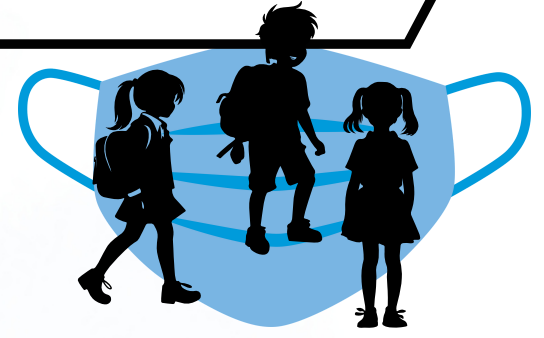


EPIDEMIOLOGY AND FACTORS ASSOCIATED WITH SARS-COV-2 TRANSMISSION AMONG STUDENTS FOLLOWING RESUMPTION OF FACE-TO-FACE CLASSES IN A PRIVATE UNIVERSITY IN METRO MANILA, PHILIPPINES

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BACKGROUND AND OBJECTIVES

COVID-19 has brought disruptions in our lives including the education system. In the Philippines, schooling has transitioned to online and modular distance learning delivery of instruction at the start of the pandemic. To date, there has been no local study on the clustering rates within schools in the Philippines. This study aims to determine the epidemiology and factors associated with SARS-CoV-2 transmission among students following resumption of face-to-face classes in a private university in Metro Manila, Philippines. Specifically, it aims:

- to describe the demographic and clinical characteristics of university students with confirmed COVID-19, such as: age, sex, vaccination status, presenting signs and symptoms, disease severity, time to clinical recovery, time interval from COVID-19 vaccination
- and, to determine the incidence of clustering among university students after resumption of face-to-face classes.

METHODOLOGY

RESEARCH DESIGN: Retrospective cross-sectional study

OUTCOME OF INTEREST: COVID-19 infection among students in the University of Santo Tomas in Metro Manila, Philippines during AY 2021-2022 and 2022-2023

- For the AY 2021-2022, only students with confirmed COVID-19 enrolled at Doctor of Medicine, Bachelor of Science in Medical Technology, Bachelor of Science in Nursing and Bachelor of Science in Physical Therapy programs were included as these were the only programs authorized to conduct limited face-to-face classes for both terms in that year.
- For AY 2022-2023, all academic units have resumed face-to-face classes hence all students (including high school, college and post-graduate students) with confirmed COVID-19 enrolled were included.
- *A separate section on students <19 years old was done (e.g. junior, education and senior high school).*

DATA COLLECTION: Digital chart review of students with confirmed COVID-19 was retrieved using Thomasian Online Medical Services and Support (ThOMedSS), a platform launched by UST Health Services to allow the members of the university community to access online medical and mobile medical and patient services.

STATISTICAL ANALYSIS:

- A multiple logistic regression model was developed to determine factors associated with SARS-CoV-2 transmission, with the outcome of this model being the presence or absence of SARS-CoV-2 infection. P-values below 0.05 were considered statistically significant.
- Incidence of clustering was determined. Clustering was defined as two cases reported at the college or program (e.g. Doctor of Medicine, BS in Nursing, etc.) and being reported within 7 days of each other; if the difference in date between two cases was less than or equal to 7 days, or they could be linked by a sequence of such cases.

RESULTS

A total of 1,302 student records in the university's high school and college levels were obtained for analysis.

Demographic and clinical characteristics of students with confirmed COVID-19, Junior High School (N=31) and Senior High School (N=90), A.Y. 2022-2023

- Average age: 14.29 + 1.4 years (junior high) and 17.18 + 0.80 years (senior high)
- Almost equal distribution of males and females in junior high while more females were affected in senior high.
- All students were fully vaccinated against COVID-19 with one booster dose received.
- The presumed route of transmission for all cases was through close contacts at school.
- The most common symptoms reported by the students included cough, colds, and fever.
- Some had a history of pre-existing conditions like allergic rhinitis, asthma, or atopic dermatitis.
- Most infections in the junior high school population occurred 9 to less than 12 months after the last COVID-19 vaccination.
- Diagnostic confirmation of COVID-19 was done using the Rapid Antigen Test and, to a lesser extent, the RT-PCR test.
- For disease severity, most cases were classified as mild for both populations.
- Average recovery time: 7.55 + 2.81 days (junior high) and 7.79 + 2.66 days (senior high)

Demographic and clinical characteristics of students with confirmed COVID-19, College Level (N=1181)

- Average age: 21.22 + 2.37 years
- There were more females (69.86%) than males (30.14%) affected.
- The College of Nursing (17.44%), Faculty of Medicine and Surgery (14.39%), and Faculty of Pharmacy (12.53%) accounted for the highest number of cases among the affected students.
- The majority (78.32%) of confirmed cases were fully vaccinated with one booster dose received.
- The presumed route of transmission was mainly through close contacts at school (98.90%).
- The most commonly reported symptoms were colds (37.51%), followed by cough (32.35%) and fever (19.39%).
- Regarding pre-existing health conditions, asthma was reported in 6.44% of cases, while others were observed in smaller percentages.
- Significant portions of this population group were infected within 3 to less than 6 months (27.77%) and 6 to less than 9 months (29.55%) post-vaccination.
- Diagnostic confirmation of COVID-19 was done through the Rapid Antigen Test (63.00%) and RT PCR test (37.00%).
- In terms of disease severity, the majority of cases were mild (88.31%), while 11.60% were asymptomatic.
- One case was categorized as moderate COVID-19.
- The average recovery time was 8.39 + 3.77 days.

Table 3. Severity of COVID-19 Infection by Level (N=1302)

SEVERITY	College (N=1181)		Junior High School (N=31)		Senior High School (N=90)	
	n	%	n	%	n	%
Asymptomatic	137.00	11.60	1.00	3.23	7.00	7.78
Mild	1043.00	88.31	30.00	96.77	83.00	92.22
Moderate	1.00	0.08	--	--	--	--

- Majority of COVID-19 cases across all academic levels were mild (88.31% - 96.77%), while about 3.23% - 11.60% were asymptomatic.

RESULTS

Table 4. Factors Associated with SARS-CoV-2 Transmission via Close Contacts from School and Home

CHARACTERISTICS	SCHOOL		HOME	
	Odds ratio (OR)	p-value	Odds ratio (OR)	p-value
Age	0.992	0.910	1.018	0.896
Sex				
Female	0.894	0.757	0.826	0.783
Male	0.894	0.757	0.826	0.783
Level				
College	0.752	0.760	0.858	0.934
Junior High School	0.884	0.932	1.026	0.993
Senior High School	0.884	0.932	1.026	0.993
COVID-19 Immunization Status				
Unvaccinated	0.267	0.817	2.601	0.934
Partially vaccinated	0.657	0.783	0.938	0.984
Fully vaccinated	0.676	0.626	0.941	0.970
Fully vaccinated with one booster shot	0.714	0.565	1.290	0.826
Fully vaccinated with two booster shots	0.714	0.565	2.601	0.934
Presenting Symptoms				
Cough	0.929	0.845	0.965	0.962
Colds	0.626	0.848	2.359	0.802
Sore throat	0.924	0.889	0.934	0.950
Shortness of breath	1.201	0.822	0.732	0.828
Difficulty of breathing	1.863	0.621	1.563	0.859
Myalgia	0.978	0.994	0.004	0.094
Anosmia	1.010	0.998	0.028	0.399
Ageusia	0.641	0.874	41.279	0.384
Fever	0.977	0.956	1.152	0.867
Headache	0.824	0.973	0.834	0.987
Malaise	0.863	0.978	0.859	0.989
Nausea	220.089	0.487	41390.831	0.716
Diarrhea	0.882	1.000	3.005E-08	---
Time of Infection from Last Vaccination (months)				
12 months or more	0.656	0.940	0.634	0.968
3 to less than 6 months	0.561	0.918	0.818	0.986
6 to less than 9 months	0.606	0.929	0.658	0.970
9 to less than 12 months	0.632	0.935	0.633	0.968
Less than 3 months	0.464	0.890	0.881	0.991
History of other diseases				
Allergic rhinitis	0.995	1.000	2067.798	0.782
Allergy to seafood	2.073	0.978	1449.744	0.802
Anaphylaxis	1.845	0.982	2045.178	0.793
Anemia	1.354	0.991	2882.153	0.784
Asthma	1.112	0.997	2003.597	0.778
Atopic dermatitis	1.115	0.997	1924.286	0.787
Congenital heart disease	1.030	0.999	1696.326	0.798
Diabetes	1.750	0.984	1699.282	0.808
Discoid lupus	1.288	0.992	2413.582	0.788
Eczema	0.977	0.999	2030.985	0.795
Hypercholesterolemia	1.352	0.991	2757.153	0.785
Hypertension	1.351	0.991	1931.271	0.794
Juvenile idiopathic arthritis	1.968	0.980	1564.127	0.800
Obesity	0.005	0.845	12.295	0.949
PCOS	---	---	---	---
VSD	---	---	---	---
Time to recovery (days)	0.980	0.637	1.006	0.936

- From the results of the regression analysis and the p-values obtained, there is no variable which can be significantly associated with transmission of infection among close contacts either at school or at home.

Table 5. Clustering of Cases by College/Faculty During AY 2021-2022

College/Faculty	Total N	Number of clustered cases	Percentage of Total N (%)
College of Nursing	55.00	49.00	89.09
Faculty of Medicine and Surgery	36.00	31.00	86.11
College of Rehabilitation Sciences	19.00	14.00	73.68
Faculty of Pharmacy	14.00	7.00	50.00

Table 6. Clustering of Cases by Degree Program/SHS Strand During AY 2021-2022

Degree Program/Strand	Total N	Number of clustered cases	Percentage of Total N (%)
Nursing	55.00	49.00	89.09
Doctor of Medicine	36.00	31.00	86.11
Physical Therapy	19.00	14.00	73.68
Medical Technology	14.00	7.00	50.00

- The highest number of clustered cases by college and by program during AY 2021-2022 were reported in the College of Nursing and the Nursing program, respectively.

RESULTS

Table 7. Clustering of Cases by College/Faculty, AY 2022-2023

College/Faculty	FIRST TERM			SECOND TERM		
	Total N	Number of clustered cases	Percentage of Total N (%)	Total N	Number of clustered cases	Percentage of Total N (%)
Nursing	123.00	116.00	94.31	28.00	24	85.71
Medicine and Surgery	102.00	98.00	96.08	33.00	26	78.79
Science	96.00	90.00	93.75	24.00	22	91.67
Pharmacy	83.00	80.00	96.39	51.00	46	90.20
Architecture	78.00	74.00	94.87	15.00	12	80.00
Rehabilitation Sciences	59.00	56.00	94.92	20.00	14	70.00
Senior High School	39.00	34.00	87.18	51.00	48	94.12
Education	35.00	30.00	85.71	13.00	8	61.54
Arts and Letters	23.00	18.00	78.26	23.00	20	86.96
Fine Arts and Design	21.00	16.00	76.19	14.00	12	85.71
Engineering	21.00	16.00	76.19	35.00	33	94.29
Junior High School	20.00	14.00	70.00	9.00	4	44.44
Tourism and Hospitality Management	18.00	10.00	55.56	27.00	26	96.30
Conservatory of Music	15.00	8.00	53.33	3.00	3	100.00
Civil Law	7.00	4.00	57.14	4.00	3	75.00
Commerce	5.00	2.00	40.00	32.00	30	93.75
Accountancy	4.00	2.00	50.00	11.00	10	90.91
Information and Computing Sciences	4.00	2.00	50.00	13.00	10	76.92
Philosophy	3.00	2.00	66.67	2.00	2	100.00
Graduate School	--	--	--	3.00	2	66.67

Table 8. Clustering of Cases by Degree Program/High School Academic Strand During the First and Second Term, AY 2022-2023

Degree Program/Strand	FIRST TERM			SECOND TERM		
	Total N	Number of clustered cases	Percentage of Total N (%)	Total N	Number of clustered cases	Percentage of Total N (%)
Degree Programs						
Nursing	122.00	114.00	93.44	28.00	23.00	82.14
Doctor of Medicine	100.00	98.00	98.00	32.00	27.00	84.38
Architecture	77.00	68.00	88.31	15.00	13.00	86.67
Medical Technology	52.00	42.00	80.77	25.00	21.00	84.00
Medical Biology	50.00	44.00	88.00	9.00	7.00	77.78
Pharmacy	30.00	18.00	60.00	21.00	18.00	85.71
Physical Therapy	29.00	24.00	82.76	9.00	3.00	33.33
Psychology	20.00	16.00	80.00	4.00	4.00	100.00
Nutrition and Dietetics	16.00	12.00	75.00	7.00	3.00	42.86
Speech Language Pathology	14.00	8.00	57.14	7.00	4.00	57.14
Behavioral Science	12.00	8.00	66.67	4.00	2.00	50.00
Occupational Therapy	12.00	8.00	66.67	4.00	2.00	50.00
Microbiology	11.00	4.00	36.36	3.00	3.00	100.00
Advertising Arts	10.00	8.00	80.00	8.00	5.00	62.50
Food Technology	10.00	8.00	80.00	5.00	4.00	80.00
Mechanical Engineering	9.00	4.00	44.44	4.00	4.00	100.00
Hospitality Leadership	8.00	6.00	75.00	6.00	4.00	66.67
Industrial Biology	7.00	2.00	28.57	--	--	--
Interior Design	7.00	4.00	57.14	5.00	4.00	80.00
Juris Doctor	7.00	4.00	57.14	4.00	4.00	100.00
Chemistry	6.00	2.00	33.33	--	--	--
Culinary Entrepreneurship	6.00	2.00	33.33	5.00	4.00	80.00
Electronics	6.00	2.00	33.33	6.00	5.00	83.33
Biochemistry	4.00	2.00	50.00	5.00	3.00	60.00
English Language Studies	4.00	2.00	50.00	--	--	--
Accountancy	3.00	2.00	66.67	8.00	7.00	87.50
Music Technology	3.00	2.00	66.67	--	--	--
Philosophy	3.00	2.00	66.67	--	--	--
Sports Science	3.00	2.00	66.67	--	--	--
Applied Math	2.00	2.00	100.00	--	--	--
Industrial Engineering	2.00	2.00	100.00	5.00	5.00	100.00
Applied Physics	--	--	--	2.00	2.00	100.00
Business Economics	--	--	--	13.00	12.00	92.31
Civil Engineering	--	--	--	17.00	17.00	100.00
Computer Science	--	--	--	5.00	4.00	80.00
Entrepreneurship	--	--	--	3.00	2.00	66.67
Financial Management	--	--	--	6.00	4.00	66.67
Human Resource Management	--	--	--	3.00	2.00	66.67
Legal Management	--	--	--	7.00	6.00	85.71
Marketing Management	--	--	--	7.00	5.00	71.43
Travel Operation and Service Management	--	--	--	13.00	10.00	76.92
High School Academic Strands						
Science, Technology, Engineering, and Mathematics (STEM)	11.00	6.00	54.55	14.00	13.00	92.86
Health Allied	9.00	4.00	44.44	13.00	10.00	76.92
Humanities and Social Sciences (HumSS)	8.00	4.00	50.00	10.00	9.00	90.00
Accountancy, Business, and Management (ABM)	7.00	4.00	57.14	4.00	4.00	100.00

RESULTS

FIRST TERM, A.Y. 2022-2023

- The highest number of reported cases and clustered cases belonged to the faculties/colleges of Pharmacy, Medicine and Surgery, and Rehabilitation Sciences
- For degree programs and academic strands, the medical and allied health courses had the highest proportions of clustered cases.
- It was notable that all reported cases from the Applied Mathematics and Industrial Engineering programs were clustered.

SECOND TERM, A.Y. 2022-2023

- The Conservatory of Music and Faculty of Philosophy, though reporting the smallest numbers of cases, had the highest proportion of clustered cases by college/faculty, while the Faculty of Pharmacy and the senior high school level reported the highest number of cases for this term.
- In terms of degree programs, the highest reported cases include the Doctor of Medicine, Medical Technology, Nursing, and Pharmacy programs. With regards to clustering of cases, a high proportion was seen in all programs.
- All cases reported in the Applied Physics, Civil Engineering, Industrial Engineering, Juris Doctor, Microbiology, Psychology programs and ABM senior high school strand are all clustered.

CONCLUSION AND RECOMMENDATION

- Based on the study results, clustering can occur in school settings in the Philippines.
- Despite the low cases in the community, transmission is still present among university students.
- Infection prevention and control strategies must still be strictly observed until the virus is completely eradicated in order to prevent sporadic outbreaks.
- Further research can be done to determine differences in COVID-19 clustering rates between private and public educational institutions from pre-school to college levels. Studies that compare susceptibility of infection depending on year levels of each college program can also be done. A standardized health declaration form that can be implemented on all sectors of the community can also help the government and health community analyze the trends of infections and further develop research on how to mitigate infections, especially highly contagious diseases like COVID-19. This study can be used as a sample for further research on clustering rates of other infectious diseases aside from COVID-19.

