Healthcare Encounters and Outcomes of Filipino Patients with Systemic Lupus Erythematosus Managed at a Tertiary COVID-19 Referral Center

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ABSTRACT

Objective. The coronavirus disease 2019 (COVID-19) pandemic has limited healthcare delivery for patients with chronic diseases, including Systemic Lupus Erythematosus (SLE). This study aims to describe the outcomes of patients with SLE in a national COVID-19 referral center in the Philippines.

Methods. A review of records of all adult patients with SLE seen in the University of the Philippines-Philippine General Hospital (UP-PGH) from March 2020 to December 2021 was done. Data about patient characteristics, health encounters, and outcomes before and after the first visit during the study period were extracted. Descriptive statistics were employed.

Results. Our population of 403 patients was predominantly young (mean age 34.53 ± 11.14 years), female, and unemployed. This consisted of 370 known cases of SLE, 92 were diagnosed in institutions outside UP-PGH, and 33 new patients. Over the 22-month study period, there were 2,093 medical encounters, most of which were teleconsultations (81.70%). During an average gap of 53.6 ± 26.7 weeks between the last consultation and the first visit within the pandemic study period, 84 patients (22.70%) discontinued at least one of their SLE control medications, 68 (18.38%) patients developed a lupus flare, and 79 (21.35%) were hospitalized for various reasons. On their return to the rheumatology clinic during the pandemic, 37.47% were in lupus flare, 28.29% needed to be hospitalized, and 20 died. However, 86.75% of flares were controlled. During subsequent health encounters, 48 patients had a new flare (43 of these were controlled) and 20 died. The most common reason for hospitalization (n=160) was lupus disease flare and the most common cause of death (n=40) was pneumonia. Sixty patients acquired COVID-19 infection from which most recovered and four died.

Conclusion. Audio teleconsultation was the most common method used by our lupus cohort to interact with their doctors during the pandemic. There was an average of a year-long interruption in medical care for 62.70%. More than a third developed a disease flare and 15% acquired COVID-19 but outcomes were good in more than 85%. Despite the challenges posed by the pandemic, the majority of our lupus cohort who were able to continue their treatment had favorable outcomes.

Keywords: lupus, outcomes, encounter, COVID-19, Philippines

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INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has caused drastic changes in most healthcare systems. Universal implementation of social isolation measures and travel restrictions have disrupted the provision of care for patients with chronic diseases,[1] including systemic lupus erythematosus. A substantial number of SLE patients reported in a study by Rathi et al. had missed follow-ups (54%) and problems in getting their prescribed medicines due to

lockdown (36%). These factors were correlated with worsening of the disease,[2] as SLE patients require regular follow-up visits to ensure early detection of flares. Rheumatologists were then presented with the difficult task of managing risks to their patients, while learning and implementing new systems for remote healthcare.[3]

The University of the Philippines – Philippine General Hospital (UP-PGH) was delegated as a national referral center for COVID-19 in March 2020, concentrating all efforts on the management of COVID-19 patients, resulting in admissions being limited only to life or limb-threatening diseases. Electronic record system and telemedicine were utilized to reach as many patients as possible while protecting hospital staff.[4] The number of face-to-face (FTF) consultations were limited to 5-10 per service starting March 2020, and teleconsultation became the main mode of healthcare delivery for outpatient consult, but not without its own limitations.[5]

Data on several aspects of the care of SLE patients during this unprecedented time is lacking in the Philippines. Therefore, there is a need to put forward the challenges encountered and lessons learned in managing these patients. This study aims to describe the healthcare encounters and outcomes of SLE patients in a national COVID-19 referral center in the Philippines.

MATERIALS AND METHODS

We performed a review of physical and electronic records of all patients aged 18 years and above with SLE based on the 1997 American College of Rheumatology (ACR) or 2019 European Alliance of Associations for Rheumatology (EULAR)/ACR classification criteria, seen at the University of the Philippines – Philippine General Hospital (UP-PGH) from March 2020 to December 2021. Prior to the pandemic, patient information was mostly stored in physical records. There was a shift to electronic medical records within the first six months of the pandemic. The first electronic chart entry was the reference point for the first pandemic visit. Data about patient characteristics, disease status, and patient outcomes were extracted from records of health encounters that occurred during the specified study period. The primary outcomes of interest included hospitalizations, disease flares, COVID-19 and non-COVID-19 related infection, other comorbidities, and death. The severity of disease flares was based on the Systemic Lupus Erythematosus Disease Activity Index 2000 (SLEDAI 2k). Descriptive statistics such as mean and standard deviation were used to present continuous variables, while frequency and percentage were used for categorical data. The study was approved by the University of the Philippines Manila Research Ethics Board (UPMREB) Review Panel 3 on November 8, 2021 (2021-0594-01), and conducted according to the principles of the Declaration of Helsinki.

RESULTS

Patient characteristics

The demographic and clinical characteristics of 403 included patients are shown in Table 1. Individuals were predominantly female (96.53%) with a mean age (SD) of 34.53 (11.14) years. Two hundred ninety-two (72.46%) were unemployed. Most patients reside in the National Capital Region (214, 53.10%) and in the other provinces of Luzon (186, 46.15%). The most frequent comorbidities identified are cardiovascular disorders (32.88%), antiphospholipid syndrome (17.97%), pregnancy (9.83%), and diabetes (6.44%) (Appendix Table 1). One hundred eighty-seven (46.40%)

Table 1. Characteristics of SLE Patients included in the Study (n= 403)

Characteristics	Mean ± SD or n (%)
Age (years)	34.53 ± 11.14
Female	389 (96.53)
F:M ratio	28:1
Employed	111 (27.54)
Residence	
NCR	214 (53.10)
Luzon	186 (46.15)
Outside Luzon	3 (0.07)
Patient classification on first pandemic visit	
New patients[a]	92 (22.83)
Out-patient	53 (57.60
In-patient	39 (42.39)
Follow-up patients[b]	311 (77.17)
Out-patient	292 (93.89)
In-patient	19 (6.11)
Provision of healthcare service	
Out-patient only	289 (71.71)
Both in- and out-patient	89 (22.08)
In-patient only	25 (6.20)
Comorbidities (number)	
None	193 (47.89)
1	123 (30.52)
≥2	87 (21.59)
Vaccination status for COVID-19	
Unvaccinated	197 (48.88)
Fully vaccinated	169 (41.94)
Partially vaccinated	18 (4.46)
Unknown	19 (4.71)
Vaccine used (n = 187)	
Inactivated vaccine	
Sinovac	94 (50.26)
Sinopharm	4 (2.14)
mRNA vaccine	
Pfizer	32 (17.11)
Moderna	22 (11.76)
Non-replicating vector vaccine	
AstraZeneca	27 (14.43)
Johnson & Johnson	6 (3.21)
Sputnik	2 (1.07)

[a] Patients who consulted for the first time in UP-PGH adult rheumatology
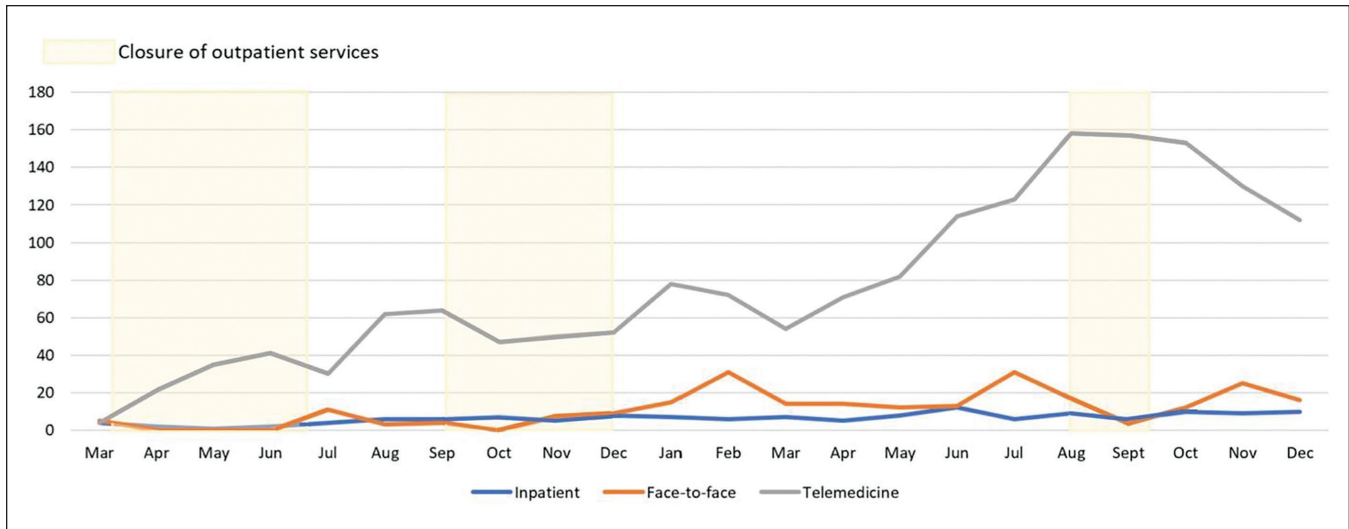[b] Patients who have previous consultations in UP-PGH adult rheumatology

Figure 1. Monthly distribution of encounters during the study period.

received vaccination for COVID-19 but only 41.94% were fully vaccinated. Most received Sinovac, Pfizer, and AstraZeneca (50.26%, 17.11%, 14.43%, respectively).

Patient encounters

All patients contributed to a total of 2,093 health encounters during the study period. Out-patient consultations comprise 93.31%, with an average of 4.84 encounters per patient. Most of these consultations were through telemedicine (81.70%), which increased in number since the start of study period (Figure 1). Face-to-face consultations comprise 11.61%, and remained low compared to telemedicine, with slight increases in number following reopening of the outpatient services. In-patient encounters (6.69%) remained relatively constant throughout the study period. There were 166 patients (41.19%) who had missed at least one out-patient visit. The most frequent reason for a missed visit was inability to connect with the patient's given contact number (81.33%). There were 28 (6.95%) who defaulted follow up (Appendix Table 2).

Patient outcomes observed before the first pandemic visit to UP-PGH

Drug discontinuation

Among the patients with SLE diagnosed prior to the pandemic (n=370), there was a mean interval of 53.6 ± 26.7 weeks between the last pre-pandemic visit and the first pandemic visit. During this gap period, there were 84 patients (22.7%) who discontinued at least one (1) and 21 (5.68%) who discontinued all SLE-control medications (Table 2). Hydroxychloroquine (74.16%) was the most frequently discontinued medication, followed by mycophenolate mofetil and azathioprine (10.11%), and prednisone (6.74%).

Disease flare

There were 68 patients (18.38%) who had a disease flare. Fifty-nine (86.76%) had mild to moderate disease flare and 9 (13.24%) had severe flare based on SLEDAI 2k (Appendix Table 3). The manifestations most frequently identified during the flare were arthritis, followed by rash,

Table 2. Outcomes of Diagnosed SLE Patients prior to their First Consultation to PGH during the Pandemic

Outcome	Number of patients (%)
Patients with established SLE prior to first pandemic visit[a]	370
Discontinuation of SLE control medication	
One medication	84 (22.70)
All medications	25 (6.76)
Disease flare prior to first pandemic visit	68 (18.38)
Flare controlled	57 (83.82)
Flare uncontrolled	11 (16.18)
Needed to visit other healthcare facilities for any reason	140
Out-patient only	61 (43.57)
In-patient only	41 (29.29)
Both in- and out-patient	38 (27.14)
Total number of visits to other institutions Level of care	171
Primary	
Private	73 (42.69)
Government	5 (2.92)
Secondary	
Private	27 (15.79)
Government	5 (2.92)
Tertiary	
Private	25 (14.62)
Government	36 (21.05)

[a] *Included are new patients who were previously diagnosed outside UP-PGH (n=47) and those diagnosed at UP-PGH before the age of 19 (n=12)*

nephritis and hematologic (thrombocytopenia and anemia), (34.09%, 31.82%, 11.36%, 6.82%, 5.68%, respectively) (Appendix Table 4). Flares were controlled in 55 (80.88%) patients (Appendix Table 5).

Consultations in other institutions

There were 140 patients (37.83%) who consulted (n=171 visits) at other healthcare institutions instead of UP-PGH (Table 2). Most of these visits were at primary healthcare institutions (45.61%), 18.71% in secondary, and 35.68% in tertiary institutions.

Outcomes observed during consultations in PGH during the pandemic period

Drug discontinuation

There were 38 (9.92%) patients who discontinued at least one SLE control medication. The most frequent of which is hydroxychloroquine followed by mycophenolate mofetil, azathioprine and prednisone (54.76%, 19.04%, 14.28%, 11.9%, respectively).

Disease flare

The average follow-up period from the first pandemic visit to the latest one during the study period averages 30.7 ± 18.9 weeks. There were 151 patients (37.47%) with disease flare on their first pandemic visit (Table 3), mostly mild to moderate (68.87%) in severity (Appendix Table 3). The most frequent manifestations were nephritis (19.77%), acute rash (19.39%), arthritis (18.63%), thrombocytopenia (9.89%), and anemia (4.56%) (Appendix Table 4). Control of flares was done on an out-patient basis in 54.97% and after hospitalization in 31.79%. Deaths occurred in 20 of 151 patients (13.25%) (Appendix Table 5).

Forty-eight (11.91%) patients who had stable disease during the first pandemic visit had a flare afterward. These flares were mostly mild to moderate (87.50%) but six (12.50%) were severe (Appendix Table 3). Thirty-nine (81.25%) of total flares were controlled as out-patient, and four (8.33%) were controlled after hospitalization. There were two deaths (4.17%) among these patients (Appendix Table 5).

Occurrence of infection

There were 152 infections that were observed. Non-COVID-19 infections occurred in 125 patients (31.01%). The most frequent non-COVID-19 infections were pneumonia (28.29%), urinary tract infection (26.32%), tuberculosis (13.16%), and head and neck infections (including the upper respiratory tract, 13.16%).

Coronavirus disease-19 was documented in 60 patients (14.89%). Most of them had moderate COVID-19 (85%) and only 8.33% and 6.67% were critical and severe, respectively. Fifty-six (93.33%) of patients who had COVID-19 recovered and four (6.67%) died, all of whom are classified as COVID-19 critical (Appendix Table 6).

Table 3. Outcomes of New and Follow-up patients Consulting at the UP-PGH from March 2020 to December 2021 (n=403)

Outcome: Disease Flares and their outcomes	Number of patients (%)
Disease flare detected on first pandemic visit (n=403)	151 (37.47)
Follow-up patients	91 (60.93)
Controlled[a]	32 (35.16)
Uncontrolled[b]	2 (2.20)
Death	7 (7.69)
New patients	59 (39.07)
Controlled	46 (77.97)
Uncontrolled	0
Death	13 (19.70)
Disease flare detected on subsequent visits among patients who had inactive disease on their first pandemic visit	
Follow-up patients (n=311)	41 (13.18)
Controlled	38 (92.68)
Uncontrolled	0
Unknown[c]	1 (2.44)
Death	2 (4.88)
New patients (n=92)	7 (7.6)
Controlled	5 (71.43)
Uncontrolled	0/7
Unknown	2/7 (28.57)
Death	0/7

Outcome: Hospitalizations in PGH or other institutions	Number of patients (%)
With at least 1 hospitalization in UP-PGH (various reasons)	114 (28.29)
Total deaths from any cause	40/403 (9.93)
Discontinuation of SLE control medication during pandemic visits[d]	34/383 (8.88)
One medication	4/383 (1.04)
All medications	

[a] Resolution of manifestations of disease flare after initial treatment
[b] Disease flare with progressive or non-resolving symptoms or laboratory parameters despite treatment, as of the end of study period. For nephritis, progressive deterioration of renal function despite initial/induction therapy or change in immunosuppressive treatment during study period.
[c] Patient defaulted at end of study period
[d] Excluded are those who died on first pandemic visit (n=20)

Hospitalizations and death

A total of 114 patients (28.29%) had at least one hospitalization in UP-PGH during the study period. The most frequent indication for hospitalization was SLE flare (35.62%), followed by non-COVID-19 infections (21.87%). Pregnancy and COVID-19-related hospitalizations comprise 12.50% and 11.87%, respectively (Appendix Table 7).

Forty patients (9.93%) died during the study period, 20 of them during or right after their first pandemic visit to PGH and the other 20 during the subsequent follow-up period. The most common cause of death was non-COVID-19 infections (pneumonia), followed by cardiovascular disease (15%) (Appendix Table 8). Ten patients (25%) died with no documented cause (Appendix Table 8).

DISCUSSION

We performed a descriptive study on the experience of a national COVID-19 referral center in managing Filipino SLE patients during the first 22 months of the pandemic. Our results revealed important points on healthcare access, treatment interruption, and outcomes during this time.

Globally, a decline of up to 45-65.5% in the hospitalization rate of SLE patients were found, which coincides with nationwide lockdowns.[6-9] In 2019, there were a total of 2008 SLE patient encounters (889 cases seen as outpatient and 188 hospital admissions) in UP-PGH during a 12-month period. The first 12 months of face-to-face encounters in our study was only 0-7.82% of the monthly encounters identified during the same time period in 2019. Compared to the 22-month duration of this study, we experienced an almost proportional rate of decline in total healthcare encounters (in-patient and out-patient) as other published data. This coincides with the closure of outpatient facilities as well as the decrease in total bed capacity catering non-COVID-19 patients.[4]

During the early months of the pandemic, almost a third of our patients discontinued at least one SLE control medication. Of these, hydroxychloroquine was the most frequently discontinued drug (74.16%). The interruption in hydroxychloroquine intake may partly be due to the shortages of this drug when it gained attention as a potential treatment for COVID-19,[10,11] difficulty in individual procurement due to regional lockdowns, and an economic collapse[12] which impacts the unemployed majority in our cohort. An almost similar finding was reported in India by Rathi et al., where 36% of their SLE patients dealt with problems acquiring the prescribed drugs during this time period.[2] In the Philippines, an online survey of 512 SLE or rheumatoid arthritis patients reported that 68.6% of SLE patients who were prescribed hydroxychloroquine had irregular intake due to drug unavailability. This was significantly associated with an increased occurrence of musculoskeletal and cutaneous complaints among these patients.[13] This proves that those who are consistently maintained on this drug are less likely to experience a flare.[14,15] An important finding in our study was that after the first pandemic visit, there was a decrease in drug discontinuation rate (from 29.5 to 9.9). This owes to the provision of free hydroxychloroquine by the Department of Health.

Our cohort mainly resides in the epicenter of the pandemic (NCR) which implemented the longest and the strictest mobility regulations,[16] limiting access to health services and diagnostics. Healthcare utilization for various reasons outside of UP-PGH during this gap period was mostly in primary care facilities, including government and private clinics. This may reflect the difficulty in seeking care at secondary or tertiary hospitals whose bed capacities and services may be limited to mainly COVID-19 cases. Although 19.11% of flares were uncontrolled, 70.6% of flares (mainly mild to moderate) were resolved through outpatient visits at other institutions. In this regard, the number of flares (18.38%) during the gap between pre-pandemic visit and the first pandemic visit which averages about 53 weeks, was self-reported and may be underestimated. And a clear comparison between the frequency of flares during that period was difficult to do.

Audio telemedicine was still the major means of consultation in our study, consistent with published data. As an example, the Dutch Rheumatology society reported that more than 80% of consultations were via the telephone during the pandemic.[17] Even so, our study showed that almost half had at least one missed visit, the majority of which were telecommunication problems. Nevertheless, 50.6% of mild to moderate flares were controlled solely through telephone consultations during the time. This emphasizes that telemedicine is an important channel through which SLE patients may be monitored amid difficulty in healthcare access. A study in Hong Kong showed that the proportion of patients who maintained inactive disease was similar between those who were followed up via telemedicine and those under conventional care.[18] Broadly similar conclusions were seen in Singapore where disease flares at follow-up visits were similar between remote and face-to-face consultations.[19]

The risk of infection is significantly higher with SLE patients compared to the general population, and the use of immunosuppressive medication can increase that risk.[20,21] Moreover, infections are the leading causes of morbidity and mortality in SLE.[22,23] Our study showed a significant proportion of patients acquiring infection before and after their first pandemic visit. Infection was also the most common cause of death. This is consistent with the systematic review and meta-analysis by Pego-Reigosa et al., which showed that the risk of acquiring pneumonia and tuberculosis is higher than the healthy population.[20]

While the true incidence of COVID-19 infection in SLE as compared to the general population is still unknown, initial data suggests that there seems to be no increased risk.[24] The incidence of confirmed COVID-19 infection in our cohort (14.89%) is higher than in other studies (1.8-8.4%).[25-30] This increase may be due to the concentration of our patients in the epicenter of the pandemic and the fact that the Philippines carries the highest burden of COVID-19 cases and deaths in the Western Pacific region.[31] Furthermore, the risk factors for more severe infection in SLE patients remains unclear[32] and it may be dictated by demographic factors, comorbidities as well as uncontrolled disease. Data suggests that active lupus nephritis is a significant predictor for severe to critical COVID-19, which may be due to the need for higher doses of immunosuppression.[33,34] Indeed, 3 out of 4 mortalities from critical COVID-19 in our cohort had active nephritis.

The strength of our study lies in the number of included patients as well as the long duration of observation. It captures the characteristics and outcomes of Filipino SLE

patients in the face of four (4) surges since the pandemic began.[35] This study also identifies areas for further research such as socioeconomic and technological factors, as well as psychological determinants, that may influence health-seeking behavior and outcomes. However, the retrospective nature of this study lends itself to the risk of recall bias and incomplete data sources. Additionally, associations cannot be made and causal relationships cannot be established. Nevertheless, further studies on the different personal and socioeconomic factors that might have contributed to the decrease in healthcare utilization are important to better understand the impact of the pandemic on this vulnerable population.

CONCLUSION

We have uniquely described the encounters, characteristics, outcomes, and challenges in managing Filipino SLE patients in a national COVID-19 referral center. The unprecedented arrival of COVID-19 has taken its toll on healthcare delivery for SLE patients, evidenced by drug discontinuation, a decrease in the total encounters, and the significant gap in follow-up. Audio teleconsultation was the main mode of healthcare access. Nevertheless, the majority had favorable outcomes, with most patients managed through audio telemedicine.

Statement of Authorship
JRMG and EOS contributed equally in the conceptualization of work, acquisition and analysis of data, drafting and revising of manuscript, and final approval of the version to be published. JHAB contributed in the acquisition and analysis of data, and drafting and revising of manuscript.

Author Disclosure
The authors have no conflicts of interest to declare.

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APPENDICES

Appendix Table 1. Comorbidities

Comorbidity	n (%)
Number of patients with comorbidity	295
Cardiovascular disorder	87 (32.88)
Hypertension	82 (27.79)
Heart disease	5 (1.69)
Autoimmune disorder	53 (17.97)
Antiphospholipid syndrome (APS)	47 (17.97)
Rheumatoid arthritis	6 (2.03)
Other musculoskeletal disorders	38 (12.88)
Osteoarthritis	15 (5.08)
Avascular necrosis	12 (4.06)
Fibromyalgia	4 (1.35)
Osteoporosis	4 (1.35)
Gout	3 (1.01)
Pregnancy	29 (9.83)
Endocrine disorder	28 (9.49)
Diabetes	19 (6.44)
Thyroid dysfunction	9 (3.05)
Chronic kidney disease	16 (5.42)
Cataract	11 (3.73)
Bronchial asthma	10 (3.39)
Cerebrovascular disease	10 (3.39)
Malignancy	5 (1.69)
Major depressive disorder	3 (1.02)
Others	5 (1.69)

Appendix Table 2. Patient Encounters during the Study Period

Patient Encounters	n (%)
Total number of visits in UP-PGH	2093
In-patient	140 (6.69)
Out-patient face-to-face	243 (11.61)
Telemedicine	1710 (81.70)
Average number of out-patient encounter per patient	4.84
Frequency of missed visits	
None[a]	217 (53.84)
1	70 (17.37)
2-3	55 (13.65)
>4	41 (10.17)
Reasons for missed visit *(n=166)*	
a. Number unreachable	135 (81.33)
b. Not available for consult	15 (9.04)
c. Transportation/funds problem	12 (7.23)
Patients who have defaulted follow-up[b]	28 (6.95)

[a] Excluded are newly diagnosed patients who died after the first pandemic visit (n=20)
[b] Patients with no documented follow-up after four or more consecutive missed visits, or those who transferred to other institution

Appendix Table 3. Severity of Disease Flares

Outcome	Flares occurring prior to first pandemic visit (n=68)	Flares detected on the first pandemic visit (n=151)	Flares occurring after the first pandemic visit among patients with inactive disease (n=48)
Mild to moderate	59 (86.76)	104 (68.87)	42 (87.50)
Severe	9 (13.24)	47 (31.13)	6 (12.50)

Appendix Table 4. Manifestations of Disease Flares

Manifestation	Prior to first pandemic visit (total flares=68)	On first pandemic visit (total flares=151)	After first pandemic visit (initially inactive disease who later had a flare) (total flares=48)
Renal	10 (11.36)	52 (19.77)	10 (16.66)
Cutaneous	28 (31.82)	51 (19.39)	14 (23.33)
Arthritis	30 (34.09)	49 (18.63)	16 (26.66)
Alopecia	5 (5.68)	6 (2.28)	4 (6.66)
Thrombocytopenia	6 (6.82)	26 (9.89)	4 (6.66)
Anemia	5 (5.68)	12 (4.56)	1 (1.66)
Leukopenia	0	2 (0.08)	1 (1.66)
Neurologic/ophthalmologic	2 (2.27)	9 (3.42)	1 (1.66)
Vasculitis	1 (1.36)	4 (1.52)	0
Cardiac	0	5 (1.90)	0
Serositis	0	4 (1.52)	0
Mucosal ulcers	1 (1.36)	3 (1.14)	9 (15)

Appendix Table 5. Outcome of Disease Flares which Occurred during the Study Period

Outcome	Flares occurring prior to first pandemic visit (n=68)	Flares detected on the first pandemic visit (n=151)	Flares occurring after the first pandemic visit among patients with inactive disease (n=48)
Controlled through out-patient care	48 (70.59)	83 (54.97)	39 (81.25)
Controlled after hospitalization	7 (10.29)	48 (31.79)	4 (8.33)
Uncontrolled	13 (19.12)	0	0
Death	-	20 (13.25)	2 (4.17)
Unknown	0	0	3 (6.25)

Appendix Table 6. Infections in New and Follow-up Patients Consulting at the UP-PGH from March 2020 to December 2021[a]

Non-COVID-19 infections	n (%)
Patients who had non-COVID-19 related infection	125 (31.01)
Total number of non-COVID-19 infection	152
a. Pneumonia	43 (28.29)
b. Urinary tract infection	40 (26.32)
c. Tuberculosis (Pulmonary, disseminated)	20 (13.16)
d. Head and neck infections (upper respiratory, otitis media, ophthalmic)	20 (13.16)
e. Other bacterial infections (skin, meningitis, intra-abdominal)	15 (9.87)
f. Fungal infections (vaginal/oral candidiasis, fungal SSTI)	11 (7.24)
g. Viral infections (herpes zoster, dengue)	3 (1.97)
COVID-19 infections	n (%)
Patients who had documented COVID-19 infection	60 (14.89)
Severity of COVID-19 infection	
Mild	0
Moderate	51 (85)
Severe	4 (6.67)
Critical	5 (8.33)
Outcome of COVID-19 infection	
Recovered	56 (93.33)
Died	4[b] (6.67)

[a] Infections were cumulative of those managed in PGH and elsewhere
[b] All who died were COVID-19 critical

Appendix Table 7. Events Leading to Hospitalization of All Patients during Study Period

Events leading to hospitalization	Events (%)
Total events	160
a. Disease flare	57/160 (35.62)
b. Non-COVID-19 infection	35/160 (21.87)
c. Pregnancy delivery/morbidity	20/160 (12.50)
d. COVID-19 infection	19/160 (11.87)
e. Surgical procedure	11/160 (6.87)
f. Cardiovascular morbidity	8/160 (5)
g. Others	8/160 (5)
h. Unknown	2/160 (1.25)

Appendix Table 8. Causes of Deaths during the Study Period

Cause	Number of patients (%)
Infection	
Non-COVID-19 infection (Septic shock, pneumonia)	14 (35.0)
COVID-19 infection	5 (12.5)
Non-infectious causes	
Cardiovascular (MI, fatal arrhythmia, pulmonary embolism)[a]	6 (15.0)
Neurologic (CVD bleed, herniation)	2 (5.0)
Malignancy (cervical CA, vulvar CA)	3 (7.5)
Unknown[b]	10 (25.0)

[a] Observed in a patient with COVID-19
[b] Deaths occurring outside of UP-PGH with unknown cause as reported by patients' significant others