

Blood Supply Management Amidst COVID -19 Pandemic

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Abstract

AIMS AND OBJECTIVES: The mandatory lockdown restrictions and curtailment strategies towards mass gatherings imposed by the government amid the COVID-19 outbreak, the organization of the voluntary blood donation camps were suspended and in house donations were limited leading to scarcity of blood. With this we intend to assess the effect of this mass lockdown on our blood supply management in four phases [phase-I prior to the outbreak], phase-II[during the outbreak], Phase-III: The declining phase [Oct20-Feb21] and Phase IV: The second wave [March21-may21]

MATERIALS AND METHOD : This is a retrospective study of twenty months of a blood bank supplying to a 1200 bedded multi-specialty Tertiary Care Academic Hospital in Lucknow. The study was divided into four phases namely: • Phase-I: Pre-pandemic phase [Oct'19 to Feb'20] • Phase-II: The full-blown pandemic phase [Mar 20-Sep 20] • Phase-III: The declining phase [Oct20-Feb21] • Phase IV: The second wave [March21-may21] Details of the blood units collected both in-house as well as in the VBDC's were used for the study. The date of collection, expiry and date of issue for each packed red blood cell [PRBC] units were noted. The components prepared from the whole blood was also noted. The average In-house donations were tabulated. The various components issued month wise was also noted. The supply of Convalescent plasma in all the three phases was tabulate

RESULT: The average whole blood collection pre pandemic was 1103 units (55%), 768units (51%) in pandemic phase, 1219units (61%) in declining phase and only 692units (21%) in second wave of the pandemic. In Phase I 27 VBDC collected 1153 units (58%) and in Phase III 8 VBDC collected 236units(12%) Due to restrictions in mass gatherings and lockdown enforced, the whole blood collections from Phase II and Phase IV was 93units (6.5%) and 76units (2.2%) only. In Phase I, the average In House Donation was 33.6%, In Phase II it was 12%, In Phase III was 5.75% and lastly in Phase IV was 5.4% The PRBC issued on an average in the four phases was 59%, 48%, 55% and 26% respectively. Similarly the FFP issued in Phase I, II, III and IV was 62%,34%,58% and 20%. Lastly the RDP issued was 15%, 13%, 19% and 4.5% in all the various phases.

CONCLUSION: Our study concluded that COVID 19 pandemic had a negative impact on total number of In-house donations, voluntary blood donation camps, blood stock inventory and transfusion recipients along with taking a major toll on health and safety of our blood bank staff as well. With little insight of the disease and everyday learning, by motivating more voluntary donors and health care workers the efficient chain of blood supply and demand can be maintained as the virus is to stay with us for a long time.

Introduction:

The novel corona virus disease (Covid-19) also known as ("SARS-CoV2") is now a global pandemic affecting and disrupting health care facilities at all levels in an unwavering manner. The recent corona virus disease soon developed into an unprecedented global public health crisis with significant

humanitarian consequences. As of 1st July 2020, the World Health Organization had informed **14,043,611** confirmed cases of COVID-19 including **5,97,583 deaths**, worldwide¹. The outbreak has caused over 11,000,00 cases with 27,000 deaths so far in our country as well in 2020².

Covid-19 came back with sudden upsurge in number of cases in the form of Second wave worldwide in phases including the South East Asia regions primarily affecting India the worst. By 1st May 2021 the South-East Asia Region continued to report marked increase in both case and death incidences making India accountable for over 90% of both cases and deaths in the region as well as contributing 46% of global cases and 25% of global deaths reported³.

The COVID virus is transmitted mainly by the respiratory route. There is a theoretical and likely minimal risk of transmission through blood transfusion⁴. This outbreak has had a huge setback to the Blood Banking services reducing the number of donations affecting the demand and supply chain drastically. During the pandemic most hospitals had deferred almost all elective surgeries and non urgent medical treatments, reducing blood product needs.⁵ Following global recommendations of social distancing with regulatory guidelines from the Government on deferral of conducting Voluntary Blood Donation Camps (VBDC's) further lead to the decline in blood stocks⁶. The fear, anxiety and scare among the health care staff was left unseen and unheard which further lead to issues in managing their working hours. The pandemic fear lead to decline in drive of healthy regular donors visits to the hospital as well⁷. However, the increasing number of critically ill COVID patients, who develop significant cytopenias, coagulopathy or require extracorporeal membrane oxygenation (ECMO) support will require an increase in blood supply⁸.

In keeping with this objective in the background, we aimed to study the impact of the pandemic on our Blood Transfusion services along with taking necessary steps in planning and managing blood stocks for the unseen future this pandemic holds.

Materials And Method:

This is a retrospective study of twenty months of a blood bank supplying to a 1200 bedded multi-specialty Tertiary Care Academic Hospital in Lucknow. The study was divided into four phases namely:

- • **Phase-I:** Pre-pandemic phase [Oct'19 to Feb'20]
- • **Phase-II:** The full-blown pandemic phase [Mar 20-Sep 20]
- • **Phase-III:** The declining phase [Oct20-Feb21]
- • **Phase IV:** The second wave [March21-may21]

Details of the blood units collected both in-house as well as in the VBDC's were used for the study. The date of collection, expiry and date of issue for each packed red blood cell [PRBC] units were noted. The components prepared from the whole blood was also noted. The average In-house donations were tabulated. The various components issued month wise was also noted. The supply of Convalescent

plasma in all the three phases was tabulated. Like most centres, we follow the rule of 'first in, first out' policy for issuing of red cell units, keeping that in mind, the numbers of red blood cell units which were not utilized and were outdated beyond were tabulated as well.

Result:

The whole blood (WB) collected in Phase I, Phase II, Phase III and Phase IV was 5517 5379, 6096 and 2076 units respectively. The average whole blood collection pre pandemic was 1103 units (55%), 768units (51%) in pandemic phase, 1219units (61%) in declining phase and only 692units (21%) in second wave of the pandemic.

In Phase I 27 VBDC collected 1153 units (58%) and in Phase III 8 VBDC collected 236units(12%) contributing to the total donation. Due to restrictions in mass gatherings and lockdown enforced, the whole blood collections from Phase II and Phase IV was 93units (6.5%) and 76units (2.2%) only.

In Phase I, the average In House Donation was 33.6%, In Phase II it was 12%, In Phase III was 5.75% and lastly in Phase IV was 5.4%. A decline in the average In-House donations was also seen further reducing the blood stores.

The blood components prepared in all the phases was according to the demand and supply. In Phase I and Phase III, more components were prepared and supplied while in pandemic phase and second wave, due to reduction in blood donations and cancellation of all elective procedures, components prepared were less in number.

The PRBC prepared on an average in Phase I was 1260 units, Phase II was 745units, Phase III was 1215units and lastly was 729 units in Phase IV. Similarly was the FFP preparation. Lastly RDP prepared was 336units, 214units, 82units and 45units respectively in all the four phases.

Similarly the demand of the components was also seen on the declining trends in full blown pandemic phase and the second wave phase. In pre pandemic phase and declining phase, the demands seen were on the higher side.

The PRBC issued on an average in the four phases was 59%, 48%, 55% and 26% respectively. Similarly the FFP issued in Phase I, II, III and IV was 62%,34%,58% and 20%. Lastly the RDP issued was 15%, 13%, 19% and 4.5% in all the various phases.

Convalescent plasma therapy has shown some documented positive effects on patients of Covid19. We issued over 69units in Phase II, 34 units in Phase III and 78units in the second wave of the pandemic.

A record of ODBE(Outdated Beyond Date of Expiry) was also kept. In spite following first in first out policy, due to decrease in demands 301units were discarded in Phase II, followed by 201units in phase III and 218units in Phase I. With the second lock down and limitation in house donations, the ODBE was only 114units.

Discussion:

The first confirmed case of Covid-19 in India was reported on 27th January 2020 in Thrissur, Kerala⁹. The country was in a complete state of Lockdown from March-June 2020. Since July 2020 there was an exponential rise in daily notified cases with declining trends seen from Nov 2020. The nation witnessed its worst catastrophe again when the second wave hit us affecting almost over 2 million people¹⁰. With this mammoth population affected and infected, the Blood Transfusion services suffered a significant drop in Blood stores.

While considering the broader issues for blood supply planning during the pandemic, a key consideration for transfusion services is to maintain the balance between supply and demand¹¹. With disruption in this cycle from many issues worldwide, we complied, reviewed and analyzed the blood collection demand, supply, the discarded units at our Blood Bank. Although there have been a number of reports on the impact on blood donations worldwide, there is till date a paucity of information on the transfusion needs of COVID inpatients and the overall blood component requirements during the COVID pandemic¹².

The whole blood (WB) collected in phase I, phase II, Phase III and Phase IV were 5517 5379, 6096 and 2076 units respectively. The average In-house donations in phase I was 33.6% as compared to only 12% in Phase II. Similarly in phase III, due to fear and anxiety of contracting Covid-19 from the hospital, the average In house donations was further decreased to 5.75%. With sharp ascend in cases from the second wave in Phase IV, the In house donations was barely 5.1% leading to further depletion in blood stores.

Apart from replacement donations and voluntary blood camps, there is no other way to maintain the blood stocks. We observed that in pre pandemic Phase I 27 VBDC collected almost 1153 units (58%) contributing to the blood stock. With restrictions on mass gatherings, VBD camps could not be conducted which resulted in further decline of our blood stores. In Phase II only 93 units (6.5%) were collected. With government guidelines on resuming voluntary blood camps again, 8 camps collected 236 units (12%) in the declining phase. With the wrath of the deadly second wave, only 76 units (2.2%) were collected to contribute to the blood stores.

The phenomenon of decrease in voluntary donation has been seen in many countries globally. In a study conducted by Yahia et al from King Abdullah Hospital, Bisha, Saudi Arabia, published their eight months experience ie (from September 2019 to May 2020) with blood supply and demand. They noted a significant drop of 39.5% in blood bank-based in house collections. At the same time, they also noted a drop in blood demand by 21.7%¹³. Wang et al. also reported a similar experience from The First Affiliated Hospital, Zhejiang University School of Medicine, Hangzhou, China¹⁴

The average issue of PRBC Units was high with the average of 1180 units during the pre pandemic Phase I. With halt in almost all elective surgeries and non urgent medical procedures, the average PRBC issued in Phase II was only 681 units. With return to normalcy and increase in IPD services, the PRBC issued in Phase III again increased to 1108 units. With the upsurge of Covid-19 cases again, the number of PRBC

units issued was only 866 units. However in Phase IV, the major requirement of PRBC units was anemia (non bleeding), being the major reason for transfusion. This was a concurrent finding from a study in Italy where 39% of the admitted patients required PRBC transfusion for the indication of anemia (non bleeding) in first 15 days of hospital admission¹⁵.

The majority of demand of platelet (PLT) units generally comes from oncology and surgical wards. While wards were functional in full capacity in Phase I, the average platelet demand 15% which declined to 13% in Phase II. With start of OPD's and non Covid admissions, the average demand of PLT in Phase III further increased to 19%. With the start of second wave towards the end of March, all non urgent admissions were deferred to reserve Blood components for Covid-19 patients. An increase in demand in PLT supply is seen due to thrombocytopenia and widespread use of anticoagulants in ICU and HDU (High Dependency Units)⁸. But our PLT demand was only 4.65% in Phase IV. This result was not in-concurrence from the other studies. Although the association of thrombocytopenia is seen as a marker of poor outcome in patients of Covid19¹⁶.

While assessing the demands of FFP (Fresh Frozen Plasma), Phase I being the Pre Pandemic Phase showed the average of almost 1248 units(62%) while the Pandemic phase II showed a decline with demand of just 514 units (36%) .The phase III again showed increase in the rise of demands of FFP amounting to 1164 units(58%).

A typical and distinct pattern of coagulation disturbance, including raised D-dimer concentration, has been seen as a poor prognostic marker in Covid 19 patients.¹⁷. In spite of tests suggesting hypercoagulability, onset of acute disseminated intravascular coagulation is not seen in patients of Covid-19¹⁸. Apart from this, patients with COVID-19 also show elevated levels of fibrinogen, normal platelet counts, often normal prothrombin time(PT) and activated partial thromboplastin time(APTT).¹⁹ The demand of FFP in Phase IV was an average of 966 Units (29%). A study conducted in France showed 64(43%) patients out of 150 presented with thrombotic complications, but only 3% patients presented with bleeding complications.²⁰ Till date, however bleeding complications that could increase blood component requirements have not been frequently seen in patients of Covid-19.²¹

In the 1890's, passive immunization therapy has been successfully used to treat infectious diseases. Following identification of those with high titers of neutralizing antibody, convalescent plasma (CP) containing these neutralizing antibodies can be administered in individuals with a specified clinical disease to reduce symptoms and mortality.²²

A general principle of passive antibody therapy is that it is more effective when used for prophylaxis than for treatment of disease²³. The antibody works by modifying the inflammatory response, which is also more easily achieved during the initial immune response, a stage that may be asymptomatic²⁴

With keeping in mind the early benefits from plasma therapy in Covid-19 patients, we administered a total of 181 units of Convalescent plasma in three phases of the pandemic. 69 units were transfused in the

pandemic phase, 34units in the declining phase and 78units in the second wave of the pandemic.

Lastly we also kept a record of the outdated units beyond expiry (OBDE) as well. In phase I, the OBDE units were 218(11%) of the total collection. With the pandemic phase and no elective surgeries being conducted, the number of ODBE units increased to 301units (21%).This was due to unused blood components. In Phase III, with good utilization and increase in In-house donations, the number of OBDE was reduced to 201units (10%).With less donations and less components prepared, the number of OBDE units in phase IV was only 114units (3.4%).The older units that are discarded does not amount to wastage per se, qualitatively it is not considered as “good transfusion practices”.

An emergency preparedness plan is necessary for all healthcare setups to face a pandemic like COVID 19.²⁵ There is a dire need of an action plan to mitigate and attenuate the potential shortage of blood supply and manage the blood transfusion services efficiently. Apart from protocols laid down by WHO (World Health Organization) and NBTC (National Blood Transfusion Council) to ensure smooth and safe blood transfusion services²⁶, many proactive measures like contacting with NGO's, military/Police services, religious/cultural associations will also help in mobilizing a large number of donors in short time. Lastly Educating people and creating awareness about the availability of safe (in accordance with safety guidelines of Covid-19) and accessible options of blood donations will encourage more people to donate blood.

Conclusion:

Our study concluded that COVID 19 pandemic had a negative impact on total number of In-house donations, voluntary blood donation camps, blood stock inventory and transfusion recipients along with taking a major toll on health and safety of our blood bank staff as well. With evolving knowledge and every day learning about Covid-19 is still on a rise, a well efficient emergency preparedness plan with conducive regulatory guidelines shall help in combating acute shortage of blood supply and maintain stable reserves of blood during COVID 19 and future pandemics.

Declarations

CONFLICT OF INTEREST

The authors have disclosed no conflicts of interest.

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Figures

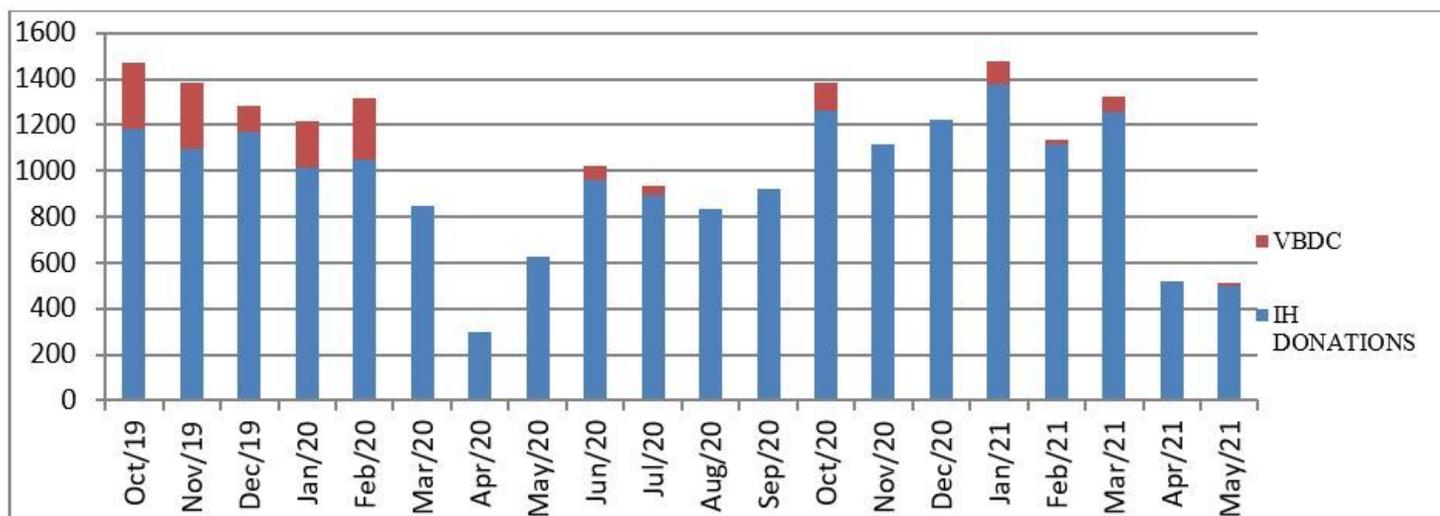


Figure 1

WHOLE BLOOD COLLECTION AT VBDC AND IH IN FOUR PHASES

Avg In House donations(%)

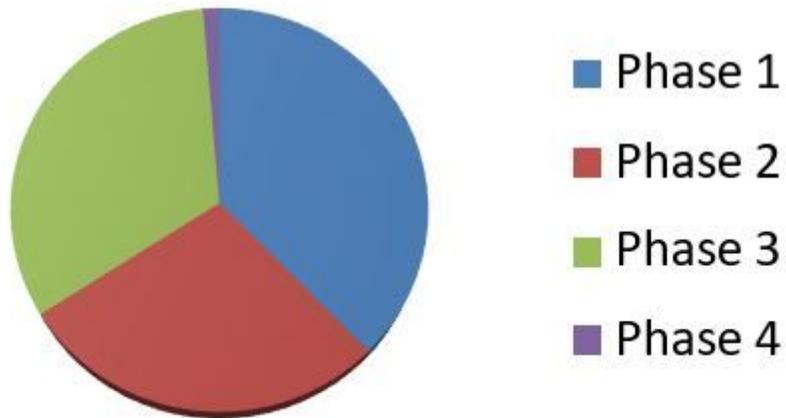


Figure 2

AVERAGE IN HOUSE DONATIONS IN FOUR PHASES

Number of Convalescent Plasma units issued

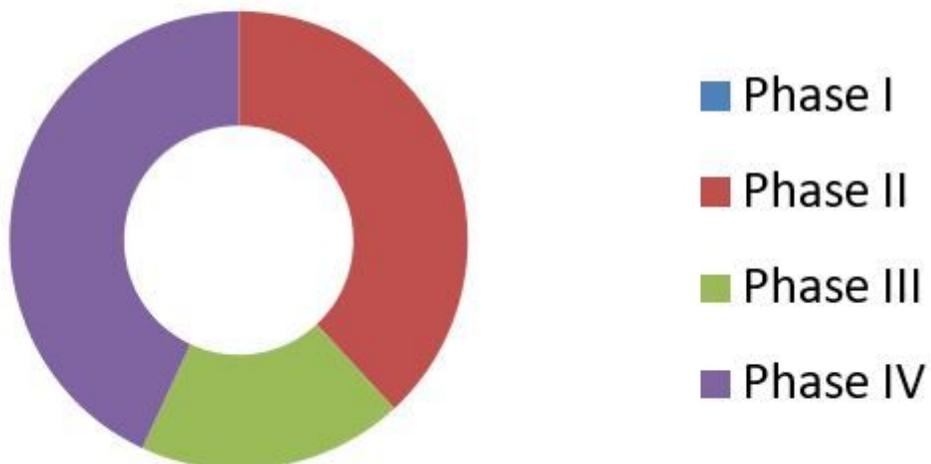


Figure 3

CONVALESCENT PLASMA IN THREE PHASES

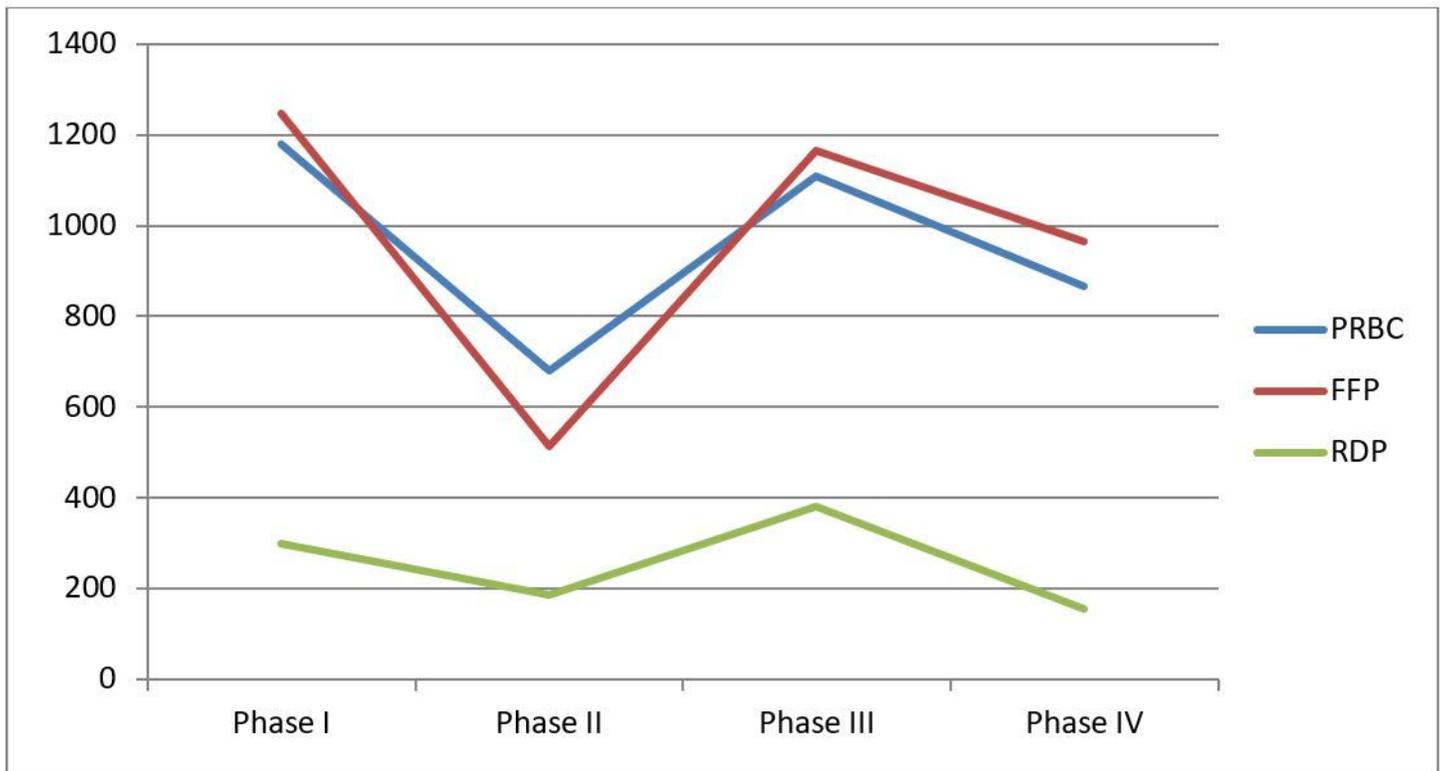


Figure 4

AVERAGE NUMBER OF COMPONENTS ISSUED IN FOUR PHASES