ORIGINAL ARTICLE

COVID-19 Pandemic: Trends, Interventions and Outcomes experienced at Allied Hospitals of Rawalpindi Medical University Pakistan

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Abstract

Objectives
To determine the trend of COVID-19 cases, the effects of the interventions done to limit the spread of coronavirus and outcomes achieved during COVID-19 pandemic at Rawalpindi city.

Subjects & Methods
A cross-sectional study was conducted at four tertiary care hospitals (Holy Family Hospital, Benazir Bhutto Hospital, District Head Quarters Hospital & Rawalpindi Institute of Urology & Transplantation) and two field hospital established on emergency basis through consecutive sampling. The data was gathered from mid-March till first week of July 2020 regarding their management (oxygen supply or placement on ventilators) and mortality. The data was analyzed by SPSS version 25.0.

Results
28,208 study subjects presented with coronavirus associated symptoms and screened at filter clinics established in tertiary care and field hospitals affiliated and managed by Rawalpindi Medical University. Out of 4,106 suspected cases, 2119 were found to have confirmed COVID-19. Adequate number of beds and equipment including ventilators and oxygen cylinders were arranged in phases to tackle with patient burden as medical interventions. Lock down imposition constituted non-pharmacological intervention. Total 357 deaths were reported with highest frequency (65.3%) of males. Initially people were asymptomatic and stable but later were reported with severe symptoms of COVID-19. Peak of cases were detected about 10-14 days after lockdown lifting and Eid Festival.

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Conclusion
Medical as well as non-medical interventions seemed to be quite effective in limiting the spread of COVID-19.

Keywords
COVID-19, trends, interventions, outcomes, ventilators, lockdown, social distancing, hand sanitization.

Introduction

SARS-Cov-2 is an extremely pathogenic coronavirus following SARS-CoV and MERS-CoV with alarming fatalities.[1] Currently 10 million COVID-19 cases are reported globally with approximately 529,113 deaths and 6,297,610 recoveries.[2] About 103,722 active cases are registered in Pakistan as of 4th July 2020 and among them 2,479 are diagnosed with critical illness.[1] Pakistan initially encountered this challenging outbreak owing to human mobility across the borders specifically those of China and Iran that were labeled as epicenters for this havoc.[3]

World Health Organization reported exceedingly high risk of mortality and morbidity amid COVID-19 pandemic across the globe.[4] Contagiousness and rapid spread are the basis for tagging COVID-19 as Public Health Emergency of International Concern.[5] High risk to this novel infection is primarily attributed to absence of immunity to SARS-CoV-2.[6] Elders, pregnant women and immuno-comprised individuals are more susceptible with mean incubation period of 3-7 days.[7] Fever, dry cough, sore throat, body aches, diarrhea, nausea and vomiting are common symptoms.[8] Severe cases may suffer from respiratory distress, septic shock, coagulopathy and metabolic acidosis.[9]

Diverse interventions imposed amid COVID-19 pandemic across the globe were social distancing, use of personal protective equipment, closure of educational institutes and restricted gatherings.[10] Government's interventions like early lockdown lifting keeping in view its unfavorable socioeconomic impact also contributed somewhat to escalation of cases.[7] Pakistani

citizens are more prone to COVID-19 infection due to their socio-cultural attributes.[11] About 80% of our people are mildly infected and only 4.7% required intensive care.[12] Moreover, with only 0.75% GDP allocation to health sector, there was anticipated difficulty in dealing with expected devastating health outcomes of novel coronavirus.[13]

The present study is therefore intended to determine the trends of COVID-19 experienced among patients and suspects visiting tertiary care and field hospitals managed and affiliated with Rawalpindi Medical University, the interventions done to mitigate this calamity and the resultant health outcomes. This research would really provide valuable insights to our policy makers and strategic planners for appropriate interposition and efficient healthcare management to cope up with this novel disease.

Subjects & Methods

A cross-sectional study was conducted at four tertiary care hospitals namely Holy Family Hospital (HFH), Benazir Bhutto Hospital (BBH), District Head Quarters Hospital (DHQ), Rawalpindi Institute of Urology & Transplantation (RIU&T) was collected through consecutive sampling. The data was also accumulated from Sports Complex Field Hospital (SCFH) that was established on emergency basis and Red Crescent Hospital (RCH) purposely transformed to deal with burden of COVID-19 regarding the number of COVID-19 patients reported on daily basis from mid-March till first week of July 2020 along with the data with respect to their management (oxygen supply or placement on ventilators) and mortality. The data was analyzed by using SPSS version 25.0 to delineate the trend of COVID-19, measures taken to arrest its rapid spread and health outcomes charted out at Rawalpindi city.

Results

Rawalpindi Medical University was set in action beforehand to manage the anticipated patient burden of COVID-19. Ample planning was done in phases pertinent to pharmacological interventions like adequate beds arrangement in general ward and isolation rooms along with sufficient oxygen supply and ventilators amid COVID-19 pandemic as shown below in Figure 1.

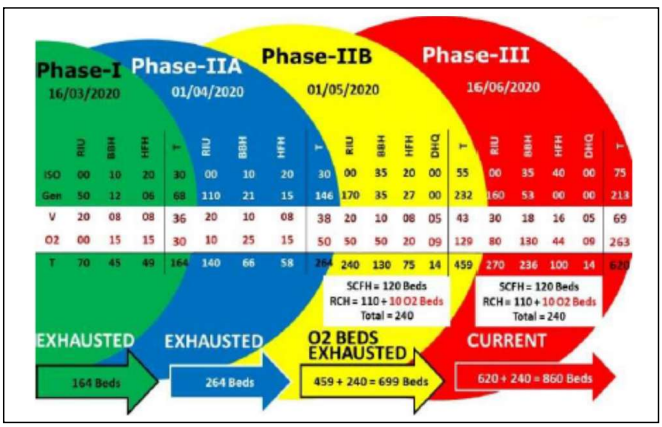

Fig 1. Phases of COVID-19 healthcare planning by Rawalpindi Medical University / Allied Hospitals

About 28,208 study subjects presented with symptoms suggestive of coronavirus infection and screened at flu filter clinics established in Allied Hospitals of Rawalpindi Medical University amid COVID-19 pandemic. About 4,106 were suspects and 2,119 constituted confirmed cases as depicted below in Table 1.

First peak of COVID-19 was noted on 11th May, 2020 when there was increased risk of viral transmission due to continued social gatherings and violation of Standard Operating Procedures (SOPs). Initially people were asymptomatic or mildly infected but severe cases were reported with the passage of time. A lockdown was imposed in Punjab on the 25th March 2020 that resulted in gradual rise of cases as shown below in Figure 2.

Cases were limited to imported cases initially from the Iranian border and international flights, gradually disease spread into

Table 1: Patient burden in Allied Hospitals of Rawalpindi Medical University

Hospitals	Patients visiting flu filter clinic	Total suspected	Total confirmed cases	Confirmed admitted
BBH	21661	2677	985	39
HFH	4413	1063	491	11
RIU&T	00	00	1093	50
DHQH	2134	366	126	00
SCFH	00	00	00	00
RCH	00	00	170	02
Total	**28,208**	**4,106**	**2,119**	**102**

BBH- Benazir Bhutto Hospital, HFH- Holy Family Hospital, RIU&T- Rawalpindi Institute of Urology & Transplantation, DHQH- Distric Head Quarters Hospital, SCFH- Sports Complex Field Hospital, RCH- Red Crescent Hospital

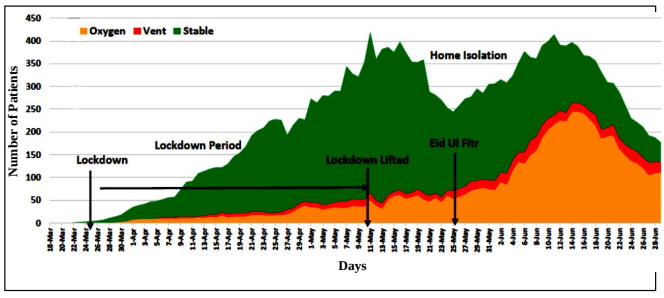

Fig 2. COVID-19 scenario in association with lockdown at Rawalpindi

community and also in four provinces resulting increase number of infected cases.

First trough was due to the new policy of home isolation, introduced by the health department. After which only symptomatic and serious infected cases, were admitted to the hospitals, rest were isolated at home. This policy lessened the hospital cases as shown in Figure 2.

Second peak followed the Eid holidays and lockdown lifting. Exactly after 10 days of Eid, the cases started rising, especially oxygen dependent cases (Shaded Yellow) with little rise in ventilated cases (Shaded Red). This trend continued to raise leading to the highest peak from the 10th to 18th June 2020. This trend followed the natural history pattern of COVID-19 disease.

After 15 days, most of the cases started recovering, some unfortunately died, following the natural course of COVID-19 disease and the second trough started. The reason for the second trough was that maximum urban population had been exposed at one given point of time on Eid and is now in the recovery phase. New cases decreased because the unexposed population had decreased. As maximum population of urban areas is exposed, incubation period and natural course of the disease has completed, so the trend of admitted patients started coming down**.**

Of the total 357 deaths reported in RMU affiliated Allied Hospitals due to COVID-19, 65.3% (233) were males while 34.7% (124) were females. The case fatality rate (CFR) was reported to be 16.8% with maximum fatalities reported from 12th – 18th June 2020 as shown below in Figure 3.

Out of total 357 deaths registered till 2nd July 2020, highest number was verified from Benazir Bhutto Hospital (BBH) as reflected in Table 2.

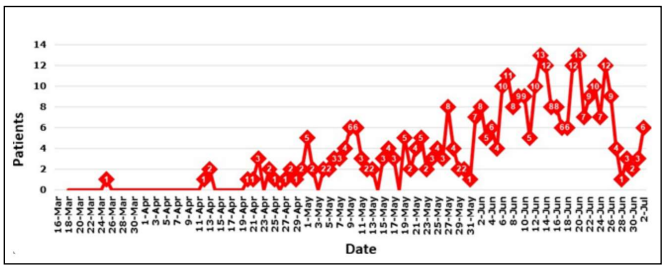

Fig 3. COVID related deaths reported from 16th March-2nd July 2020 at RMU affiliated teaching hospitals.

Table 2: Hospital wise data of COVID-19 mortalities

Hospitals	BBH	HFH	RIU & T	DHQ	RCH
Deaths	163 (45%)	106 (30%)	79 (22%)	06 (2%)	03 (1%)

Discussion

Pakistan has always been susceptible to alarming consequences of national epidemics.[14] COVID-19 outbreak has led the concerned authorities to take meticulous steps like provision of testing kits, quarantine facilities, health education and lockdown imposition likewise other international jurisdiction.[15]

Coronavirus infected cases surged exponentially in Pakistan after lifting of lockdown during May 2020. WHO recommended Government of Pakistan to re-impose strict and intermittent lockdown preferably in areas with increased number of cases to limit the spread of coronavirus.[16] When COVID-19 began encompassing the most regions of the world and declared as pandemic by World Health Organization on 11th March 2020, countries were called on to take rigorous action to halt the rapid spread of coronavirus.[17] COVID19 was initially limited to those returning Pakistan from other countries but ultimately it disseminated to all the provinces. However, there was gradual rise in COVID-19 cases following lockdown in Punjab on 25th March 2020. Rapid proliferation of coronavirus and mounting of cases was observed around 3-10 days after the lifting of restrictions just ahead of Muslim festival (Eid-ul-Fitr) by the end of May 2020. Eid shopping and social gatherings contributed to booming. Lockdown was also imposed in France amid COVID-19 pandemic. People became aware of mode of transmission and course of this disease with the passage of time, so they started adopting precautionary measures like hand washing, use of mask, careful attitude while coughing and sneezing and social distancing.

Basic reproduction number (R_0) was calculated to be 3.3 in France at the beginning of outbreak before lockdown. After lockdown, effective reproduction number (R_e = 0.47) was computed to be drastically low thus reflecting very little risk of uncontrolled second wave.[18] This low Re value is suggestive of restriction efficiency in suppressing the contact, hence leading to mitigation of infectious cases. Due to contagiousness of covid-19, apart from other precautions, lockdown wherever inflicted is determined to be beneficial in limiting the expansion of disease.

Initially during COVID-19 outbreak, basic reproduction number (R_0) in Wuhan city of China was calculated to be 2.24 to 3.58 with mean of 2.91.[19] Similarly mean R_0 in China on reviewing the results of twelve different researches was found to be 3.28 during January 2019, thus illustrating the risk of infection to more persons from one infected individual. This was the time when epidemic in China was at the peak and increased mortalities were reported per day.[20] An Iranian research by Sahafizadeh E *et al* revealed higher virus reproduction number (4.29) during initial phase of outbreak but later reduced to 2.37 over a period of two months following non-pharmacological interventions including institutional closure.[21] Recently Imperial College of London has predicted that COVID-19 pandemic is in declining phase at Pakistan with effective reproduction number (R_t) of

0.74. On reviewing the global virus reproduction numbers, it became evident that only four countries (Spain, Italy, Canada & Netherlands) has R_t lower than Pakistan. On the other hand, some Asian country including India and Bangladesh had higher R_t as compared to that of Pakistan. The lower virus reproduction number at Pakistan was attributed to the smart lockdown strategy of the state and sealing of hotspots.[22] Still there is need to continue with precautionary measures for sustained control of epidemic.

In our research, peak of COVID-19 cases in real life scenario at Rawalpindi hospitals are seen around 10^{th} – 18^{th} June 2020 that is about 2 weeks after lifting of lockdown and Eid festival. As majority of our urban population is now exposed to this dreadful virus, so down trend of cases is mainly attributed to completion of incubation period and natural course of disease. Another national research carried out to predict the extent of COVID-19 infection in Pakistan by using SIR model revealed average R_0 equivalent to 2.65 that was basically calculated from data of February – March 2020 retrieved from National Institute of Health (NIH) Islamabad. This figure portrayed that approximately 90% of our population would likely be infected with coronavirus with expected peak of outbreak on 26^{th} May and 24^{th} June 2020.[23] Likewise our study, no peak wave is predicted in this NIH data based research from June onwards. COVID-19 epidemic control and non-occurrence of second wave might be predicted due to less testing or home isolation of the people. However, R_0 should preferably be calculated at this moment when the first peak has passed to grasp the true picture.

Adjusted reproduction number (R_0) for COVID-19 in Bangladesh from March to May 2020 was estimated to be 1.62 suggestive of exponential increase in the cases. This research recommended for application of stringent precautions to limit the spread of horrible virus.[24] Likewise China, mean R_0 in Korea was also computed to be 3.50, thus reflecting high infectivity rate.[25] Ideally virus reproduction number should be below 1.[24] The placement of rigorous control measures should therefore be prioritized by concerned authorities for reduced infectivity and containment of virus.

Limitations

As disease did not spread right from the beginning of epidemic, so only the people imported from other countries were infected. Moreover, admission of even asymptomatic or suspected citizens in the hospital also resulted in rise of hospital cases. Some symptomatic people isolated at home and so not enumerated.

Conclusion & Recommendations

Medical as well as non-medical maneuvers helped a great deal in reduction of COVID-19 cases in Pakistan. The second peak of COVID-19 can best be avoided by strict adherence to and legal implementation of Standard Operating Procedures.

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