

461. Classical Antigen Presenting Cell Activation Correlates with T Cell Immunity and COVID-19 Severity

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Session: P-21. COVID-19 Research

Background. The initial response of immune cells against respiratory viruses often determines the severity and duration of disease. The early trajectory of the immune response during infection with SARS-CoV-2 remains poorly understood. Dysregulation of innate immune factors that facilitate viral clearance and the adaptive response, such as type I interferons, have been implicated in severe COVID-19. However, collection of biological samples during the first seven days post-symptom onset has posed a logistical challenge, limiting our knowledge surrounding the immune responses that drive protection versus immunopathology.

Methods. From March 2020, Military Health System beneficiaries presenting with a positive SARS-CoV-2 test, a COVID-19 like illness, or a high-risk SARS-CoV-2 exposure at nine military medical treatment facilities across the United States were eligible for enrollment in our longitudinal cohort study, which included collection of respiratory sample, sera, plasma, and peripheral blood mononuclear cells (PBMCs). Twenty-five SARS-CoV-2 infected study participants provided samples with in the first seven days of symptom onset, fifteen of whom were hospitalized with COVID-19. We employed multiparameter spectral flow cytometry to comprehensively analyze the early trajectory of the innate and adaptive immune responses.

Results. We discovered that early activation of critical antigen presenting cell subsets was impaired upon comparing inpatients with outpatients, correlating with decreased antigen-experienced T cell responses. Specifically, we noted reduced expression of key costimulatory molecules, CD80 and CD86, on conventional dendritic cells that are required for viral antigen-specific T cell priming. Reduction in CD38, a marker of activation was also observed on inpatient dendritic cell subsets.

Conclusion. Reduced antigen presenting cell activation and expression of ligands that facilitate T cell engagement may impede the efficient clearance of SARS-CoV-2, coinciding with more severe disease in our cohort. Further analysis of the functional activation of early innate immune responses triggered by SARS-CoV-2 may unveil new immune biomarkers and therapeutic targets to predict and prevent severe disease associated with inadequate T cell immunity.

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462. Differences in the Humoral Response to SARS-CoV-2 Infection in Children vs. Adult

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Background. One of the most striking observations of the COVID-19 pandemic has been the difference in infection among children vs. adults. Overall, children with SARS-CoV-2 infection generally had milder disease compared to adults, though the cause is not clear.

The objective of this study was to compare the humoral response to infection in children vs. adults of a same family.

Methods. We performed a prospective cohort study at Sainte-Justine University Health Center in Montreal, Canada from July 2020 to March 2021. Children with a positive SARS-CoV-2 PCR were recruited from the COVID-19 clinic (index case), enrollment was offered to all household members. Serum IgG against SARS-CoV-2 native S1/S2 spike proteins was measured using the Diasorin (Liaison XL) assay, 4-6 months following a positive PCR. A mean antibody threshold of 15 Arbitrary unit per ml (AU/ml) was considered seropositive, with 94.4% positive agreement to plaque reduction neutralization tests (PRNT90) at a 1:40 ratio. Antibody titer was compared between children and adults.

Results. 111 participants (52 adults and 59 children) were recruited from 50 separate families. Characteristic of participants and their clinical symptoms are described in Table 1. Among all participants, 76.3% children were SARS-CoV-2 seropositive vs.

51.9% of adults (p=0.007). Median antibody titer was significantly higher in children vs. adults (82.8 AU, [IQR: 18.4-130], vs 17.0 AU, [IQR: 6.8-77.8], p=0.006); findings were similar among SARS-CoV-2 PCR positive participants only. Overall, 13 participants were PCR positive but seronegative, 7 were PCR negative and seropositive, while 61 were both PCR positive and seropositive. Older participants and those with any comorbidity. Among the PCR positive group, the seropositive participants were younger (median age 31±17 vs 19±17 years, p=0.003) and more likely to have comorbidity (69% vs 29%, p=0.007).

Table 1: Clinical characteristics and antibody response among participants

	All Participants(n=111)			Only participants with Positive SARS-CoV-2 PCR (n=73)		
	Adult n=52	Child n=59	p-value	Adult n=30	Child n=43	p-value
Age (years, mean±SD)	41.5±10.6	8.5±5.5		40.2±11.9	8.6±5.7	
Sex (male)	19 (36.5%)	24 (40.7%)	0.66	10 (33.3%)	18 (41.8%)	0.46
SARS-CoV-2 PCR						
Positive	30 (57.7%)	44 (74.5%)	0.10	30	43	NA
Negative	18 (34.6%)	13 (22.0%)		0	0	NA
Not Done	4 (7.7%)	2 (3.4%)		0	0	NA
DISEASE SEVERITY						
Asymptomatic	14 (26.9%)	18 (30.5%)	0.67	5 (16.7%)	9 (20.9%)	0.37
Mild disease	27 (51.9%)	38 (64.4%)	0.18	15 (50%)	31 (72%)	0.05
Moderate disease	7 (13.5%)	3 (5.8%)	0.11	6 (20%)	3 (7.0%)	0.1
Severe disease	3 (5.8%)	0	0.1	3 (10%)	6 (14.0%)	0.72
Critical disease	1 (1.9%)	0	0.5	1 (3%)	0	0.41
SEROLOGY						
Time between SARS-CoV-2 PCR and Serology (Mean ± SD)	137 ±51	133±45	0.64	139 ±47	139 ±42	0.76
Seropositive (Cut off >=15 AU/ml)	27 (51.9%)	45 (76.3%)	0.007	21 (70%)	39 (90.7%)	0.02
Titer (AU/ml) (median, IQR)	17 [6.8-77.8]	82.8 [18.4-130]	0.006	32.8 [12.9-108]	93.2 [49.8-148]	0.03

Conclusion. These results suggest that children have a stronger antibody response to SARS-CoV-2 infection than adults, and that older age and presence of comorbidity are associated with a less robust humoral response. Further work on the differences in response between children and adults may help elucidate mechanisms underlying the severity of disease

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463. Factors of Social Determinants of Health Associated with Length of Stay in COVID-19 Patients with Multimorbidity in Southwest Georgia, United States

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Session: P-22. COVID-19 Social Determinants of Health

Background. Previous studies have observed that multimorbidity, defined as two or more comorbidities, is associated with longer lengths of stay (LOS) and higher mortality in patients with COVID-19. In addition, inequality in social determinants of health (SDOH), dictated by economic stability, education access and quality, health-care access and quality, neighborhoods and built environment, and social and community context have only added to disparities in morbidity and mortality associated with COVID-19. However, the relationship between SDOH and LOS in COVID-19 patients with multimorbidity is poorly characterized. Analyzing the effect SDOH have on LOS can help identify patients at high risk for prolonged hospitalization and allow prioritization of treatment and supportive measures to promote safe and expeditious discharge.

Methods. This study was a multicenter, retrospective analysis of adult patients with multimorbidity who were hospitalized with COVID-19. The primary outcome was to determine the LOS in these patients. The secondary outcome was to evaluate the role that SDOH play in LOS. Poisson regression analyses were performed to examine associations between individual SDOH and LOS.

Results. A total of 370 patients were included with a median age of 65 years (IQR 55-74), of which 57% were female and 77% were African American. Median Charlson Comorbidity Index was 4 (IQR 2-6) with hypertension (77%) and diabetes (51%) being the most common, while in-hospital mortality was 23%. Overall, median length of stay was 7 days (IQR 4-13). White race (-0.16, 95% CI -0.27 to -0.05, p=0.003) and residence in a single-family home (-0.28, 95% CI -0.38 to -0.17, p< 0.001) or nursing home/long term care facility (-0.36, 95% CI -0.51 to -0.21, p< 0.001) were associated with decreased LOS, while Medicare (0.24, 95% CI 0.10 to 0.38, p=0.001) and part-time (0.35, 95% CI 0.13 to 0.57, p=0.002) or full-time (0.25, 95% CI 0.12 to 0.38, p< 0.001) employment were associated with increased LOS.

Conclusion. Based on our results, differences in SDOH, including economic stability, neighborhood and built environment, social and community context, as well as healthcare access and quality, have observable effects on COVID-19 patient LOS in the hospital.

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464. Structural Vulnerability among Patients with HIV and SARS-CoV-2

Coinfection: Descriptive Case Series from the U.S. Midwest

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Session: P-22. COVID-19 Social Determinants of Health

Background. It is well known that the HIV epidemic and COVID-19 pandemic have both disproportionately harmed marginalized minority and immigrant communities in the United States. The risk factors associated with disease incidence and outcomes reaffirm that *structural vulnerabilities*—sociopolitically imposed risk factors like discrimination, legal status, poverty, and beyond which impact a patient’s opportunity to achieve optimal health—play a key role in facilitating the inequitable harms of COVID-19 and HIV alike. This study explores the role of structural forces in increasing the risk of SARS-CoV-2 coinfection among people with HIV (PWH).

Methods. We performed a retrospective chart review of PWH receiving care at the University of Nebraska Medical Center HIV clinic in Omaha, Nebraska, to collect patient demographics, comorbidities, HIV outcomes, and COVID-19 outcomes for 37 patients with HIV and SARS-CoV-2 coinfection as of August 27, 2020. As a comparison group, we obtained demographic data from a registry of all patients seen at the HIV clinic. We used R Statistical Software to perform descriptive statistical analysis.

Results. Relative to our overall HIV clinic population, over twice as many Hispanic patients (35.1% vs. 16.0%), three times as many undocumented patients (13.5% vs. 4.2%), and four times as many refugee patients (16.2% vs. 4.0%) had COVID-19. The majority (67.6%) of coinfecting patients reported working in “essential” jobs during the pandemic. Thirty-four of the 37 people with HIV and COVID-19 (PWHC) had at least one comorbidity, including increased BMI (83.7%), hypertension (64.9%), or hyperlipidemia (48.6%). All 37 PWHC remained alive as of October 4, 2020.

Table 1. Demographics and HIV Disease Progression of People with HIV and SARS-CoV-2 Coinfection vs. Overall HIV Clinic Registry

	Patients with HIV/SARS-CoV-2 Coinfection (N=37)	HIV Registry (N=1128)
Age (years)		
Mean (SD)	46.3 (12.3)	46.7 (12.6)
Median [Min, Q1, Q3, Max]	47 [23, 40, 56, 73]	48 [3, 37, 56, 85]
Gender	n (%)	n (%)
Cisgender male	28 (75.7)	849 (75.3)
Cisgender female	9 (24.3)	260 (23.0)
Transgender ^a	0 (0)	19 (1.7)
Race		
White	24 (64.9)	696 (61.7)
Black	12 (32.4)	344 (30.5)
Asian	1 (2.7)	29 (2.6)
Other ^b	0 (0)	56 (5.0)
Missing	0 (0)	3 (0.3)
Ethnicity		
Not Hispanic or Latinx	24 (64.9)	946 (83.9)
Hispanic or Latinx	13 (35.1)	180 (16.0)
Missing	0 (0)	2 (0.2)
Legal status		
Refugee	6 (16.2)	45 (4.0)
Undocumented	5 (13.5)	47 (4.2)
Asylee	0 (0)	6 (0.5)
Other	4 (10.8)	42 (3.7)
U.S. Citizen or Permanent Resident	22 (59.5)	936 (83.9)
Missing	0 (0)	54 (4.8)

Demographics and HIV Disease Progression of People with HIV and SARS-CoV-2 Coinfection vs. Overall HIV Clinic Registry

Income (percent of federal poverty level)		
<100%	8 (21.6)	372 (33.0)
100-200%	13 (35.1)	267 (23.7)
201-300%	9 (24.3)	201 (17.8)
301-400%	6 (16.2)	93 (8.2)
>400%	1 (2.7)	34 (3.0)
Missing	0 (0)	161 (14.3)
Housing status		
Stable/permanent	37 (100)	1043 (92.5)
Non-permanent housing	0 (0)	76 (6.7)
Incarcerated	0 (0)	4 (0.4)
Missing	0 (0)	5 (0.4)
Primary insurance		
Private	24 (64.9)	646 (57.3)
Medicare	7 (18.9)	202 (17.9)
Medicaid	3 (8.1)	122 (10.8)
Uninsured	3 (8.1)	152 (13.5)
Other plan, not listed	0 (0)	2 (0.2)
Missing	0 (0)	4 (0.4)
Viral suppression (<50 copies/mL) at most recent HIV clinic visit		
Yes	36 (97.3)	849 (75.3)
No	1 (2.7)	166 (14.7)
Missing	0 (0)	113 (10.0)
History of AIDS		
Yes	16 (43.2)	393 (34.8)
No	21 (56.8)	735 (65.2)

^aGender identities within the transgender spectrum were combined to maintain patient anonymity.
^bIncludes American Indian and Alaska Native, Native Hawaiian or Other Pacific Islander.
 Abbreviations: AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

Demographics and HIV Disease Progression of People with HIV and SARS-CoV-2 Coinfection vs. Overall HIV Clinic Registry (continued)

Table 2. Comorbidities and Outcomes of Patients with HIV and SARS-CoV-2 Coinfection

	Patients with HIV/SARS-CoV-2 Coinfection (N=37)
BMI category (kg/m²)	n (%)
Normal BMI (18.5-24.9)	5 (13.5)
Overweight BMI (25.0-29.9)	17 (45.9)
Obese BMI (30.0-39.9)	13 (35.1)
Severely obese BMI (>40)	1 (2.7)
Missing	1 (2.7)
Diabetes mellitus	
None	22 (59.5)
Prediabetes	9 (24.3)
Type 2 diabetes mellitus	6 (16.2)
Hypertension	
Yes	24 (64.9)
No	13 (35.1)
Hyperlipidemia	
Yes	18 (48.6)
No	19 (51.4)
Maximum level of COVID-19 care required	
Outpatient	34 (91.9)
Inpatient ^a	2 (5.4)
Intensive care	0 (0.0)
Not on file	1 (2.7)

Footnotes:
^aOne inpatient admission was for chest pain rule-out, and the other was for seizures. Both patients were tested routinely for SARS-CoV-2 upon admission and resulted SARS-CoV-2-positive.
 Abbreviations: AIDS, acquired immunodeficiency syndrome; HIV, human immunodeficiency virus; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; BMI, body mass index; COVID-19, coronavirus disease 2019.

Conclusion. The disproportionate burden of SARS-CoV-2 coinfection on Hispanic, undocumented, and refugee PWH may be a product of structural vulnerabilities contributing to greater risk of exposure. Although all 37 PWHC had