

REVIEW ARTICLE

A Glimpse of Health Research Findings on COVID-19 Pandemic in Myanmar

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Introduction

At the end of 2019, a new strain of coronavirus named SARS-CoV-2 was reported from Wuhan, China. This disease is of little-known etiology and with symptoms similar to pneumonia in its severe form. It was later identified as the deadly novel virus SARS CoV-2. The disease has had a major impact on human health globally infecting a large number of people; causing severe disease and associated long-term health problems, with high mortality especially among older and vulnerable populations. First reported in December 2019, the cumulative COVID-19 incidence count has surged to approximately 45.67 million cases globally, killing around 1.29 million people as of the 31 October 2020 (16:54 GMT), Worldometer. COVID-19 corona-virus pandemic reported cases and deaths by country, territory, or conveyance.¹ December, 2022 is the third anniversary of China's announcement of the outbreak that would lead to the COVID-19 pandemic and at the time of writing (04 February 2023), 67.57 million cases occurred worldwide with 6.76 million deaths.²

Research publications on COVID-19

In just six months, major databases have been flooded with research articles, letters, reviews, notes, and editorials related to COVID-19. For just over a year of the COVID-19 pandemic, *Nature* highlighted key papers and preprints to help readers keep up with the flood of coronavirus research. Number of coronavirus articles reaches over 23,500 on major databases. 28 August 2020.³

A separate study estimates that 23,634 unique published articles have been indexed on Web of Science and Scopus between 1 January and 30 June 2020. Research papers accounted for 48% and 37% of all COVID-19-related articles on Scopus and Web of Science, respectively. Letters, reviews, editorials, and notes made up the rest of the share of coronavirus articles on each database. In both databases, the United States, China, and Italy were the leading countries by publishing volume, while *BMJ*, *Journal of Medical Virology*, and *The Lancet* published the most papers related to the coronavirus. One of the first papers about COVID-19 to appear in the literature — a 24 January publication in *The Lancet* about 41 people hospitalized in Wuhan, China — is the most cited.⁴ In this review an attempt has been made to describe the findings of some research studies carried out during the different waves of COVID-19 epidemic. The findings ranged from epi-demiological and genetic diversity to clinical management of COVID-19 infections in Myanmar. Also included were vaccine awareness, impact of containment measures, effects on mental health and lived experiences of the patients. Clinical studies were also described. It is expected that the findings could describe the pattern of COVID-10 epidemic in Myanmar.

Search strategy

For this research, the literature of observational and epidemiological studies,

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clinical trials, reviews, letters to the editor, and WHO documents were searched on-line during the months of November and December 2022. Literature including the key words; COVID-19, SARS-CoV-2, COVID Pandemic and relating to Myanmar were included. The search engines used were Google, PUBMED, Web of Science and Scopus. All literature retrieved were perused and those who did not include a Myanmar author were excluded. Also, whose full text was not obtained or those whose authors cannot be contacted were excluded. Available data from the website of the Ministry of Health (Formerly, Ministry of Health and Sports), Coronavirus Disease 2019 (COVID-19) Surveillance Dashboard, Myanmar, between 23 March 2020 and 31 December 2020, which covered the daily situation of COVID-19 was also used to determine the laboratory-confirmed and expired cases during the different epidemic waves.⁵

COVID-19 infections in Myanmar

In Myanmar, the first two confirmed cases of COVID-19 were reported on 23rd March 2020, in people who had recently returned from the United States of America and the United Kingdom and there were 379 confirmed cases and 6 deaths during the first wave of epidemic which was observed between 23rd March and 15th August 2020. After a gradual decrease in the number of COVID-19 cases, the country was hit with an unexpected rise of cases starting from 16 August 2020. The second wave started with people from Rakhine State and main source of infection was from the main market at Sittway, the capital of Rakhine State. Within a short span of five months, the disease spread to the whole country and Yangon became a major epicenter. The second wave lasts for 284 days up to 26th May 2021. The number of positive cases reached 142,944 (5.78 positive rate) with 3200 deaths resulting in CFR of 2.24. Since 27th May 2021, the confirmed cases gradually increased again and a big cluster was found at Tonzan, Kyi-khar village. It was proved by gene sequencing later. Following that, COVID-19 clusters were identified in Bago

Region (Letpadan cluster: 126 confirmed cases) and Yangon Region (Hlegu cluster: 246 confirmed cases) during the second week of July 2021. These clusters of infections played a critical role in modifying patterns of COVID-19 transmission, which exponentially increases the number of cases. Subsequently, Bago and Yangon were the regions with the highest detected cases in the early stage of the third wave. The community spread in the third wave was faster than the second wave in Myanmar. The third wave lasted for 246 days ending in 27th January 2022. During the third wave, there were 391,353 confirmed cases with a positive rate of 10.57. There were also 16,095 deaths (CFR 4.11). Fourth wave began in 28th January 2022 and reached peak in March. It started from Sagaing, Kalay and Tamu and as of November, 2022, the total number of daily new confirmed cases was nearly 98,574 (positive rate 2.94) with 178 deaths (CFR 0.18). At the time of writing, the epidemic is now 340 days and is officially not over as yet.⁵

Genetic diversity of COVID-19

On 15th June 2021, Ministry of Health (MOH) reported that Alpha: B.1.1.7 and Delta: B.1.617.2 (Variants of Concern) and Kappa: B.1.617.1 (former Variants of Interest) were detected in 11 confirmed cases. On 22nd July 2021, MOH also announced that Beta: B.1.351 variant (Variants of Concern) was newly detected in Myanmar. As the COVID-19 disease surveillance, on 31st August 2021, MOH stated that Delta variants were detected again in 15 confirmed cases (five cases in Nay Pyi Taw, two cases in Yangon, two cases in Mandalay, each case in Sittwe, Taungoo, Lashio, Mawlamyine, Monywa, and Kalay). Recently, during the fourth wave, the Omicron variant was identified as the main variant.⁵

Molecular based methods were also carried out on the retrieved samples (nasopharyngeal swabs collected from patients) to investigate the genetic diversity of virus in the different waves of the COVID-19 epidemic in Myanmar. Mutational and phylogenetic analysis of 30 whole genome sequences for the virus's

genomic characteristics in the early phase of the pandemic (March-June 2020) and the sudden surge of infection (August-September 2020) was carried out. In the early phase of the epidemic, 4 samples showed B.6 lineage and five samples collected from 5 returnees by rescue flights showed B.1.36.1 (three from India), B.1.1 (one from India), and B.1.80 (one from China). All samples collected during the sudden surge showed lineage B.1.36.⁶ In a different study, the first wave samples revealed GISAID clade O or PANGOLIN lineage B6 and the second wave was changed to GH or lineage B.1.36.16 with a close relationship with other South Asian strains.⁷

Also the presence of a novel variant of SARS-CoV-2, B.1.1.7, was indicated by detecting a sensitive surrogate marker S-gene target failure (SGTF). Among 76952 nasopharyngeal swab samples tested during January 2021 to May 2021, 623 samples were found to be SARS CoV-2 test positive. The SARS CoV-2 positive samples were further tested with “TaqPath-1 Step SARS CoV-2 Detection kit, Thermo fisher Scientific” to determine SGTF. SGTF was identified as “non-detection of the S gene target among samples that tested positive (cycle threshold less than 37) for both the N gene and ORF1ab gene target. Among 623 COVID-19 positive samples, 17 samples (2.7%) were found to be SGTF positive.⁸

Public health studies

Community-based studies were carried out to determine the perception, protective behaviors and knowledge of the people. A community-based study carried out at Yangon and Bago Regions on 597 adults age above 18 years of both sexes revealed that almost all respondents agreed to the important role of community in prevention of COVID-19. Among them, 29.3% mentioned that COVID-19 is a viral infection and 91.3% understood that it can be spread from person to person. Regarding the mode of transmission, the majority (66.6%) responded that it could be transmitted by droplets whereas (29.6%) responded that it could be transmitted by direct contact. Among them, frequent hand

washing with soap and water or alcohol-based hand sanitizer was considered as a preventive measure by 54.8%, followed by avoiding crowded places by 45.2%. They also accept the fact that the suspected cases need to be reported to the health authority and to follow the instructions of MOH. Almost all respondents (97%) perceived that disease will be more severe for elderly and people with comorbidities. About 86% perceived that COVID-19 will cause severe signs and symptoms and many (78%) thought that infected person could not survive. Also, some respondents wrongly perceived that susceptibility of disease was low among young people (39%) and in healthy people (32%). Regarding protective behaviors: 45% wash hands frequently, 34% avoided travel or trip, 58% avoided crowded area to prevent COVID-19. Also nearly half of the respondents (47%) stated that they always completely covered the mouth and nose during coughing and sneezing and that the majority (83%) discarded used mask or tissues into dustbin. Regarding to health advice to fever/cough patient, 87% reported they will give advice to go clinic, 7% want to give advice to avoid crowded places while 6% want to give advice to avoid close contact with others. Only 3% said they don't know what advice should be given to fever patients.⁹

In the third wave of the epidemic, MOH reported that more than 2000 daily confirmed cases were detected starting from 1st July 2021, more than 4000 daily confirmed cases starting from 8th July 2021, and more than 6000 daily confirmed cases starting from 14th July 2021. For the COVID-19 related deaths, more than 100 daily deaths were reported starting from 13th July 2021, more than 200 daily deaths starting from 17th July 2021, and more than 300 deaths starting from 22nd July 2021. The third wave of the COVID-19 epidemic took a peak in the fourth week of July (on 22nd July) 2021 and the length of the critical period (from the start of the wave to its peak) was 56 days. The weekly percent changes of confirmed cases and deaths were positive values from week 1-8 and week 1-10, respectively. After a period of most

containment measures (weeks 7-9), the weekly percent changes of confirmed cases and deaths were negative values. Confirmed cases reduced 52.69% at 4 weeks, 66.04% at 8 weeks, 78.37% at 12 weeks, and 88.86% at 17 weeks, from the peak of the epidemic (week 9). COVID-19 related deaths also reduced 60.31% at 4 weeks, 79.88% at 8 weeks, 90.73% at 12 weeks, and 96.91% at 17 weeks, from the peak of the epidemic. It could be suggested that the containment measures had a positive impact on COVID-19 infection and deaths.¹⁰

A team of researchers calculated the cost of management of COVID-19 based on two cost components, namely direct and indirect costs. Direct costs were the costs that were directly attributable to patient care. It involved the cost of health workers that was spent on treating the patient, along with the entire test performed, drugs and medical supplies used including Personal Protective Equipment (PPE). Indirect costs included the costs that were not directly related to the care. It covered the costs of non-medical supplies such as furniture, office materials, cost of human resources who were working in administration or management roles, and the operation costs of these facilities such as electricity, water, etc. On December 31, 2020, Myanmar recorded 124,630 confirmed cases with 47,359 asymptomatic patients. Clinical management cost for 76,169 patients with mild-moderate symptoms and 1,102 patients with severe symptoms accounted for 139,438,249,370 MMK (104,840,789 USD) in total.¹¹

The current disruption of social and economic life caused by COVID-19 particularly impact the mental health of older people the problem of mental health among COVID-19 sufferers was studied among 142 consenting COVID-19 patients attending Hmawbi COVID-19 Treatment Center in Yangon in December 2021 and January 2022. A cross sectional telephone survey was carried out using a pretested Myanmar language version of a structured questionnaire based on Center for Epidemiologic Studies Depression Scale (CES-D) was used as a tool for assessment of

depressive symptoms. The questionnaire comprised two parts: background characteristics (including socioeconomic factors, epidemic-related factors, psychological factors, and psychosocial supports) and assessment for depressive symptoms. It contained 20 items about symptoms that occurred in a week prior to the interview with response options from 0 to 3 that refer to the frequency of the symptoms.

Significant associated factors of depressive symptoms were identified as those with 40 years and older (AOR 2.99), those with small household size (less than 4 persons) (AOR 3.45), those with less than 400,000 kyats of monthly family income (AOR 2.38) and infection to family members (AOR 4.18). In the subscale of somatic symptom, negative effect, and anhedonia (inability to feel pleasure) were 4.64 (± 2.53), 2.51 (± 2.12), and 5.01 (± 3.26), respectively. The authors concluded that establishments of psychosocial supports, providing psycho-education, enhancing the social contact with family and friends, and using credible source of information related COVID-19 would be integral parts of mental health services in COVID-19 pandemic situation.¹²

A qualitative, descriptive phenomenological approach was used to described the lived experience of lived experience of being patients with COVID-19 during the third wave. The age of participants (ten females and 5 males) ranged from 39 to 70 years. Nine of the respondents had a medical history, including obesity, diabetes mellitus, hypertension, heart disease, and arthritis. Fifteen individuals described their experiences using four themes and 17 categories. The main themes were the aggressive natures of the pandemic, suffering from the disease, receiving vital support for survival, and the hardships during the crises. The aggressive natures of the pandemic were revealed by community survivors who could not access hospital care due to the crises during the period. Participants explored the aggressive natures of the pandemic by supporting seven subthemes: uncontrollable outbreak, unfeasible prevention, and preparation for the worst,

unknown source of disease transmission, self-isolation, depleted medical resources, loss of significant others, and financial difficulties and job insecurity. Second, respondents explored their main theme of suffering from the disease by compiling physical and psychological conditions. Third, the main theme of receiving vital support for survival was composed of support from family members and society; support in the form of medical, respiratory, nutritional, and spiritual support; and support by learning. Fourth, the scarcity of health workers during the crises. The author concluded that although there were some limitations in the study, the experiences of people who survived the deadly disease were well noted.¹³

Clinical studies

Presenting symptoms of COVID-19 patients presenting at medical centers were studied in different waves and reported. Management regimes and their outcomes were also studied in medical institutions.

In a study carried out in the second wave of epidemic in Myanmar at two designated treatment centers for confirmed COVID-19 patients, presenting clinical features and associated factors were highlighted. The study included 222 COVID-19 patients aged 17 to 86 years 44.81 (\pm 16.99) years. Among them, 98 (44.1%) patients had a history of contact with confirmed cases. 181 study participants (81.5%) were symptomatic; the most common initial presenting symptoms been fever 98 (54.1%) followed by loss of smell 91 (50.3%), cough 56 (30.9%), muscle ache 53 (29.3%), and headache 52 (28.7%). 46 patients (20.7%) presented with severe pneumonia were treated at the Intensive Care Unit among which 6 (13%) died. Patients who were 60 years and older, those with overweight or obesity, those who were current smokers, those who were alcohol drinkers and those who were with comorbidities were more likely to develop severe pneumonia.¹⁴

The clinical presentations, and severity of SARS-Cov-2 wild type, the Delta variant and the Omicron variant were studied during the early fourth wave of the epidemic in Myanmar.

The study was carried out in patients attending two military hospitals in Yangon during October 2021 to early January 2022 were included in the study. Among laboratory confirmed 150 cases, Wild type was identified 2 cases (1.3%), Delta variant in 138 cases (92%) and Omicron variant in 10 cases 6.7%. Wild type infected patients presented with fever, loss of smell and cough. Delta variant infected patients produced mild 36.2% (50 cases), moderate 52.5% (72 cases), severe 10.9% (15 cases) and critical 0.7% (one case).¹⁵

The effectiveness of early remdesivir (a broad spectrum antiviral medication) therapy during viral phase of COVID-19 was retrospectively studied on 204 high risk COVID-19 patients who had received remdesivir (RSDV) therapy within 7 days from the onset of illness before oxygen desaturation. All patients received RSDV therapy according to standard five days course of 200 mg loading dose on day 1, followed by 100 mg daily for up to 4 additional days. Out of 204 patients, 60.75% (124/204) were aged 60 years and above with comorbidity; 21.1% (43/204) aged under 60 years with comorbidity and 18.1% (37/204) were aged more than 60 years old without comorbidity. The patients who received RSDV therapy within 1-4 days and within 5-7 days were 50.5% (103/204) and 49.5% (101/204) respectively.

All patients survived to 21 days without ICU admission or mechanical ventilation. Eighty six percent of patients had no hypoxia and only five percent had moderate to severe hypoxia, requiring oxygen. Those who received RSDV therapy within 1 to 4 days from the onset of symptoms had significantly lower rate of hypoxia compared to those who received RSDV therapy on 5 to 7 days. After RSDV therapy, increased lymphocyte count and decreased CPR were observed in 74.5% (152/204) and 52.9% (108/204) of the patients respectively. There was no report of major adverse events. RSDV, if given within first 4 days from the onset of symptoms, is the most effective strategy for prevention of oxygen desaturation, further progression of COVID-19 and death. It is still beneficial if

given later at days 5 to 7. It is a safe drug to be prescribed in hospital and at home care.¹⁶

The efficacy and safety of Baricitinib therapy was studied in severe COVID-19 infection in Myanmar. A case control study was conducted in COVID-19 treatment centers in Myanmar - Yangon and Nay Pyi Taw, from June to October 2021. Baricitinib 4 mg daily for 14 days was given to the patients with severe COVID-19 infection as an add on therapy to Standard treatment group (Remdesivir). A total of 64 patients with severe COVID-19 infection were enrolled. Base line characteristics in both groups, Baricitinib group (n=32) and Standard treatment group (n=32), were comparable. Nearly 53% of patients in Baricitinib group and 59% of patients in Standard treatment group survived; however, mean duration of hospital stay was shorter in Baricitinib group (15.53 ± 6.83 days versus 22.25 ± 11.17 days; $p < 0.001$). Improvement in oxygen supplementation, radiological changes and changes in inflammatory markers were not different in both groups. In treating patients with severe COVID-19 infection, the survival rate was not different between Baricitinib group (Baricitinib plus Remdesivir) and Standard treatment group (Remdesivir). Among survivors, those in Baricitinib group had shorter duration of hospital stays; quick recovery time and accelerating improvement in clinical status.¹⁷

Covid vaccination

Vaccines serve a crucial role in preventing deaths and hospitalizations caused by infectious diseases and help to control disease transmission; hence, their influence on infection and severe illness is enormous. Vaccines are one of the most dependable and cost-effective public health interventions ever implemented and save millions of lives annually.

A study was reported on the acceptance of COVID-19 vaccine among 301 Myanmar migrant workers in Thailand. Among them thirty-nine percent of workers intended to receive the COVID-19 vaccine within a year. The following factors were also found to

be associated with obtaining the COVID-19 vaccine: a high level of perception of COVID-19 (AOR 5.43), income less than or equal to 10,000 baht/month (AOR 6.98), financial status at a sufficient level (AOR 7.79), wearing a face mask in the previous month almost all the time (AOR 4.26), maintaining 1-2 m of distance from anyone in the last month (AOR 2.51), and measuring temperature in the previous month (AOR 5.24). High reluctance to accept the COVID-19 vaccine among Myanmar migrant workers can influence efforts to eliminate COVID-19.¹⁸

A cross-sectional descriptive study was conducted among health care workers and their family members from January 2022 to May 2022. The SARS-CoV-2 infection was confirmed either with RT-PCR testing or rapid diagnostic test from a nasopharyngeal sample. The majority of cases with breakthrough infections in fourth wave was mild. The prevalence of breakthrough hospitalization was 3-6% in health care workers and family members; showing the protective effect of vaccine from severe manifestation. Non-survivors were elderly, having multiple comorbidities and incomplete vaccination or unvaccinated. The chance of breakthrough infections was decreasing if they obtained 4 doses compared to 3 doses. The possibility of breakthrough infections after taking 3 doses of vaccine was 50% in health care workers and 33% in family members; it dropped to 36% and 22% respectively after 4 doses of vaccine. Therefore, 3 doses of COVID-19 vaccine could protect 50-67 percent; the protective efficacy increased to 65-87 percent with 4 doses. Therefore, 4 doses of COVID-19 vaccine are recommended for prevention of fifth wave in Myanmar.¹⁹

A study was reported on the effectiveness of 4 doses of COVID-19 vaccine in a group of patients on maintenance hemodialysis (MHD). A hospital-based descriptive study was conducted in July 2022 to November 2022 among patients on MHD who received COVID-19 vaccine 4 doses; last dose was 2 weeks ago. A total of 61 patients on maintenance hemodialysis (MHD) who

had 4 doses of COVID-19 vaccination more than 2 weeks were included. COVID-19 infection was determined using PCR test two times a week. If the patients developed COVID-19 infection, clinical parameters were recorded and investigations were conducted as required.

The severity of COVID-19 infection was determined according to WHO criteria and they were given treatment according to hospital guideline. They were followed up till 28 days. Half of the patients had comorbidities: 16.4% (10/61) had diabetic nephropathy; 9.8% (6/61) had cerebrovascular accident; 24.6% (15/61) had coronary heart disease. One fifth of them were also four doses of COVID-19 vaccine in patients on MHD was not satisfactory as 36% of them were infected in the 5th wave of epidemic in Myanmar. However, all the infected cases were mild form and they did not need oxygen therapy showing that booster vaccination pre-vented morbidity and mortality. Therefore, the protection rate of four doses of COVID-19 vaccine in patients on MHD was nearly 65%; it reduced the severe form of infection and death. Fifth dose of COVID-19 vaccine is necessary along with personnel protective measures.²⁰

To determine infections with new variants of COVID-19 infection, a cross-sectional descriptive study was conducted in July 2022 on consenting 42 health care workers who had 3 doses of COVID-19 vaccine, the last dose being at least 2 weeks ago. Anti-Spike antibody was measured as a surrogate marker of new variants. Though it was not statistically significant, the anti-Spike antibody level was relatively higher in following conditions: female; non-smokers; those with COVID-19 infection; those with shorter duration from last infection; those with shorter duration from last vaccination; and those who got vaccination in the afternoon.²¹

Conclusion

History had documented pandemics all over the world. Most notorious pandemics were

Plague (1348), Small pox (1775), and Spanish Flu (1918) causing high morbidity and mortality.²²

However, none is of comparable to the speed of spread of the current pandemic of COVID-19 which is like tsunami in nature. The pandemic has also tested the global health system exposing the unpreparedness of many countries across the globe. It has caused global crisis including human fatalities and economic downturn. Developed countries are of no exception and suffered no less than lower-and-mid income countries in Asia and Africa in terms of morbidity and mortality. Scientists during all pandemics had discovered new medical and health knowledge to overcome the health crises.

Public health measures and containment procedures are in existence since the early pandemics but many scientific developments followed by research publications were observed following the pandemics. Small pox pandemic had led to the development of vaccines and cholera pandemic had led to the discovery of new pathogenic bacteria, Spanish flu (influenza) pandemic had led to discovery of viruses. COVID-19 pandemic has led to grave situations but scientific research had led to discovery of new techniques and a very potent vaccine was developed within a very short time. It is most important to study the research developments of pandemics and to learn from the research publications in preparing for future pandemics.

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