PROFILE AND CLINICAL OUTCOMES AMONG PATIENTS

ADMITTED FOR SARS-CoV2 INFECTION

IN A TERTIARY HOSPITAL IN TACLOBAN CITY

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Profile and Clinical Outcomes Among Patients Admitted For SARS-CoV2 Infection in a Tertiary Hospital in Tacloban City

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ABSTRACT

Vaccine against SARS-COV-2 infection had been proven effective in many studies, but the incidence of breakthrough infection is notably increasing worldwide and few is known about their clinical presentation, course of admission and outcomes for their hospitalizations. This study determined the profile and clinical outcomes of COVID-19 vaccinated and unvaccinated individuals admitted for COVID-19 infection in terms of demographic profile, disease severity, length of hospital stay and their hospitalization outcome. A prospective cross-sectional analytical study that was conducted at Divine Word Hospital from October 2021 to March 2022 wherein a total of 279 PCR-test confirmed adults were included, of which 170 were vaccinated and 109 were unvaccinated. In both groups, vaccinated and unvaccinated, majority of the patients belonged to elderly group, age group >60 years old, female and with presence of at least 1 comorbidity. Most frequent comorbidity associated was hypertension followed by diabetes and chronic kidney disease. Majority had mild to moderate disease regardless of their vaccination status. And the disease severity classification was significantly associated with vaccination status similar to other studies. Age was significantly associated with hospitalization outcome in vaccinated group. However, there was no association of vaccine status to comorbidity count and to length of hospital stay in both vaccinated and unvaccinated group in this study. With these findings, this study stands with the importance of COVID-19 vaccination and supports the need for booster doses as breakthrough infections are on the rise.

Keywords: COVID-19 vaccination, Breakthrough infection

TABLE OF CONTENTS

Page

TITLE PAGE ……i

ABSTRACT……..ii

TABLE OF CONTENTS ……iii

CHAPTER

I. INTRODUCTION

Background of the Study..…… 1

Review of related literature……..3

Research Question……6

Significance of the Study……..……..…..…6

Scope and limitation of the Study……6

Objectives of the Study……..……....7

Definition of Terms……8

Conceptual framework…….……10

II. METHODOLOGY

Research Design…….....11

Research Respondents……11

Research Setting…….....11

Research Procedure and Data Gathering…….……11

Data Analysis……..12

III. RESULTS AND DISCUSSION

Table 1. Baseline characteristics of persons with documented SARS-CoV-2 infection……14

Table 2. Disease severity……..……...15

Table 3. Length of Hospital Stay……...16

Table 4. Hospitalization Outcome……17

Discussion……17

Conclusion……..…...22

REFERENCES……23

DATA COLLECTION FORM ….……27

LETTER OF CONSENT……...…...28

CHAPTER I

INTRODUCTION

A. Background of the study

Coronavirus disease 2019 (COVID-19) from severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) emerged in late 2019 in Wuhan China that caused our ongoing pandemic, threatening 220 countries. The pandemic's global significance necessitated the development of policies to contain it. Non-pharmaceutical interventions (NPIs) include masking policy enforcement, hand sanitization, social distance, travel limitations, school closures, and partial or complete lockdowns. NPIs were able to delay the disease's growth, but the most promising technique for containing the pandemic and reducing mortality and morbidity rates remained within medical technology's capabilities. Vaccines that are effective, safe, and economical are examples of such medical technology. Vaccines are one of the most effective and cost-effective public health treatments ever, saving millions of lives every year [1].

Effective SARS-CoV-2 vaccinations are now available in most countries, including the Philippines, and are a critical tool in containing the pandemic. Vaccine efficacy trials have revealed that the vaccinations are extremely protective against severe disease and death, with efficacy levels reaching 100% for many outcomes. Based on studies, CoronaVac (SinoVac) which is the most available in our country, had an efficacy of 51% against symptomatic SARS-CoV-2 infection, 100% against severe COVID-19, and 100% against hospitalization starting 14 days after receiving the second dose based on World Health Organization (WHO) [2]. Meanwhile a study in Chile [3], had effectiveness of 67% of preventing from symptomatic Covid-19; 85% from hospital admission; 89% from ICU admission; 80% from death. Other vaccines have also been inoculated such are Johnson

& Johnson, Pfizer-BioNtech and Moderna. The studies found that each of the vaccines had at least 85 percent efficacy in preventing severe COVID-19 illness. The vaccines also prevented many people from getting any COVID-19 symptoms: Johnson & Johnson (Janssen), 74 percent ; Pfizer-BioNTech, 95 percent; Moderna, 94 percent [4].

According to Center for Disease Control and Prevention (CDC), no vaccine in 100% effective in preventing diseases, hence a breakthrough infection cases are expected. A vaccine breakthrough infection is defined as the detection of SARS-CoV-2 RNA or antigen in a respiratory specimen collected from a person ≥14 days after they have completed all recommended doses of WHO authorized COVID-19 vaccine [5].

SARS-CoV2 has several variants, and it mutates to generate new strains, such as the Delta and Omicron variants. RNA-based viruses mutate at a faster rate than flu viruses. The scientific community is keeping track of numerous mutations and variants. The ones who gain dominance over time are the ones who improve their ability to evade our defense measures. One explanation for explaining cases of breakthrough [6].

A recently published study done in Israel regarding breakthrough COVID-19 infection concluded that increasing age was associated with a higher risk of severe disease or death, while vaccination is associated with a lower risk and presence of comorbidities was not associated with severe disease or death among persons with breakthrough infection[7].

Breakthrough infections have been reported and few is known about their clinical presentation, course of admission and outcomes for their hospitalizations. Until today, there is little information on the risk factors for COVID-19 infection following full vaccination. Insight into such risk variables should drive public health policy regarding vaccination booster tactics, particularly in terms of target population identification, duration, and frequency[8].

B. Review of Related Literature

There are now effective vaccinations against the SARS-CoV-2 infection that are available worldwide [11]. Approximately 60 percent of the world's population has been vaccinated, with 54 percent receiving both doses, and over 10 billion doses have been provided in total[12]. In both clinical trials and real-world situations, vaccines against SARS-CoV-2 have proven to be very efficacious and safe against infection with SARS-CoV-2 or hospitalization [13,14]. These vaccines had also been found to diminish asymptomatic infection and the infectivity that comes with it [14]. Despite the vaccine's outstanding potency and effectiveness, breakthrough infection has been documented among fully vaccinated people[11]. No vaccination provides 100 percent protection against infection, and even with the mRNA vaccines' 95 percent efficiency, there is still a high risk of infection and a high number of breakthrough infections is likely[7]. This breakthrough infection is defined as COVID-19 infection after an individual has finished all WHO recommended doses of a SARS-CoV-2 vaccine with a typical 14-day lag period[12]. Increased numbers of vaccinated people, distinct SARS-CoV-2 variants circulating at the same time, possibly waning immunity, and changes in community mitigation strategies are all variables that could have contributed to the rise in breakthrough cases[9].

In the study of Juthani et al., they found that nearly a fifth of patients had received at least one dose of the vaccine, and observed that many patients had not completed the full vaccine course and over a quarter of completely vaccinated SARS-CoV-2 patients admitted to hospitals with COVID-19 were critically ill[14]. After full immunization, the rate of breakthrough infection among fully vaccinated people was 0.66 per 1000 person-days[11]. A 28 percent lower risk of a breakthrough infection was also linked to full vaccination[13]. Intriguingly, a study showed patients with complete vaccination hospitalized because of

breakthrough COVID-19 were older, with more comorbidity, and had a high mortality rate compared to partially vaccinated[15].

These breakthrough infections were associated with older age, female sex, and a higher number of comorbidities[13]. Meanwhile in large scale cohort study in Belgium showed younger age, female sex, non-healthcare professionals, vaccination with adenoviral-vector-based vaccines, a higher background virus level, and being tested regularly for COVID-19 were all linked to an increased risk of a breakthrough infection.

The severity of disease in breakthrough infection could be reflective of numerous factors as identified by some studies, including the emergence of SARS-CoV-2 variants, vaccine qualities, immune features, older age, ethnicity and presence of comorbidities [7,14,16]. Interestingly, regardless of a person's immune status, breakthrough cases appeared to be significantly less severe than pre-vaccination COVID-19 infections[13].

Vaccines are important in avoiding severe and fatal COVID-19 infections, but they may not always prevent breakthrough infections [11,16] allowing ongoing transmission to additional subjects. Vaccines can reduce transmission in two ways: 1) by preventing infection and 2) by reducing the infectiousness of breakthrough cases[16]. After the second vaccine dosage, antibody titers drop from 4 to 5 months, correlating to an increase in breakthrough infections. This is consistent with the negative relationship between immunity and the severity of illness or disease[16].

Identifying high-risk populations for serious breakout infections could lead to earlier preventative methods like antiviral medicine administration[16]. There is a growing need to track vaccine effectiveness and duration of protection against diverse variations. Perhaps the most effective SARS-CoV-2 transmission reduction strategy is to achieve universal vaccination. Individuals and the scientific community must work together to stop the

spread, with the latter ultimately responsible for providing the public with the information they need to make informed vaccination decisions[12].

In a study by Stouten et al., they identified that of 18–64 year old had a higher cumulative incidence of a breakthrough infection than persons aged 65–79 or 80 years[8.] While a study by Butt et al, they concluded increasing age is linked to a higher risk of severe disease or mortality in people with breakthrough SARS-CoV-2 infection, whereas immunization is linked to a lower risk. They identified at least one comorbid ailment was present in 61.2% of vaccinated people and 47.8% of unvaccinated people, with hypertension and diabetes being the most common in both groups. However, comorbidities were not linked to severe disease or death in people who had a breakthrough infection[7].

Another highlighted that all comorbidities were associated with higher incidence of breakthrough infections, with CKD posing the largest risk while people with chronic lung disease had the highest prevalence of breakthrough infection, but the lowest probability of hospitalization as a result [17].

Breakthrough infections among vaccinated HCWs (health care workers) were prevalent, according to one study. Although common symptoms did occur, most breakthrough infections were mild or asymptomatic [18].

Two studies for breakthrough infection in HCWs, showed most of the population were female and mostly were asymptomatic to mild disease [19,20]. Due to silent breakthrough infections, the local study emphasizes the use of boosters and continuous compliance with non-pharmaceutical therapies even after immunization (Velasco). Meanwhile the other study suggested no secondary infections linked to any of the breakthroughs. This supports the conclusion that these workers were less contagious than unvaccinated individuals.

The average length of stay for COVID-19 patients admitted to the ICU is 29.7 days, compared to 8.0 days for patients not admitted to the ICU [21].

C. Research Question

Among admitted COVID-19 patients in Divine Word Hospital for the month of October 2021 to March 2022, what are the clinical outcome, profile and vaccination status of the patients?

D. Significance of the study

There are data regarding the efficacy and effectiveness of the SARS-CoV2 vaccines, but despite such, there are reported breakthrough infections among fully vaccinated. There is still limited data about the risk factors, characteristics, hospitalizations and their clinical outcomes after the breakthrough infection. This study will investigate the incidence, to be able to determine possible risk factors associated with breakthrough infections, and to assess the hospitalization outcome of individuals with breakthrough infections. This study will compare the severity of illness and outcomes in persons with breakthrough infection versus infection in unvaccinated patients. Monitoring these cases among vaccinated persons and evaluating trends will make us better understand who is at risk for severe COVID-19 following vaccine breakthrough infection.

E. Scopes and Limitations of the Study

This will be a single-centered investigation which will be conducted in a tertiary hospital, Divine Word Hospital from October 2021 to March 2022. All admitted patients

who were PCR-confirmed COVID-19 infection during the said time-frame will be evaluated through patient's demographic data, vaccination status and followed up their hospitalization outcome. This study will be prospective type whereby data will be mainly derived from the medical chart.

This study will focus on patients with breakthrough COVID-19 infection and Primary infection by determining their Age, Sex, Comorbiditity and Comorbidity count, Length of Hospital stay and Hospitalization outcome.

F. Objectives of the study

General:

To determine the profile and clinical outcomes of admitted patients with COVID-19 infection in vaccinated and unvaccinated individuals.

Specific:

1. Describe the clinical profile of COVID 19 patients in terms of
    a. Age
    b. Sex
    c. Presence and number of Co-morbidities
2. Describe the disease severity classification of the COVID 19 patients
    a. Mild
    b. Moderate
    c. Severe to Critical

3. Determine the length of hospital stay
    a. < 8 days
    b. 8-14 days
    c. > 14 days
4. Determine the hospitalization outcome
    a. Death
    b. Recovered
5. Determine the factors associated (age, sex and comorbidities) with severity disease with breakthrough infection

G. Definition of terms

a. COVID-19 infection - infectious disease caused by the SARS-CoV-2 virus[2]

b. Breakthrough infection - breakthrough infection is defined as the detection of SARS-CoV-2 RNA or antigen in a respiratory specimen collected from a person ≥14 days after they have completed all recommended doses of WHO authorized COVID-19 vaccine [5]

c. Vaccinated – Individuals is considered fully vaccinated: (1) two weeks after receiving the second dose in a two dose COVID-19 vaccine series or (2) two weeks after receiving a single dose COVID-19 vaccine [5]

d. Unvaccinated – Individual who have received one or more doses of an authorized vaccine but have not reached the full 14 days after the final dose of the primary series or those who have not received any dose of a COVID-19 vaccine [9].

e. Comorbidity - the simultaneous presence of two or more diseases or medical conditions in a patient [10].

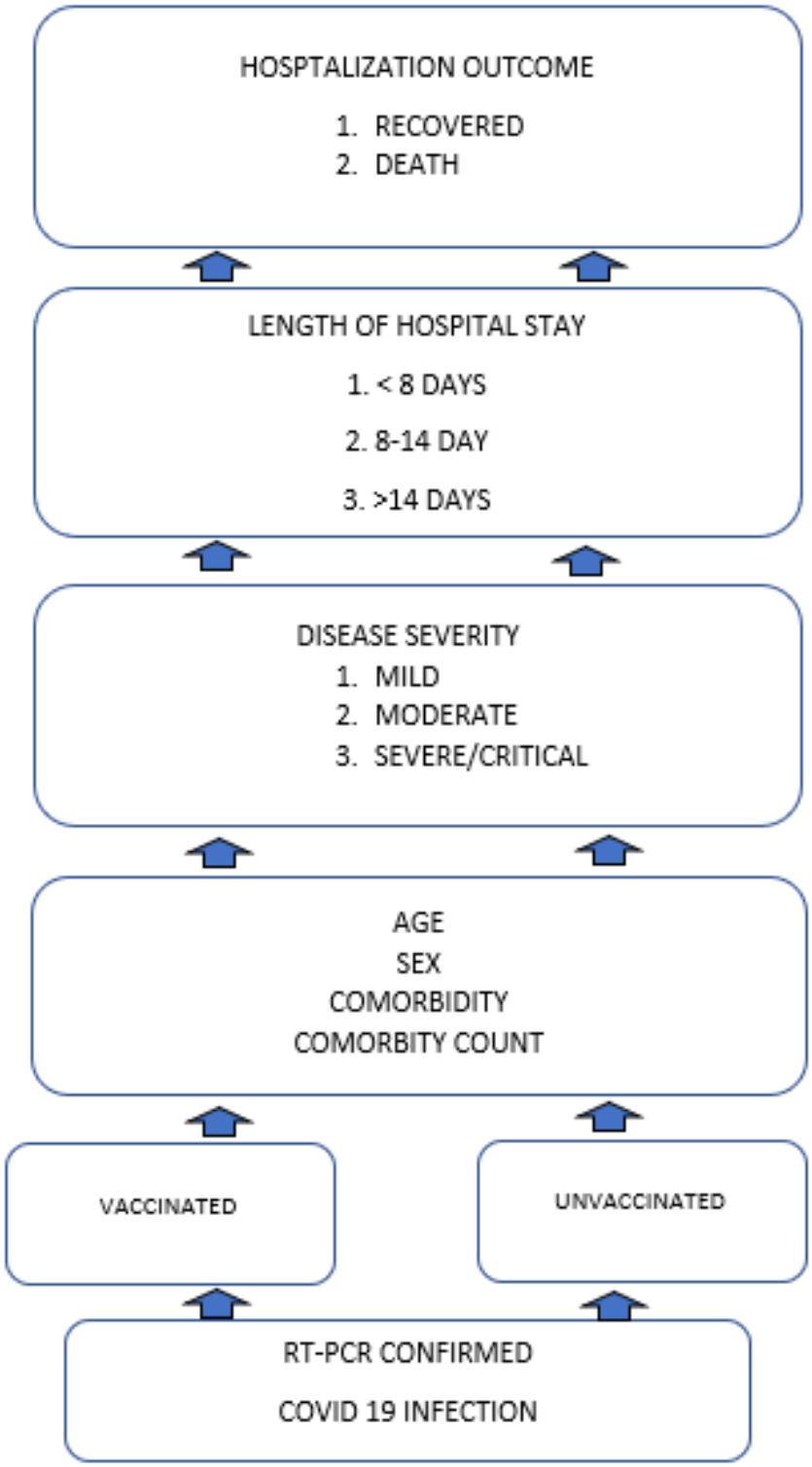
f. Disease severity classification based on WHO Clinical Management and PSMID clinical guideline [4]

Mild Disease - Symptomatic patients presenting with fever, cough, fatigue, anorexia, myalgias; other non-specific symptoms such as sore throat, nasal congestion, headache, diarrhea, nausea and vomiting; loss of smell (anosmia) or loss of taste (ageusia) preceding the onset of respiratory symptoms with NO signs of pneumonia or hypoxia

Moderate Disease- Adult with clinical signs of non-severe pneumonia (e.g. fever, cough, dyspnea, respiratory rate (RR) = 21-30 breaths/minute, peripheral capillary oxygen saturation (SpO2) >92% on room air)

Severe/Critical Disease - Adult with clinical signs of severe pneumonia or severe acute respiratory infection as follows: fever, cough, dyspnea, RR>30 breaths/minute, severe respiratory distress or SpO2 < 92% on room air. Patients manifesting with acute respiratory distress syndrome, sepsis and/or septic shock.

H. Conceptual framework



CHAPTER II

METHODOLOGY

A. Research design

This is a prospective cross-sectional analytical study.

B. Research respondents

Inclusion criteria:

1. PCR-test confirmed COVID-19 adult patients who were admitted at DWH isolation ward from October 2021 to March 2022

Exclusion Criteria:

1. Adult patients who were previously PCR positive for Covid regardless of vaccination status.
2. Adult patients who transferred to other institution.
3. Patients who were age < 19 years old with PCR-test confirmed COVID-19 infection.

C. Research setting

This study was conducted at the at Divine Word Hospital, a 179-bed tertiary private training hospital in Tacloban City, Leyte, Philippines. The Residency Training Program of the Department of Internal Medicine is duly accredited by the Philippine College of Physicians which the investigator belongs.

D. Research Procedure and Gathering of Data

A letter of consent to conduct the study was to the Hospital Administrator, the Medical Director, and the Chair of the Internal Medicine. After getting approval, the medical charts of

the patients who are COVID-19 positive and who met the inclusion and exclusion criteria were obtained. The data that were extracted include Covid 19 vaccination status, age, sex, comorbidities and hospitalization outcome.

E. Data analysis

Categorical values will be expressed as percentages and compared through the chi-square test independence t-test. A p-value of < 0.05 will considered significant for all the statistical tests to be done. All data analysis will be tabulated and performed in SPSS version 23.

CHAPTER III

RESULTS AND DISCUSSION

Between October 2021 to March 2022, a total of 279 PCR-test confirmed adult COVID-19 patients were included in the study. We identified170 patients were fully vaccinated and 109 were unvaccinated.

Regardless of the vaccination status, elderly patients aging >60 years old comprised the majority of the admission, 53.5% (17.6%, 35.9%) for the vaccinated (VA) and 65.1% (18.3%, 46.8%) for the unvaccinated (UV). For both groups, sex was dominated by female population (58.2% VA and 57.8% UV). In the comorbidities, most of the patients have comorbidity count of at least 1 and most of the comorbidities were hypertension followed by diabetes and chronic kidney disease. On the disease severity, more severe patients were seen on unvaccinated group 19.3% compare to vaccinated group with 8.2%. For the hospitalization outcome, 5.3% of death was noted on VA group and 11% death was recorded on UV group.

On table 1 there is a significant association between the disease severity and vaccination status of patients (*p*-value = 0.014). On the other hand, age, sex, comorbidity count, length of hospital stay, and hospital outcome of the patients are not associated with their vaccine status (*p*-value > 0.05).

Table 1. Baseline characteristics of persons with documented SARS-CoV-2 infection

		Vaccination Status				Total		*p*-value
		Vaccinated		Unvaccinated				
		f	*%* *(n = 170)*	*f*	*%* *(n = 109)*	*f*	*%* *(n = 279)*	
Age	40 and below	28	16.5	17	15.6	45	16.1	0.173
	41 to 60	51	30	21	19.3	72	25.8	
	61 to 70	30	17.6	20	18.3	50	17.9	
	Above 70	61	35.9	51	46.8	112	40.1	
Sex	Female	99	58.2	63	57.8	162	58.1	0.942
	Male	71	41.8	46	42.2	117	41.9	
Comorbidity Count	0	34	20	33	30.3	67	24	0.137
	1 to 2	112	65.9	61	56	173	62	
	3 or more	24	14.1	15	13.8	39	14	
Comorbidity	Diabetes	57	33.5	32	29.4	89	31.9	NA
	Hypertension	110	64.7	55	50.5	165	59.1	
	Coronary Artery Disease	8	4.7	8	7.3	16	5.7	
	Chronic Kidney Disease	29	17.1	12	11	41	14.7	
	Chronic Lung Disease	16	9.4	7	6.4	23	8.2	
	Chronic Liver Disease	1	0.6	0	0	1	0.4	
	Cancer	6	3.5	6	5.5	12	4.3	
	Other Comorbidities	12	7.1	8	7.3	20	7.2	
Disease Severity	Mild	64	37.6	30	27.5	94	33.7	0.014[a]
	Moderate	92	54.1	58	53.2	150	53.8	
	Severe to Critical	14	8.2	21	19.3	35	12.5	
Length of Hospital Stay	Less than 8 days	142	83.5	80	73.4	222	79.6	0.120
	8 to 14 days	19	11.2	19	17.4	38	13.6	
	More than 14 days	9	5.3	10	9.2	19	6.8	
Hospitalization Outcome	Recovered	161	94.7	97	89	258	92.5	0.077
	Death	9	5.3	12	11	21	7.5	

[a] *Significant at 0.05 level of significance*

On table 2, most of the patients on both groups had mild to moderate diseases, 91.7% on VA and 80.4% UV. Severe disease was observed in 19.3% on UV patients while 8.2% in VA group. Severe disease was more common on elderly patient aging > 60 year old (5.3% in VA and

15.6% in UV), in male (5.3% in VA and 10.1% in UV) and patients with at least 1 comorbidity (7.6% in VA and 15.6% in UV).

Age, sex, and comorbidity count of vaccinated patients are not associated with their disease severity (p-value > 0.05). Same is true with the unvaccinated patients.

Table 2. Disease severity

		Disease Severity among Vaccinated					Disease Severity among Unvaccinated				
		Mild to Moderate		Severe to Critical		*p*-value	Mild to Moderate		Severe to Critical		*p*-value
		f	% (n = 170)	f	% (n = 170)		f	% (n = 109)	f	% (n = 109)	
Age	60 and below	74	43.5	5	2.9	0.4	34	31.2	4	3.7	0.091
	Above 60	82	48.2	9	5.3		54	49.5	17	15.6	
Sex	Female	94	55.3	5	2.9	0.074	53	48.6	10	9.2	0.293
	Male	62	36.5	9	5.3		35	32.1	11	10.1	
Comorbidity Count	Without Comorbidity	33	19.4	1	0.6	0.306[b]	29	26.6	4	3.7	0.213
	With Comorbidity	123	72.4	13	7.6		59	54.1	17	15.6	

[a] *Significant at 0.05 level of significance*
[b] *Fisher's Exact Test was used*

Table 3 showed majority of patients, 83.5% of VA group and 73.4% in UV group stayed for less than 8 days in both groups. Longer length of hospital stay of more than 8 days was noted in > 60 year old patients more frequently in UV group with 19.3% while 8.8% in VA group. More male than female (8.8% male 7.6% female in VA; 16% male 13% female in UV) and patients with comorbidity (14.7% VA and 19.3% UV) stayed longer than 8 days in both groups.

Age, sex, and comorbidity count of vaccinated patients are not associated with their length of hospital stay (*p*-value > 0.05). Same is true with the unvaccinated patients.

Table 3. Length of Hospital Stay

		Length of Hospital Stay among Vaccinated					Length of Hospital Stay among Unvaccinated				
		Less than 8 days		8 days and more		*p*-value	Less than 8 days		8 days and more		*p*-value
		f	% (n = 170)	f	% (n = 170)		f	% (n = 109)	f	% (n = 109)	
Age	60 and below	66	38.8	13	7.6	0.996	30	27.5	8	7.3	0.337
	Above 60	76	44.7	15	8.8		50	45.9	21	19.3	
Sex	Female	86	50.6	13	7.6	0.166	50	45.9	13	11.9	0.099
	Male	56	32.9	15	8.8		30	27.5	16	14.7	
Comorbidity Count	Without Comorbidity	31	18.2	3	1.8	0.179	25	22.9	8	7.3	0.713
	With Comorbidity	111	65.3	25	14.7		55	50.5	21	19.3	

[a] *Significant at 0.05 level of significance*

In the hospitalization outcome (Table 4), death was commonly observed in elderly patients >60 years old, 4.7% in VA and 10.1% in UA and in patients with comorbidity, 4.7% in VA and 10.1% in UA. Death in unvaccinated group was more common on female.

There is a significant association between age of vaccinated patients and their hospitalization outcome (p-value = 0.038). However, their sex and comorbidity count are not associated with their hospitalization outcome (p-value > 0.05).

On the other hand, age, sex, and comorbidity count of unvaccinated patients are not associated with their hospitalization outcome (p-value > 0.05).

Table 4. Hospitalization Outcome

		Hospitalization Outcome of Vaccinated					Hospitalization Outcome of Unvaccinated				
		Recovered		Death		p-value	Recovered		Death		p-value
		f	% (n = 170)	f	% (n = 170)		f	% (n = 109)	f	% (n = 109)	
Age	60 and below	78	45.9	1	0.6	0.038[a, b]	37	33.9	1	0.9	0.054[b]
	Above 60	83	48.8	8	4.7		60	55	11	10.1	
Sex	Female	95	55.9	4	2.4	0.493[b]	56	51.4	7	6.4	0.968
	Male	66	38.8	5	2.9		41	37.6	5	4.6	
Comorbidity Count	Without Comorbidity	33	19.4	1	0.6	0.689[b]	32	29.4	1	0.9	0.102[b]
	With Comorbidity	128	75.3	8	4.7		65	59.6	11	10.1	

[a] *Significant at 0.05 level of significance*
[b] *Fisher's Exact Test was used*

DISCUSSION

Vaccine against SARS-COV-2 infection had been proven effective in many studies, but the incidence breakthrough infections were notably increasing worldwide. In this study, a total to 279 patients were included, of which 170 were breakthrough infections and 109 were naïve infection. In result, majority of the admissions were breakthrough infection (60%,170/279). COVID-19 vaccines are effective at preventing most SARS-CoV-2 infection, but like other vaccines, they are not 100% effective hence breakthrough infections are expected. As the number of fully vaccinated rise up, the frequency of vaccine breakthrough illnesses will rise as well [5].

Result showed majority of the patients in both groups belonged to age group >60 years old, female and with presence of comorbidity. These findings were reflective in one study where

in the following factors older age, female sex and higher number of comorbidities were significantly associated with a higher likelihood of breakthrough infection. Increasing age and multiple comorbidities were also recognized risk factors for SARS-CoV-2 infection with increased disease severity and poorer clinical outcome in the study[7,15]. In another study, COVID-19 infection was substantially and independently linked with increasing age[7].

Severe disease in elderly individuals (table 2) was 5.3% in vaccinated group and 15.6% in unvaccinated were noted. In a study, increasing age were noted with higher risk of severe covid and dying from the infection[7,22] while vaccinated individual were associated with a lower risk of severe disease[7]. Increasing age groups is associated with poorer immunity and overall frailty which may be a potential reason for a higher risk among older persons[7]. Elderly and those with underlying comorbidities, are at a higher risk of getting serious breakthrough infections[23].

Although majority of the population were of female, the result showed male sex was more commonly observed to have severe disease with 5.3% in VA and 11% in UV group. Acquired immunity response from vaccine may be affected by viral load and genetic variant of SARS-CoV-2[16] such as sex. The following biological differences were identified as possible factors such as sex hormones, high expression of coronavirus receptors, life style and women tend to more responsible toward the pandemic than men [22].

A well-studied risk factor for poorer hospital outcome are the presence comorbidities in patients with SARS-CoV-2 infection[7,23]. Results in this study showed most of COVID 19 patient had comorbidity true to both group, 80% in VA and 69.8% in UV had at least 1 comorbidity. Results were similar to a study wherein patients with breakthrough infections especially the elderly had greater underlying comorbidities than those who were unvaccinated[23]. Elderly and those with underlying comorbidities, are at a higher risk of getting serious breakthrough infections[20]. When

compared to the general population, people with immunological deficiency experienced infection far more quickly[13]. In the same study showed that despite that breakthrough infection rates were higher in those with immune dysfunction, the severity of a breakthrough infection was lower, implying that vaccination had significant benefits. Individuals with immune dysfunction had much less severe COVID-19 outcomes after immunization than before vaccination, the illness severity of breakthrough infection cases was still noteworthy.

Hypertension was the most commonly observed, 64.7% in VA and 50.5% in UV followed by diabetes mellitus with 33% occurrence in VA and 29.4% in UV in this study and chronic kidney disease with 17.% in VA and 11% in UV. Similar to study of Butt et.al, 61.2% percent of the cases, at least one comorbid ailment was present, wherein hypertension and diabetes were the most frequent comorbidities among the vaccinated and 47.8% of the unvaccinated group[7]. In another study, they identified comorbidities are associated with higher incidence of breakthrough infections, with CKD posing the largest risk while people with chronic lung disease had the highest rate of breakthrough infection but the lowest probability of being admitted to the hospital[17].

In the two groupings, similar to a study, their findings when compared to those who were not fully vaccinated, more fully vaccinated persons hospitalized with breakthrough COVID-19 had selected chronic illnesses such as hypertension, diabetes, heart failure, or chronic obstructive pulmonary disease[24]. Patients with breakthrough infections had higher rates of lung disease, type 2 diabetes, history of malignancy, and baseline use of immunosuppressive medicines than those who were uninfected[23].

Mild to moderate diseases were commonly noted on both groups as shown on Table 2. More severe cases were noted on unvaccinated group, 19.3% on UV patients while 8.2% in VA

group and there was significant association between severity of disease and vaccination status with *p*-value 0.014. These result support the notion that individuals with vaccine break through infections have a lower chance of having severe COVID-19 infection than those who have not been vaccinated[25].

Studies showed breakthrough infection after vaccination were less severe than partially or unvaccinated individuals[7,13,20,25]. A fully vaccinated individual has 50% reduction of developing long COVID-19 symptoms compared to unvaccinated individual[13]. Vaccination and previous covid infection were associated with decrease risk of infection or breakthrough infection[26].

In this study, longer hospital stay more than 8 days was observed in elderly (19.3% UV and 8.8% in VA), in male more than female and patients with comorbidity. According to studies of viral dynamics, viral loads in breakthrough infections may be as high in vaccinated people as they are in uninfected people. In vaccinated individuals, the virus they emit is less likely to be culture positive than virus shed by unvaccinated individuals, they confirm that vaccinated people are less likely than uninfected people to spread SARS-CoV-2 to close contacts [27]. They concluded that persons who have been fully vaccinated are less likely to become sick, and if they do, they will be will be contagious for shorter periods. Interestingly in the study of Jingsun, when compared with the general population, breakthrough infection occurred far more quickly among persons with immune dysfunction[13]. In comparison to unvaccinated patients, fully vaccinated COVID-19 patients in a study conducted in Norway had a shorter length of stay in hospital (both with and without ICU admission) and a lower probability of ICU admission, however, once in the hospital, the risk of death is the same for fully vaccinated and unvaccinated people[18]. Advanced age, male sex, and certain comorbidities such as immunosuppression, kidney illness, obesity, and diabetes were all linked to a prolonged hospital stay and/or an increased chance of ICU admission or mortality [28].

Hospitalization outcome in this study is defined as death or recovered. There is a significant association between age of vaccinated patients and their hospitalization outcome (p-value = 0.038). Death was commonly observed in elderly patients with comorbidity and female in unvaccinated group. A study of adults hospitalized for breakthrough infection in Chile discovered that hospitalizations, CCU admissions, and ventilator use were all more common in unvaccinated people and immunization also reduces mortality [3]. Based on CDC, unvaccinated people had a higher chance of testing positive for COVID-19 and dying from COVID-19 than those who had vaccination and mortality rate is lower than people vaccinated with primary series any type of vaccine[5].

CONCLUSION

Based on the findings of this study, the following conclusions were drawn:

Among all admitted COVID 19 patients in DWH for the month of October 2021 to March 2022 majority were breakthrough infections (60%) this could possibly be attributed with increasing number of fully vaccinated individuals hence increasing breakthrough infection is expected as well.

In both groups, vaccinated and unvaccinated, majority of the patients belonged to elderly group, age group >60 years old, female and with presence of at least 1 comorbidity. Most frequent comorbidities noted was hypertension followed by diabetes and chronic kidney disease.

Most of the population had mild to moderate disease regardless of the vaccination status. The disease severity was significantly associated with vaccination status similar to other studies. The findings were consistent in most of the literature reviewed, showing breakthrough infection after vaccination were less severe than partially or unvaccinated individuals

Age was significantly associated with hospitalization outcome in vaccinated group but not in unvaccinated group. Increasing age was independently associated with breakthrough infection. However, there was no association of vaccine status to comorbidity count and to length of hospital stay in both vaccinated and unvaccinated group.

This study stands with the importance of COVID-19 vaccination and supports the need of booster doses as breakthrough infections are on the rise.

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DATA COLLECTION FORM

Profile and Clinical Outcomes Among Patients admitted in a Tertiary Hospital in Tacloban City with Breakthrough SARS-CoV2 infection

Name	Age
Sex	Male Female
Address (Barangay, City/Municipality, Province)	Date of admission (dd/mm/yy)
Contact Number	Date of discharge (dd/mm/yy)
Vaccination Status	Fully Vaccinated
	Partially Vaccinated
	Unvaccinated
Type of Vaccine	
	SinoVac
	Johnson & Johnson
	AstraZeneca
	Pfizer
	Moderna
	Sputnik
	Others
Comorbidities	Diabetes Mellitus
	Hypertension
	Coronary Artery Disease
	Chronic Kidney Disease
	Chronic Lung Disease
	Chronic Liver Disease
	Cancer
	Others
Morbidity Count	None
	1-2
	3 or more
Disease Severity	Mild
	Moderate
	Severe
	Critical
Length of Hospital Stay	< 7 days
	8-14 days
	>14 days
Hospitalization Outcome	Recovered
	Death

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DEPARTMENT OF INTERNAL MEDICINE

March 2, 2022

To:

SR. M. SARAH GOCELO, OSB
Hospital Administrator
Divine Word Hospital
Tacloban City

Thru:

Corazon A. Rubio, MD. FPCP
Chairperson, Internal Medicine Dept.

Greetings!

I am writing to request permission from your good office to conduct a research study in Divine Word Hospital, in partial fulfillment of the requirements for the Internal Medicine residency training program. I am a third year resident of the Department of Internal Medicine of the said institution and my study is entitled: **Profile and Clinical Outcomes Among Patients admitted in a Tertiary Hospital in Tacloban City with Breakthrough SARS-CoV2 infection.**

If approved, I will be making use of charts from the medical records to gather information for my research. Rest assured, confidentiality and anonymity will be strictly practiced at all times and only information needed for this research will be gathered.

Attached to this letter is a copy of my research proposal. Should you have any questions or concerns with regards to the study, I would be more than willing to answer them. You may contact me at my email address: princessmaepetallana@gmail.com

Thank you very much and I am hoping for your positive response.

Respectfully,

Princess Mae P. Petallana
Level III Medical Resident

Approved by:

SR. SARAH R. GOCELA, OSB
Hospital Administrator