

Positivity Rate of Person under Surveillance among Institut Jantung Negara's Patients with Various COVID-19 Vaccination Status in the First Quarter of 2022, Malaysia

M. Izzat Md. Nor, N. Jaffar, N. Zaitulakma Md. Zain, N. Izyanti Mohd Suppian, S. Balakrishnan, G. Kandavello

Abstract—During the Coronavirus (COVID-19) pandemic, Malaysia has been focusing on building herd immunity by introducing vaccination programs into the community. Hospital Standard Operating Procedures (SOP) were developed to prevent inpatient transmission. In this study, we focus on the positivity rate of inpatient Person Under Surveillance (PUS) becoming COVID-19 positive and compare this to the national rate in order to see the outcomes of the patient who becomes COVID-19 positive in relation to their vaccination status. This is a retrospective observational study carried out from 1 January until 30 March 2022 in Institut Jantung Negara (IJN). There were 5,255 patients admitted during the time of this study. Pre-admission Polymerase Chain Reaction (PCR) swab was done for all patients. Patients with positive PCR on pre-admission screening were excluded. The patients who had exposure to COVID-19-positive staff or patients during hospitalization were defined as PUS and were quarantined and monitored for potential COVID-19 infection. Their frequency and risk of exposure (WHO definition) were recorded. On the final day of quarantine, a second PCR swab was performed on PUS patients who exhibit clinical deterioration, whether or not they exhibit COVID-19 symptoms. The severity of COVID-19 infection was defined as category 1-5A. All patients' vaccination status was recorded, and they were divided into three groups: fully immunised, partially immunised, and unvaccinated. We analysed the positivity rate of PUS patients becoming COVID-positive, outcomes, and correlation with the vaccination status. The ratio of positive inpatient PUS to the total inpatient PUS is 492; only 13 became positive, giving a positivity rate of 2.6%. Eight (62%) had multiple exposures. The majority, 8/13(72.7%), had a high-risk exposure, and the remaining 5 had medium-risk exposure. Four (30.8%) were boosted, 7(53.8%) were fully vaccinated, and 2(15.4%) were partial/unvaccinated. Eight patients were in categories 1-2, whilst 38% were in categories 3-5. Vaccination status did not correlate with COVID-19 Category ($P = 0.641$). One (7.7%) patient died due to COVID-19 complications and sepsis. Within the first quarter of 2022, our institution's positivity rate (2.6%) is significantly lower than the country's (14.4%). High-risk exposure and multiple exposures to positive COVID-19 cases increased the risk of PUS becoming COVID-19 positive despite their underlying vaccination status.

Keywords—COVID-19, boosted, high risk, Malaysia, quarantine, vaccination status.

I. INTRODUCTION

FOLLOWING the emergence of the Coronavirus disease (COVID-19) pandemic, caused by the SARS-CoV-2 virus,

Mohd Izzat Md. Nor is with the Hospital Infection and Antibiotic Control Committee (HIACC)-Communicable Disease, Institut Jantung Negara (IJN),

Malaysia achieved a vaccination rate of 78.9% by the first quarter of 2022 [2], [3]. By implementing vaccination programs in the community, Malaysia has been concentrating on establishing herd immunity [4]. IJN Hospital SOP are implemented, reviewed, and revised to adapt to the COVID-19 pandemic which is constantly evolving, mainly focusing on the prevention of inpatient transmission. On 1st April 2022 Malaysia Government announced the transition to endemic with the opening of our borders, operating hour's restriction for businesses dropped, physical distancing for Jemaah prayers removed, and others [1]. Hence, we are looking at how well we are doing in the first quarter of 2022 before entering this endemic phase.

Objective

In this research, our primary focus is on the positivity rate of inpatient PUS transitioning to COVID-19 positive, comparing it to the national positivity rate [2], [3], and examining the outcomes of patients who test positive for COVID-19 in relation to their vaccination status.

II. METHODOLOGY

This is a retrospective observational study carried out from 1st January until 31st March 2022 in IJN. 5,415 patients were screened with PCR swab test before being admitted to IJN. 160 patients were detected as positive for COVID-19 during this screening process and excluded from this study. A total of 5,255 inpatients were admitted during the duration of this study. The patients who had exposure to COVID-19 positive staff or patients during hospitalization were defined as a PUS. Following contact with COVID-19 positive staff and patients during their stay at IJN, a total of 492 patients were designated as PUS (Persons Under Surveillance). Afterward, all PUS were isolated and kept under observation to detect any potential COVID-19 infection. A follow-up PCR swab test was conducted either at the conclusion of their 5-day quarantine period or sooner if they exhibited COVID-19 symptoms or experienced unexpected clinical deterioration unrelated to COVID-19.

PUS that turned to be positive COVID-19 subsequently were analysed for several factors. Their frequency and risk of

51000 Kuala Lumpur, Malaysia (phone: +60326178200, e-mail: dr.mohdizzat@ijn.com.my).

exposure were documented and recorded based on World Health Organization (WHO) definition [5]. The severity of COVID-19 infection was recorded and documented as category 1 until category 5A based on WHO and Malaysia Health Ministry guidelines [6]-[8]. The vaccination status of all patients was documented, and patients were categorized into Boosted, Fully Vaccinated, and Partially/Unvaccinated [7]. We analysed the positivity rate of PUS patients becoming COVID positive. The outcomes of COVID-19 infection were analysed using Fisher's exact test and correlated with the vaccination status of the positive COVID-19 patient.

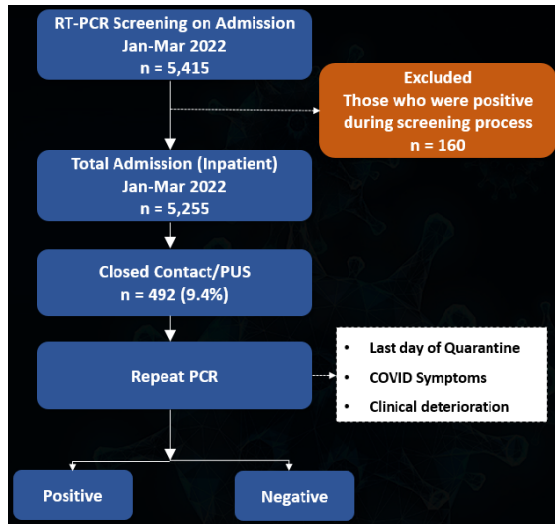


Fig. 1 Methodology

III. RESULT

The total number of inpatient individuals, including both patients and staff, amounted to 492. Out of this group, only 13 individuals tested positive for COVID-19 (13:492, or approximately 1:37.69), resulting in a positivity rate of 2.6%. A majority of these cases (62%) had multiple exposures. Among the 13 positive cases, eight of them (72.7%) had high-risk exposure, while the remaining five had medium-risk exposure. Most of these individuals tested positive between the 4th and 6th days of their admission. Regarding their vaccination status, four individuals (30.8%) had received booster shots, seven (53.8%) were fully vaccinated, and two (15.4%) were either partially vaccinated or unvaccinated. In terms of the severity of the COVID-19 infection, eight patients (61%) were classified in Category 1-2A, while the remaining 5 (39%) were in the more severe Category 3-5A. Regrettably, one patient (7.7%) succumbed to COVID-19 complications and sepsis, despite being fully vaccinated. It is worth noting that this study could not establish a significant correlation between vaccination status and COVID-19 category ($P = 0.641$).

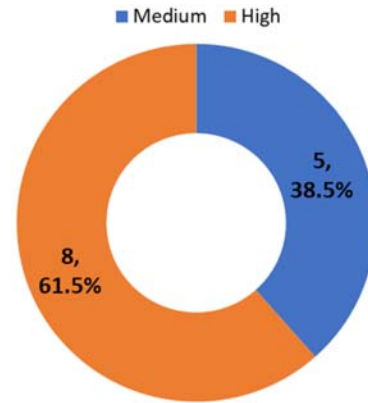


Fig. 2 Risk of exposure to confirm COVID-19 case

TABLE I
 TYPES OF EXPOSURE AND MEDIAN DAYS FROM EXPOSURE TO POSITIVE TEST

Confirmed Case Patients	Total N = 13
Type of Exposure	
• Single Exposure	• 5 (38.5%)
• Multiple exposure	• 8 (61.5%)
Median Days from Exposure to Positive	
• Single Exposure	• 5.0 (4.5,6.5)
• Multiple Exposure – 1 st Exposure	• 6.5 (5.0,7.0)
– Last Exposure	• 4.5 (3.3,5.0)

■ Partially/Not Vaccinated ■ Fully Vaccinated ■ Fully Vaccinated + Boosted

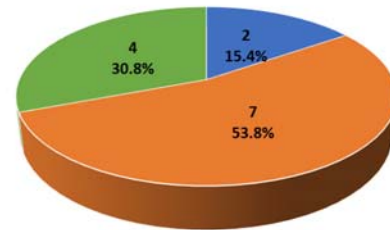


Fig. 3 Vaccination status of positive COVID-19 patient

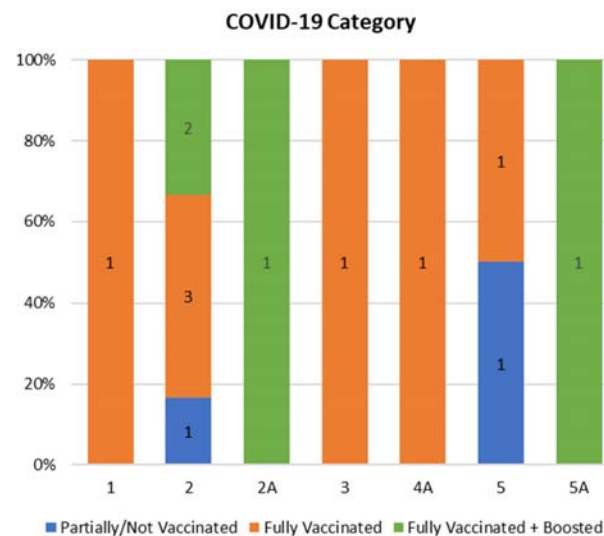


Fig. 4 Severity of COVID-19 infection in positive COVID-19 cases

Limitation

In this study, we realize that the amount of sample in our study is small in comparison with the national level sample size.

Other areas of potential multifactorial compounding factors such as age, comorbidity, and immunocompromised that may affect the outcome of this study were also not explored and may give us different parameters of data interpretation.

TABLE II
SEVERITY OF COVID-19 INFECTION CATEGORY AND OUTCOMES USING FISHER'S EXACT TEST

Outcomes	Partially/Not Vaccinated N = 2	Fully Vaccinated /Boosted N = 11	Total N = 13	P-Value
COVID-19 Categories				
1 – 2A	1 (50%)	7 (63.6%)	8 (61.5%)	0.641
3 – 5A	1 (50%)	4 (36.4%)	5 (38.5%)	
Outcomes Status				
Alive	5 (100%)	7 (87.5%)	12 (92.3%)	-
Deceased	0	1 (12.5%)	1 (7.7%)	

IV. DISCUSSION

With this study, we are able to review and improve our Hospital Policies for better prevention of COVID-19 inpatient transmission (patient to patient/staff to patient). Even though our staff did practice strict infection prevention and control measures by wearing appropriate face masks and face shields/goggles, we can still observe staff to patient transmission. This may be due to multiple exposure risks and patients who do not wear mask while being handled by our staff which gives a moderate exposure risk to the patient. Asymptomatic COVID-19 individual is also a potential contribution to inpatient transmission. However, there are no data collected on this area. There are several additional interventions we have done for improvement. Such as proactive inpatient saliva screening on days 3, 7, and 14 of patient admission day, this is important for early detection of asymptomatic COVID-19 infection. Immediate isolation of symptomatic or deteriorating cardiac patients, regardless of whether they exhibit COVID-19 symptoms, is essential to contain the affected area promptly and prevent the potential transmission of the virus to other patients.

The "Red Alert Activation Plan" constitutes a standard directive that mandates the immediate lockdown of the impacted ward or cubicle, halting all patient and staff movements, with the primary goal of preventing any additional

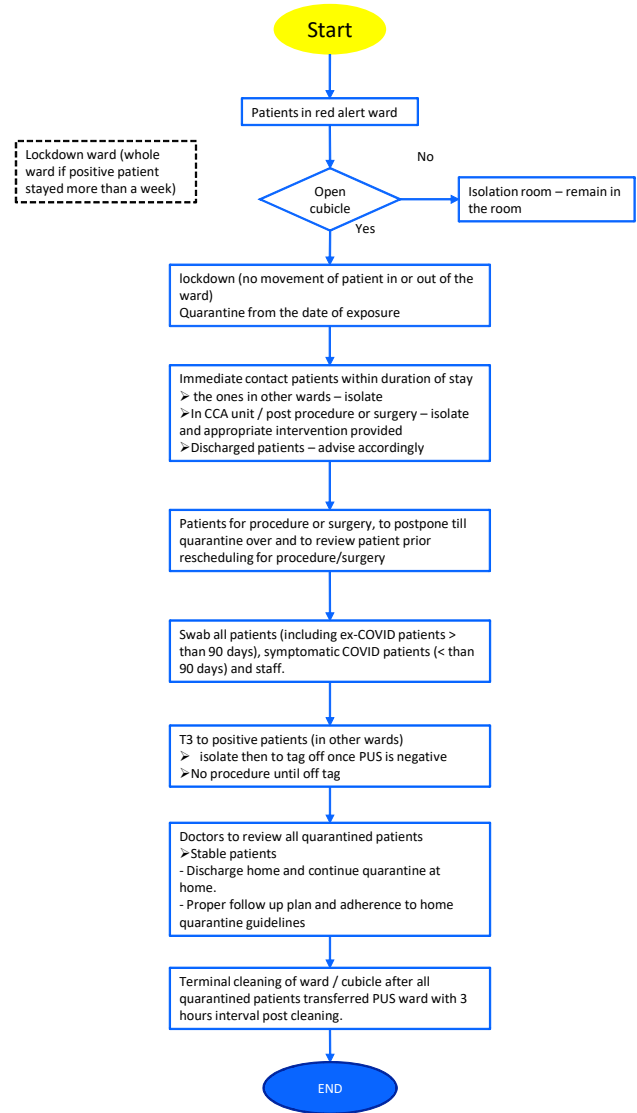


Fig. 6 Red alert flow chart

We also notice that unwell staff are still coming to work, and handling patients and it may be the reason for the staff-to-patient transmission [9]. Hence our hospital develops IJN Staff Surveillance System that requires the daily declaration of health status and uploading their COVID-19 saliva swab test result into the system. Unwell staff was not allowed to enter hospital premises once detected as unfit.

Our hospital has a centralized air conditioning system, and the windows are closed and fixed. Two main air conditioning systems of the Air Handling Unit (AHU) and Fan Coil Unit (FCU) were used in our wards. This increased the risk of airborne transmission when Aerosol Generating Procedure (AGP) was done as the air will circulate back into the same

Symptomatic / Deteriorating Patient in Ward

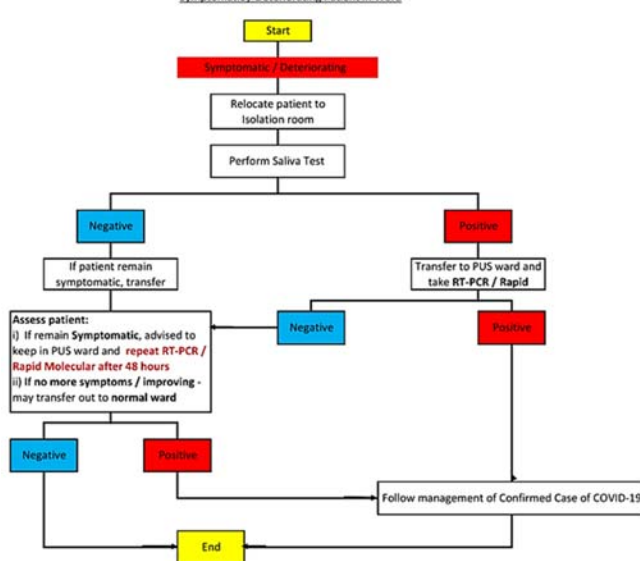


Fig. 5 Symptomatic/Deteriorating Patient in Ward flow chart

ward where the procedure was done. Hence engineering intervention was done by the Hospital Engineering unit by

Installation of High-Efficiency Particulate Absorbing (HEPA) filter system in the individual ward.

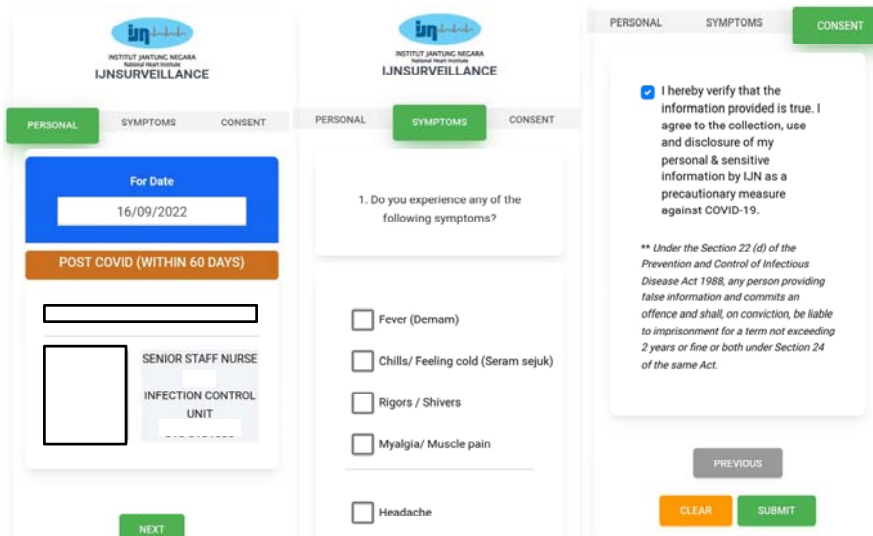


Fig. 7 IJN Surveillance System



Fig. 8 Fan Coil Unit (FCU)

Due to the practice of AGP in our hospital, we introduce Close Circuit Nebulization in the ventilation system for the patient that were intubated and require nebulized medication. New protocol of Therapeutic Aerosols Administration During The COVID-19 Pandemic was implemented for the patients that require to use bronchodilator medication via Metered Dose Inhaler (MDI) which we incorporate usage of Aero-chamber Plus in all ages and encourage giving the medication in an isolation room and away from other patients. Dedicated toilet use for each cubicle and an increase in the frequency of cleaning and disinfection help in reducing transmission in the common area that has been used by the patient. The involvement of high-level management with weekly Pandemic meeting enables the task force to share ongoing data and outbreak with the management level and get immediate feedback and decision for the next approach.



Fig. 9 Air Handling Unit (AHU)

V. CONCLUSION

This study reveals that, in the first quarter of 2022, our institution's positivity rate (2.6%) is much lower than the national positivity rate (14.4%). This result may also be influenced by our smaller sample size and much more controlled area as compared with the national level. Strong factors that contribute to the conversion of PUS to positive COVID-19 are high-risk exposure and multiple exposures. The patient that did not wear a mask in the ward are high to get high-risk exposure and those who expose to AGP were also exposed

to a high-risk environment and easily get infected by the COVID-19 virus. Despite their vaccination status they are unable to secure their outcome after got infected by COVID-19 virus. This can be explained by our patient's background of severe cardiac condition and multiple comorbidities. We hope we can further explore other potential factors that may affect this positivity rate among our patients and compare it to the international level.



Fig. 10 HEPA filter



Fig. 11 HEPA unit installation

REFERENCES

- [1] Ministry of Health Malaysia, 2022, "Fasa Peralihan ke Endemik", <https://covid-19.moh.gov.my/reopeningsafely/semasa/2022/03/fasa-peralihan-ke-endemik-11032022> (April 1, 2022).
- [2] R. Hirschmann, 2022, "Vaccination rate against COVID-19 Malaysia 2022, by state", [https://www.statista.com/statistics/1270638/malaysia-](https://www.statista.com/statistics/1270638/malaysia-covid-19-vaccination-rate-by-state/)

- [covid-19-vaccination-rate-by-state/](https://www.statista.com/statistics/1270638/malaysia-covid-19-vaccination-rate-by-state/) (Mar 31, 2022).
- [3] Ministry of Health Malaysia, 2021, COVID-19 immunisation task force, "Malaysia positivity rate", <https://covidnow.moh.gov.my/> (March 31, 2021).
- [4] Director General of Health Malaysia, Surat Pekeliling Ketua Pengarah Kesihatan Bil. 4/2021, "Polisi Pelaksanaan program imunisasi COVID-19 Kebangsaan", pp 1-5 (march 3, 2021).
- [5] World Health Organization WHO, 2020, COVID-19: Infection prevention and control, "Risk assessment and management of exposure of health care workers in the context of COVID-19: interim guidance", https://www.who.int/publications/i/item/WHO-2019-nCov-HCW_risk_assessment-2020.2 (March 19,2020).
- [6] World Health Organization (WHO), 2022, Clinical management of COVID-19 patents: living guideline, PP 28-30
- [7] Ministry of Health Malaysia,2022, Annex 2e Clinical Management of Confirmed COVID-19 Case in Adult And Paediatric,
- [8] National Institutes of Health, 2022, "Clinical Spectrum of SARS-CoV-2 Infection", <https://www.covid19treatmentguidelines.nih.gov/overview/clinical-spectrum/> (September 26,2022).
- [9] Ministry of health Malaysia, 2022, Annex 21, "Management of Healthcare Workers (HCW) during the COVID-19 Pandemic " pp 10-13 (Feb 15, 2022).