.068	±	6.476	0.049	0.961
	No	56	8.018	±	4.665		
COVID Infection Before	Yes	31	13.419	±	6.381	7.017	<0.001*
	No	98	6.347	±	4.328		
COVID Infection After	Yes	6	11.333	±	4.274	1.443	0.152
	No	123	7.886	±	5.767		

DD: Disease duration, **N:** Number, **t**: independent sample t test, **P**: probability value, ***:** $p<0.05$ is statistically significant, ****:** $p\leq0.001$ is statistically highly significant, **SD:** Standard Deviation.

DISCUSSION:

Numerous reports from many cohorts about patients with rheumatic diseases revealed no increased risk of unfavorable short and long term outcomes associated with COVID-19 infection compared to the general population[1] In the contrary, other studies showed that patients received a moderate to a high dose of steroid and rituximab and those with high disease activity, especially systemic lupus erythematosus, systemic vasculitis and systemic sclerosis with pulmonary involvement, are at increased risk for worse outcomes or death[2].

Vaccination is the best way to avoid immune-preventable infectious diseases. There are many vaccines against SARS-CoV-2 are approved for use by the general population. COVID-19 vaccines which contain antigens from these infectious agents may also induce autoimmunity or flare of inflammatory rheumatic diseases by certain mechanisms such as molecular mimicry[4].Furthermore, multiple studies showed that the immuno-responsiveness of vaccines may be weakened by the use of certain immunosuppressant or biologics [5]. For solving this controversy in the Egyptian rheumatic diseases patients, this study was

designed to study the clinical efficacy and adverse effects of different COVID 19 vaccines among Egyptian patients with different rheumatic diseases.

Most of our patients received non live vaccine (40% received Sinopharm and 16% received Sinovac) this in agreement with first EULAR recommendations about the COVID vaccination.

Furer et al.[6] delineated that non-live vaccines are recommended in patients with autoimmune diseases. Also it was reported that non live vaccine showed high safety and efficacy in the patient suffering from rheumatic and autoimmune diseases [7]. Macado et al.[8] studied the safty profile of other vaccines as viral vector (Astrazinca & Janssen) and mRNA vacines (PFaizer) and all showed high safety profile and efficacy in decreasing the covid infection.

Thirty-one patients (24.03) were infected before vaccine intake, three of them (9.68) were hospitalized and two (6.45) admitted in ICU. That is similar to results of Assar et al.[9] who found 22.1% of the studied rheumatic patients had COVID19 infection, 17.2% of them were hospitalized and 6% were admitted in ICU.

Regarding the vaccine efficacy, this study showed that the vaccination could decrease significantly the incidence of COVID 19 infection (P value <0.001). Also there was decrease of hospitalization of infected patients with decrease in the need for ICU admission after vaccination although being non-significant. That may indicate the vaccine efficacy in decreasing the incidence and severity of the COVID infection.

Similarly, Bieber et al.[10] who identified that receiving the COVID-19 vaccine lessen COVID infection, hospitalization and mortality.

More than half of the studied patients reported post vaccination side effects, all were not severe. Bodyaches was the commonest side effect (41.8%), headache (39.5%), fever and swelling at site of injection (29.4%), pain at site of injection (28.6%) that is consistent with sautii et al.[11], Polack et al.[12] and Wang,[13].

More ever, Rotondo et al[14] concluded that all types of COVID-19 vaccines were safe in rheumatic patients, the commonest effects were site injection pain then, headache, fever, myalgia and fatigue. And Li et al.[15] recorded vaccine adverse effects in 81.1% of patients, of them the most common were pain at injection site (66.3%), fatigue (57.1%), fever (19.9%), and headache (19.6%).

In agreement with our results Kulikov et al. [16] observed that COVID vaccines were well tolerated in RA patients and that flare of the disease was not noticed.

In the current study, the side effects or flare incidence were not significantly differed between SLE, RA and other rheumatic patients, and that proved its safety among the different rheumatic disease that in agreement with[11-14].

However, recent studies approved that SLE and COVID-19 virus pathogenesis share interferon1 pathways[17-22] that may lead to hyperactivity of the immune responses to covid vaccines causing flare in previously controlled lupus. These findings are in line with our findings as there was nine patients had flare of the rheumatic disease after receiving the vaccine. 4 SLE, 2 RA and 3 with other rheumatic disease.

However, Barbhaiya et al. [23] found that flare after vaccination in rheumatic patients were high with 23% of the flares after the first dose, 43% after the second dose and 33% after both doses.

Although Fan et al.[24] Visentini et al. [25] and Connolly et al.[26] reported 0.4% to 20% flare of rheumatic diseases after vaccine, but Xie et al. [27] summarized that no evidence of increased flare susceptibility in rheumatic patients after vaccine. However, the flares

may be triggered by the vaccine, and these flares are not serious.

The Asia Pacific League of Associations for Rheumatology COVID-19 task force recommended vaccination of all rheumatic patients irrespective of immunosuppressant drugs as there was no evidence of decrease the immune response. Tanriover et al.[28]

We found that the incidence of COVID infection before and after vaccination was not significantly differed between SLE, RA and other rheumatic patients. Also it was not significantly associated with intake of steroid or biologics. That is consistent with bayarousky et al. [29]

While Furukawa et al.[30] found that intake of biologics was negatively associated with anti-SARS-CoV-2 neutralizing Ab level. Anti-SARS-CoV-2 S Ab levels were lower in RA patients than in controls after vaccination.

Yuki et al.[31] found that Steroids intake was associated with lower seroconversion after vaccination and that steroids and Mycophenolate Mofetil had a deleterious effect in immune response to the vaccine these results disagree with ours as we didn't find significant difference between patients on steroids and those without steroids either regarding incidence of infection before or after vaccine or occurrence of the side effects.

Li et al.[15] reported the same side effects in different rheumatic diseases and immunosuppressant therapies. On the other hand, Akiyama et al.[32] observed that COVID-19 in rheumatic patients on steroids or csDMARDs had increased hospitalization and mortality.

Our results support those of Mikuls et al.[33] who found that the conventional synthetic DMARDs and bDMARDs intake do not worsen COVID-19 outcomes.

Our results differ from those of Hyrich et al.[34] who found that covid hospitalization was higher in rheumatic patients on high dose steroids (≥10 mg/day) and from Strangfeld et al. [35] who concluded that COVID-19-related mortality was related to ≥10 mg steroid intake.

Few data was available about the relation between COVID infection and the rheumatic disease duration, but we found that there was statistically significant positive correlation between the disease duration and the incidence of COVID infection before vaccination.

There were some Limitations of the study including Small sample size, cross sectional design of the study didn't provide data about mortality and data about accurate steroid dose, type of biologic received by patients were not available.

Conclusions:

COVID vaccine is tolerable and effective in decreasing of COVID infection and severity in patients with SLE, RA and other rheumatic patients without significant difference between different types of rheumatic diseases or different therapy including steroids or biologics regarding the incidence of flare, side effects or post-vaccine infection.

Disclosure and Conflict of Interest:

Competing interests:

The authors declare that they have no competing interests concerning this article.

Ethical approval:

All procedures performed in the study were in accordance with the ethical standards of the faculty of medicine, Ain Shams university research and ethical committee. We obtained approval from Research Ethics Committee (REC) No. FWA 000017585. FMASU R 166/2022, On 31/10/2022. Written informed consent was obtained from participants for participation in this study.

The FMASU REC is organized and operated according to guidelines of the International Council on Harmonization (ICH) and the Islamic Organization of

Medical Sciences (IOMS), the United States Office for Human research Protections and the United States Code of Feral Regulations and operates under Federal Wide Assurance No. FWA 000017585. FMASU R 166/2022.

Consent for publication:

Not applicable due to patients' privacy concern.

Availability of data and materials:

The datasets generated and/or analyzed during this study are not publicly available due to patients' privacy but are available from the corresponding author on reasonable request.

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The authors received no specific funding for this work.

Authors contributions:

All authors have participated in the concept, design, collect, analysis and interpretation of data, writing, drafting and revising the manuscript. FM: recruited patients, carried out clinical examination and assessment, and generated the result sheets. RM: underwent data tabulation and statistical analysis, and interpreted the patient's data and wrote the final results. MM: recruited patients, carried out clinical examination and assessment, and revised data interpretation and manuscript. RA: was the major contributor in writing and editing the manuscript, designed the protocol, carried out the Ethical approval, and data collection. **All authors have agreed to conditions noted on the Authorship Agreement Form and have read and approved the final version submitted. The content of the manuscript has not been published or submitted for publication elsewhere. All authors read and approved the final manuscript.**

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لقاح كوفيد في المرضى المصريين المصابين بالذئبة الحمراء والتهاب المفاصل الروماتويدي وأمراض الروماتيزم الأخرى

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الخلفية: هناك جدل كبير حول لقاح كوفيد في مرضى الروماتيزم. هل هو آمن؟ هل هو فعال؟ أثبت لقاح كوفيد أنه يقلل من الإصابة بفيروس كوفيد ١٩ في عموم السكان.

الهدف من البحث: دراسة الفعالية و الاثار الجانبيه للقاح كوفيد في المرضى المصريين المصابين بالذئبة الحمراء والتهاب المفاصل الروماتويدي ومرضى الروماتيزم الآخرين. وللتعرف على تأثير الادويه الاسترورديه و البيولوجيه على الإصابة بفيروس كوفيد وشدته واستجابة اللقاح لدى هؤلاء المرضى.

الطريقة: تم تسجيل بيانات ١٢٩ مريضا من مرضى الروماتيزم بما في ذلك العمر والجنس والتدخين ومدة المرض والأدوية ونوع لقاح كوفيد وعدد الجرعات المتلقاة. تم إجراء مقارنة بين مرضى الذئبه الحمراء و مرضى الروماتويد ومرضى الروماتيزم الآخرين فيما يتعلق بالآثار الجانبية للقاح كوفيد وعدوى كوفيد قبل التطعيم وبعده. تم مقارنه المرضى الذين يتلقون الادويه الاسترورديه مع أولئك الذين لا يتناولون الستيرويد فيما يتعلق بالآثار الجانبية للقاح وعدوى ما قبل اللقاح وبعده. تم فعل الشيء نفسه فيما يتعلق بالعلاج البيولوجي.

النتائج: كان هناك ٤٨ مريضًا بمرض الذئبة الحمراء و ٥٤ مريضًا بالتهاب المفاصل الروماتويدي و ٢٧ مريضًا يعانون من أمراض روماتيزمية أخرى (التهاب المفاصل الصدفي وتصلب الجلد والتهاب الجلد والعضلات). في جميع المرضى ، كان هناك انخفاض معتد به إحصائيًا في الإصابة بعدوى كوفيد بعد التطعيم (P <٠,٠٠١). مع انخفاض الاستشفاء للمرضى المصابين وانخفاض قبول وحدة العناية المركزة من ٠ إلى ٦,٤٥٪ بعد التطعيم. لم يكن هناك فرق معتد به إحصائيا بين مرض الذئبة الحمراء ومرض التهاب المفاصل الروماتويدي ومرضى الروماتيزم الآخرين فيما يتعلق بالآثار الجانبية والعدوى قبل التطعيم أو بعده. في جميع المرضى ، لم يكن هناك فرق بين المرضى الذين يتناولون الادويه الاسترورديه وأولئك الذين لا يتناولون الادويه الاسترورديه فيما يتعلق بالآثار الجانبية ، ونسبة الإصابة بالعدوى قبل اللقاح أو بعده. لم يُظهر المرضى اللذين يتناولون العلاج البيولوجى فرقًا كبيرًا عن أولئك الذين لا يتناولون العلاج البيولوجى فيما يتعلق بالآثار الجانبية ، ونسبة الإصابة بالعدوى قبل اللقاح أو بعده

الاستنتاجات: لقاح كوفيد مقبول وفعال في تقليل عدوى كوفيد وشدتها في المرضى الذين يعانون من مرض الذئبة الحمراء ومرض التهاب المفاصل الروماتويدي ومرضى الروماتيزم الآخرين.