Success stories of COVID-19

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ABSTRACT

Corona pandemic has unfurled its wings to disrupt the healthcare system of developing as well as developed countries and created havoc among healthcare professionals. Today, there is an atmosphere of trepidation at the possibility of getting new cure against this dreadful virus. People are looking with anxious eyes toward scientists to develop a vaccine against this virus. Already killed thousands of lives, this virus is spreading at a pace of fire. Some healthcare professionals and researchers are working out of the way to develop a new vaccine, and some are targeting the existing drug approach. Several successful trials were performed on Coronavirus disease-2019 (COVID-19) patients involving existing drugs in combination till date. This case series underlined those successful case studies of COVID-19. Different combinational approaches have been adopted by researchers such as the use of tissue plasminogen activators, extracorporeal membrane oxygenation and convalescent plasma therapy, intravenous immunoglobulins, antivirals drugs, antimalarials, antibiotics, interleukin antagonists, and corticosteroids to combat COVID-19. These therapies have corroborated to be constructive at some levels among individuals having a severe medical history as well as individuals without any profound medical history.

Keywords: Antiviral, COVID-19, corona, case studies, plasma therapy, virus, ultraviolet, ultrasonication.

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Background

Coronavirus is a large family of ribonucleic acid (RNA) viruses evolved from several animal species. They are generally RNA viruses (single stranded) responsible for causing different respiratory diseases [1]. Tyrrell and Bynoe [2] described the first strain of coronavirus. SARS-CoV-2 has been declared as a pandemic by the World Health Organization seeing the severity of infection and contagiousness [3]. SARS-CoV-2 has been proved to spread from human to human [4]. By controlling the source of infection, it can be prevented [5]. There are several ongoing therapies targeting the virus as shown in Figure 1. Extracorporeal therapies emerged as one of the treatments of this virus. This therapy constitutes plasma filtration, hemofiltration, hemoadsorption, and cell-based therapies [6]. Convalescent plasma therapy has also been used as a novel approach against this virus and proved effective in reducing symptoms and mortality [7]. In this immunotherapy, the plasma of donor (previously recovered patients of Coronavirus disease (COVID)) having antibodies transfused into COVID patient is used to fight against viruses, thereby helping to recover [8]. Recently, extracorporeal membrane oxygenation (ECMO) also emerged as an indispensable way to treat adults and children with pulmonary and cardiac dysfunction [9]. The latest advancements in ECMO involve spontaneous arteriovenous devices [10], and this technology is continuously improvising [11]. Several antiviral drugs, namely, remdesivir and favipiravir have shown their potential when tested against this virus [12]. Intravenous immunoglobulin (IVIg) is another therapy that has been clinically proven to be effective in immunodeficient patients and showed encouraging results [13]. IVIg has found its place in the treatment of inflammatory and autoimmune conditions accompanying COVID-19 [14], and remodeling in its manufacturing process is made to increase its clinical efficiency [15]. A serine protease [tissue plasminogen activator (tPA)] [16] recently proved to be productive against COVID-19 [17]. Plasminogen was used to improve the conditions of COVID-19 patients with lung lesions, hypoxemia, and such related conditions [18]. The tPA (intravenous thrombolytic treatment) is explicitly intended for severely ill patients suffering from acute respiratory distress syndrome (ARDS) [19,20]. Antibiotics such as azithromycin prevent to lower the respiratory tract illness [21]. Researchers are also exploring Teicoplanin (antibiotic) as a possible treatment of COVID-19 [22]. Micronutrients such as zinc (Zn) played a critical role in the management of COVID-19 [23,24]. Corticosteroids have also been tested against this SARS-CoV-2 infection and appeared promising [25]. Dexamethasone is recently emerged as another example in the class of corticosteroids

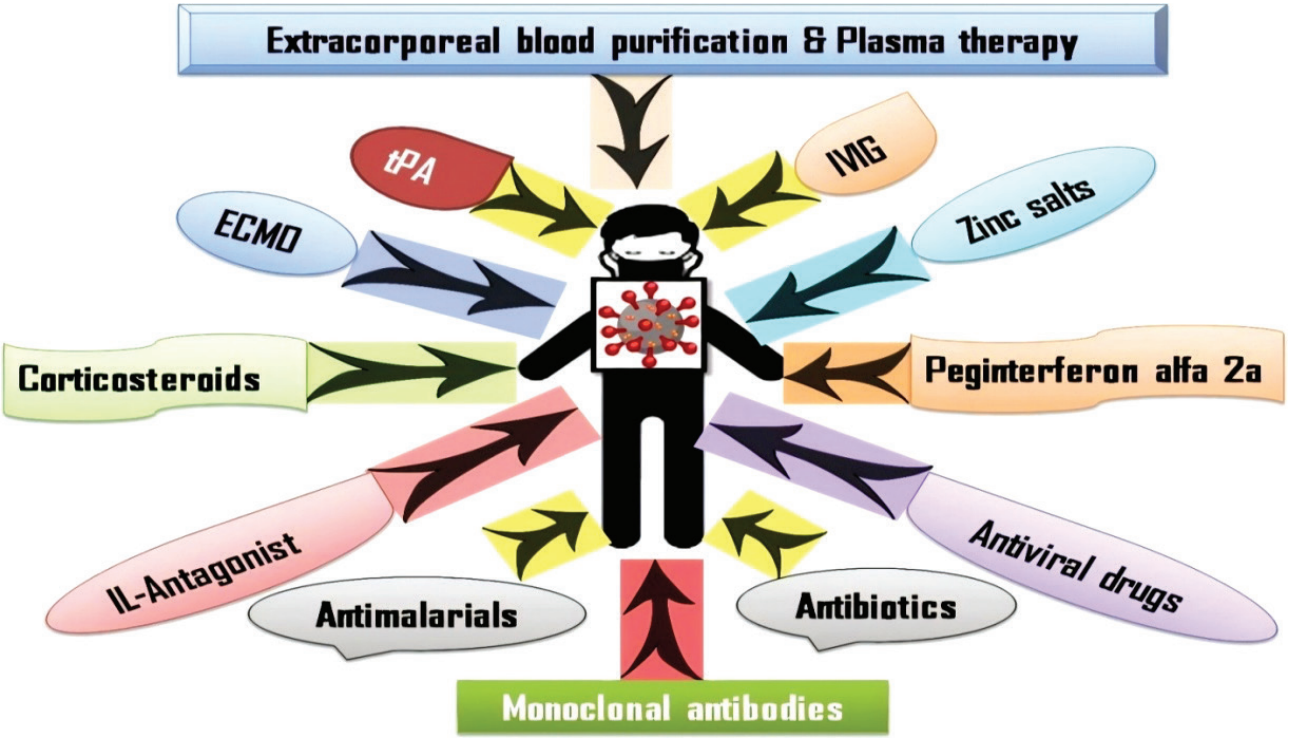

Figure 1. *Different approaches to combat COVID-19. tPA: Tissue plasminogen activator, IVIG: Intravenous immunoglobulins, ECMO: Extracorporeal membrane oxygenation, IL: Interleukin.*

which proved effective in reducing the mortality rate in COVID-19 [26]. Antimalarial drugs (chloroquine and hydroxychloroquine) showed an improvement in some parameters in COVID-19 patients [27]. Monoclonal antibodies emerged as a prominent class to combat this viral infection [28]. Interleukin (IL) 6 receptor inhibitor (tocilizumab) is found to be effective in ceasing cytokine flood in COVID-19 patients [29]. Pegylated interferon (alfa-2a, 2b) already approved for hepatitis B virus (HBV) and hepatitis C virus and also explored as a remedy against COVID-19 [30]. In this case series, we underlined several successful stories of COVID-19 explaining the use of amalgamated drug approach (Table 1) and probable role (Table 2). A literature search was performed using the keyword "COVID-19 successful case study," "case study of COVID-19," and "recovery from corona" in different scientific databases of PubMed, Scopus, and Web of Science to obtain data pertaining to triumphant case studies.

Successful Case Studies of COVID-19

Various case studies mentioned herein this article describe only the overview of combinational therapy adopted depending on the patient medical condition. Detailed information about a particular case study can be accessed via reference mentioned.

Case study no. 1

A 60-year-old male having a medical history of multiple myeloma from China infected with COVID-19 was successfully treated with the use of tocilizumab (anti-IL-6 receptor antibody). The patient was administered tocilizumab (intravenously) after 8 days of hospitalization resulted in a gradual decrease in IL-6 levels [31].

Case study no. 2

A 23-year-old diabetic patient (type-II) working near Huanan Seafood Market, China, infected with COVID-19. During hospitalization, he was given meropenem, linezolid as antibiotics accompanying ganciclovir, and oseltamivir as antiviral drugs in addition to symptomatic treatment. He was recovered after 2 weeks of treatment [32].

Case study no. 3

Fontana et al. [33] accounted a successful case study of 61-year-old male having a previous medical history of chronic kidney disease (stage IIIa) with the administration of hydroxychloroquine, IVIg, and tocilizumab.

Case study no. 4

Zhu et al. [34] described the recovery of COVID-19 in a patient aged 52 years underwent renal transplant with methylprednisolone, IVIg, biapenem, pantoprazole, and interferon α. The patient was discharged after 13 days of hospitalization.

Case study no. 5

Liu et al. [35] also recorded a successful treatment of 50-year-old liver transplant recipient COVID-19 patient with combinational oxygen therapy along with antiviral

Table 1. *The successful case studies of COVID-19 survivors.*

CASE STUDY NO.	AGE GROUP (YEARS)	GENDER	PATIENT CONDITION	STUDY AREA	A BRIEF DETAIL OF MEDICATION USED DURING TREATMENT/ PROCEDURE	INFERENCE	REFERENCE
1	60	Male	Multiple myeloma	China	Tocilizumab	Anti-IL-6 receptor antibody (tocilizumab) exhibited effectiveness in a patient with multiple myeloma. The patient was discharged from the hospital within 1 month of treatment	[31]
2	23	Male	Type II diabetes mellitus	China	Meropenem, linezolid, ganciclovir, oseltamivir	The patient showed marked improvement monitored via computed tomography imaging and relieved from hospital after 2 weeks of treatment	[32]
3	61	Male	Kidney transplant	Italy	Methylprednisolone, hydroxychloroquine, IVIg, tocilizumab	Multiple drug approach with hydroxychloroquine, IVIg, tocilizumab, and reduction of immunosuppression (temporary) therapy proved effective in this case	[33]
4	52	Male	Kidney transplant	China	Methylprednisolone, IVIg, biapenem, pantoprazole, interferon α	Symptoms of pneumonia associated with COVID was disappeared administering prescribed regime	[34]
5	50	Male	Liver transplant	China	Oxygen therapy, umifenovir, lopinavir/ ritonavir, methylprednisolone, cefoperazone, IVIg, α- interferon	With the use of therapeutic regime together with the temporary withdrawal of immunosuppression therapy patient recovered from COVID-19 pneumonia	[35]
6	77	Male	Heart transplant	Germany	Hydroxychloroquine piperacillin/ tazobactam and cotrimoxazole, ganciclovir, tacrolimus	After receiving antiviral therapy, the patient showed no deterioration of the clinical state	[36]
7	35	Female	Obstetric patient, asthma, type-II diabetes mellitus, and class-III obesity	USA	Convalescent plasma therapy, azithromycin, hydroxychloroquine, remdesivir	The patient condition was subsequently improved by following the desired regime	[37]
8	42	Female	Hypothyroidism (controlled)	Italy	Hydroxychloroquine, azithromycin, IVIg	Intravenous administration of immunoglobulins caused a significant clinical improvement. Marked reduction in inflammatory markers was observed	[38]
9	62	Male	Previous history of gallstone	China	Arbidiol, hydroxychloroquine, oseltamivir, lianhua qingwen (capsule), EBP, methylprednisolone, piperacillin, tazobactam	EBP (double plasma molecular adsorption system and plasma exchange) interrupted the inflammation cascade and ceases the cytokine storm progression thereby relieved COVID-19 associated symptoms	[39]
10	59	Female	Previous history of hypertension	USA	Hydroxychloroquine, azithromycin, alteplase	With the use of tPA (alteplase) a temporarily related improvement was observed in the respiratory status of the patient	[17]
11	45	Male	Severe pneumonia	Japan	ECMO, lopinavir/ritonavir	The patient responded well with intensive care treatment accompanying antiviral therapy	[40]
12	69	Male	Dyspnea and persistent cough	Italy	ECMO, mechanical ventilation	The patient was treated successfully adopting the desired approach	[41]
13	51	Female	Developed severe acute respiratory syndrome	USA	ECMO, remdesivir	The treated patient was successfully recovered from COVID-19	[42]
14	50	Male	Fever and dyspnea	Italy	Lopinavir/ritonavir, hydroxychloroquine, anakinra, vancomycin, piperacillin/ tazobactam, cefazolin	IL-1 inhibitor drug Anakinra showed positive results in controlling cytokine storm	[43]
15	73	Female	Sore throat, malaise, and loss of appetite	Japan	Ciclesonide (inhaled steroid)	All the three mild to mid-stage cases of COVID-19 showed favorable results with ciclesonide (Alvesco 200 µg inhaler) probably by inhibiting viral proliferation	[44]
16	78	Male	Dry cough, diarrhea, and fatigue				
17	67	Female	Dry cough				

CASE STUDY NO.	AGE GROUP (YEARS)	GENDER	PATIENT CONDITION	STUDY AREA	A BRIEF DETAIL OF MEDICATION USED DURING TREATMENT/ PROCEDURE	INFERENCE	REFERENCE
18	71	Male	Fever and cough	Korea	Lopinavir/ritonavir, hydroxychloroquine, plasma therapy	Decreased inflammatory markers and viral loads were observed after convalescent plasma therapy	[45]
19	67	Female	History of hypertension				
20	56	Male	Sore throat, fever	China	Moxifloxacin, IVIg infusion	High-dose IVIg showed satisfactory recovery of patients.	[46]
21	34	Male	Fever and dry cough		IVIg infusion		
22	35	Female	Malaise and low-grade fever		Lopinavir/ritonavir, IVIg infusion		
23	34	Man	Class II-obesity	Colombia	Ampicillin/sulbactam, Oseltamivir, chloroquine, clarithromycin	On 9th day, the patient became negative and discharged from hospital after 14 days of treatment	[47]
24	60	Female	Breast cancer	Italy	Filgrastim, levofloxacin, piperacillin, tazobactam, darunavir/cobistat, hydroxychloroquine	Combination of antiviral, antibiotic, and hydroxychloroquine resulted in fast recovery of cancer patient infected with COVID-19	[48]
25	60	Male	Arterial hypertension		Darunavir/cobicistat, hydroxychloroquine, ceftriaxone	The patient was recovered by adopting regime	
26	34	Male	Runny nose	Bangladesh	Chloroquine and azithromycin	The patient responded well to the therapy and discharged on the 12th day of his admission to hospital	[49]
27	57	Male	History of hypertension	USA	Hydroxychloroquine, azithromycin, ceftriaxone, methylprednisolone, tocilizumab, aldose reductase inhibitor (AT-001)	The patient was recovered and discharged from hospital on 19th day	[50]
28	63	Male	Headache, shaking chills	USA	Oral zinc salt in the form of lozenges	High-dose zinc salt lozenges (orally) made patients recovered from symptoms. All four patients experienced a significant recovery from COVID-related symptoms. However, the use of zinc salts in the treatment of COVID-related symptoms require more scientific and clinical trials studies	[51]
29	57	Female	Diarrhea, fatigue, low-grade fever				
30	41	Female	Body aches, cough, and sinus pain				
31	26	Female	Fever, cough, and severe body aches				
32	38	Male	Fever	UAE	Darunavir, ritonavir, hydroxychloroquine, favipiravir, peginterferon alfa 2a	The combinational approach of using interferon (peginterferon alfa 2a) with antiviral drugs showed a marked improvement in these patients	[52]
33	37	Male	Fever and dry cough		Hydroxychloroquine, lopinavir/ritonavir, peginterferon alfa 2a		
34	61	Male	Type II diabetes, hypertension, hyperlipidemia		Lopinavir/ritonavir, favipiravir, peginterferon alfa 2a		
35	52	Male	Dilated cardiomyopathy	Germany	PVAD, ECMO	Combination of PVAD and ECMO relieved patient	[53]
36	32	Male	Fatty liver	China	Oxygen therapy mechanical ventilation antibiotic treatment lopinavir/ritonavir, arbidol, traditional Chinese medicine, IVIg	Patients responded well with desired therapy as reveled by computed tomography imaging	[54]
37	19	Male	No previous medical history				
38	79	Male	History of hypertension	China	Oxygen therapy, arbidol, cefoperazone/ sulbactam, cefdinir (case 2), continuous venovenous hemodiafiltration (CVVHDF)	Cytokine removal with CVVHDF showed benefits to patients. Both patients were discharged from hospital after receiving 1 month treatment	[55]
39	40	Female	Chronic renal failure				
40	44	Male	History of hypertension	North America	VV-ECMO, tocilizumab	VV-ECMO supported the recovery of this patient	[56]

Although all the above cases of COVID-19 patients mentioned as case study no. 1 to 40 in Table 1 responded well when treated with requisite combination drug approach/therapy, but it still needs more clinical validation due to limited sample size.

Table 2. *Associated role (probable) of drugs/therapy documented in case studies [17,31–61].*

CLASS OF DRUG/THERAPY	DRUG/THERAPY	PROBABLE ROLE
Aldose reductase inhibitor	AT-001	Aldehyde reductase inhibitor
Antibiotics	Ampicillin	An irreversible inhibitor of transpeptidase
	Azithromycin	Protein synthesis inhibitor
	Biapenem, cefazolin, cefdinir ceftriaxone, vancomycin, piperacillin	Inhibits bacterial cell wall synthesis
	Cefoperazone, sulbactam, tazobactam	β-lactamase inhibitor
	Clarithromycin, linezolid	Inhibits bacterial protein synthesis
	Cotrimoxazole	Blockade of folic acid
	Levofloxacin, moxifloxacin	DNA gyrase inhibitor
Antimalarials	Chloroquine	Prevent viral entry
	Hydroxychloroquine	Interfere with lysosomal activity and autophagy
Antiviral drugs	Arbidiol (umifenovir)	Antiviral (blocking trimerization of spike glycoprotein)
	Darunavir	Antiretroviral medication
	Favipiravir	Inhibits viral RNA polymerase
	Ganciclovir	DNA polymerase inhibitor
	Lopinavir/ritonavir	Blocks viral cellular entry
	Oseltamivir, remdesivir	Inhibitor of viral replication
Corticosteroids	Ciclesonide, dexamethasone, methylprednisolone	Immunosuppressant
Granulocyte colony-stimulating factor	Fligrastim	Regulates production of neutrophils
Interferon	Peginterferon alfa 2a	Block viral replication inside cells
IL receptor inhibitor	Tocilizumab	IL-6 inhibitor
	Anakinra	IL-1 inhibitor
Micronutrient	Zinc	Maintaining the immune system function
Proton pump inhibitor	Pantoprazole	Inhibit gastric acid secretion
Tissue plasminogen activator	Alteplase	Thrombolytic agent
Vitamin	C (Ascorbic acid)	Antioxidant
Convalescent plasma therapy	Antibodies from the blood of recovered patient transfused to the infected patient	Reducing cytokine storm
ECMO	Works as an artificial lung (oxygenator)	
IVIg	Exert immunomodulatory action by acting on different components of immune systems	
Oxygen therapy	Use of oxygen as a medical treatment	

(umifenovir and lopinavir/ritonavir), systemic corticosteroid (methylprednisolone), antibiotic (cefoperazone), IVIg, and α- interferon.

Case study no. 6

Mathies et al. [36] successfully reported a 77-year-old heart patient case study from Germany infected with SARS-CoV-2 with antimalarial (hydroxychloroquine), antibiotics (piperacillin/tazobactum and cotrimoxazole), and antiviral (ganciclovir) therapy.

Case study no. 7

Anderson et al. [37] recently described the use of convalescent plasma therapy, antibiotic (azithromycin), hydroxychloroquine, glucocorticoid with hydrocortisone, and antiviral drug (remdesivir) in management of a 35-year-old obstetric COVID-19 patient.

Case study no. 8

Lanza et al. [38] noted the recovery of a 42-year-old female patient with an earlier medical concern of hypothyroidism with hydroxychloroquine, azithromycin, and IVIg treatment.

Case study no. 9

Wang and Hu [39] accounted a recovery of 62-year-old male with a novel approach of extracorporeal blood purification (EBP). The patient was discharged on the 38th day from hospital.

Case study no. 10

Wang et al. [17] employed tissue plasminogen activator (alteplase) for COVID-19-related ARDS in a 59-year-old female having a previous medical history of hypertension from the USA.

Case study no. 11

Nakamura et al. [40] elaborated the recovery of a 45-year-old male from Japan with ECMO in combination with antiviral therapy (lopinavir/ritonavir). The patient was discharged on the 24th day from the hospital.

Case study no. 12

Tavazzi et al. [41] described a case study of a 69-year-old male resident of Italy having infected with COVID-19 with venous arterial ECMO.

Case study no. 13

Firstenberg et al. [42] recorded the use of ECMO in a 51-year-old female for successful treatment. The patient was discharged to rehabilitation on the 28th day.

Case study no. 14

Filocamo et al. [43] manifested the use of anti-IL-1 receptor antagonist (Anakinra) treatment in a 50-year-old male diagnosed with COVID-19. The patient was discharged on the 29th day from the hospital.

Case study no. 15, 16, and 17

Iwabuchi et al. [44] explained the recovery of three mild-to-mid stage COVID-19 patients with repeated use of inhaled corticosteroid (ciclesonide).

Case study no. 18 and 19

Ahn et al. [45] reported the recovery of two corona patients with an amalgamated approach of lopinavir/ritonavir, hydroxychloroquine, and plasma therapy.

Case no. 20, 21, and 22

Cao et al. [46] described the case studies of three COVID-19 patients recovered using a high dose of IVIg.

Case study no. 23

Millañ-Oñate et al. [47] described a recovery of a class-II obesity patient infected with COVID from Colombia with chloroquine and clarithromycin combinational therapy accompanying nutritional support.

Case study no. 24 and 25

Spezzani et al. [48] used amalgamated drug therapy for the successful recovery of married couple case suffering from COVID-19 infection.

Case study no. 26

Jahan et al. [49] represented a case of a 34-year-old male diagnosed with COVID-19 successfully treated with chloroquine and azithromycin. The patient was discharged on the 12th day from the hospital.

Case study no. 27

Coyle et al. [50] manifested a case of a 57-year-old male having the previous condition of hypertension was recovered by conjunction therapy of anti-malarial (hydroxychloroquine), antibiotics (azithromycin and ceftriaxone), corticosteroids (methylprednisolone), monoclonal antibody (tocilizumab), and aldose reductase inhibitor (AT-001). The patient was relieved from the hospital on day 19.

Case study no. 28, 29, 30, and 31

Finzi [51] proclaimed four case studies (different age groups) of the USA interestingly treated with oral administration of a high dose of zinc salts. This is an uncontrolled study, in which zinc lozenges were found to be effective in reducing symptoms of COVID-19.

Case study no. 32, 33, and 34

Lababidi et al. [52] described the recovery of three COVID-19 patients with combinational antiviral drugs (darunavir, ritonavir, and favipiravir), antimalarials (hydroxychloroquine), and peginterferon alfa 2a.

Case study no. 35

Bemtgen et al. [53] explained the recovery of a 52-year-old male by the combination of ECMO and percutaneous ventricular assist device (PVAD).

Case study no. 36 and 37

Wang et al. [54] described the recovery of two COVID-19 patients having mild symptoms of pneumonia from China with an amalgamated approach of oxygen therapy mechanical ventilation, antivirals, antibiotics, and a traditional Chinese medicine.

Case study no. 38 and 39

Ke et al. [55] represented a case study of two COVID-19 patients via blood purification technique.

Case study no. 40

Hartman et al. [56] showed the recovery of a 44-year-old male patient having the previous condition of hypertension with venovenous ECMO together with monoclonal antibody (tocilizumab) and high dose of vitamin C.

Other Alternative Approach

Several claims have been made in different alternative systems of medicine to treat COVID-19.

Huang et al. [62] reviewed several natural compounds (quercetin, andrographolide, glycyrrhizin, luteolin, emodin, and hesperidin curcumin) derived from plants with emphasis on Traditional Chinese System of Medicine targeting against SARS-COV-2. Nikhat and Fazil [63] described several Unani medicines as a preventive care

in COVID-19. Tillu et al. [64] elaborated several methods as per Ayurvedic text in the prophylaxis of this virus. Kiran et al. [65] noted *in silico* screening of a Siddha formulation (Kabasura Kudineer) against COVID-19. Basu et al. [66] discussed several repurposed Homeopathic medicines in the management of SARS-COV-2. Keil et al. [67] recorded the use of ultraviolet light and riboflavin in the inactivation of coronavirus in plasma and platelet products via photochemical treatment. The use of ultraviolet light in air disinfection has also been explored as an approach to control the transmission of COVID-19 [68].

Nutritional support, in addition to various therapies for COVID-19, helps to boost early recovery and improvised immunity. Overall, it acts as a support system in virus treatment [69,70].

The concept of Universal antiviral vaccine [71], use of stem cell technology [72,73], and JAK (Janus kinase-signal transducer) inhibitors as an alternative approach for the treatment of this pandemic seems very promising [74].

Discussion and Author's Perspective

Substantial efforts made by scientists and scholars all over the world in searching for the permanent remedy against this pandemic is highly appreciable, and we (humans) are very near in finding a ubiquitous solution. Plants have always been a source of inspiration for humans in drug discovery for years. They are eternally explored for their therapeutic potential. A large number of antiviral phytoconstituents present in plants might become suitable drug targets for Severe acute respiratory syndrome coronavirus-2 treatment. We are trying to highlight some of the plants exhibiting diverse antiviral properties with an emphasis on root part. There are many examples of roots as shown in Table 3 having antiviral properties such as *Glycyrrhiza glabra* which is found to be

Table 3. *Examples of antiviral roots.*

BOTANICAL NAME	FAMILY	ANTIVIRAL COMPOUND	ACTIVE AGAINST VIRUS	REFERENCE
G. glabra	*Leguminosae*	Glycyrrhizin	SARS-associated virus	[75]
F. viridissima	*Oleaceae*	Dimeric lignans	Coxsackievirus B3, human rhinovirus 1B	[76]
A. membranaceus	*Fabaceae*	Aqueous and methanol extract	Influenza virus	[77]
Sophora flavescens	*Fabaceae*	Matrine-type alkaloids	HBV	[78]
E. ebracteolata	*Euphorbiaceae*	Ent-atisane type diterpenoids	Human rhinovirus	[79]
Eupatorium chinense	*Asteraceae*	Benzofurans	Syncytial virus	[80]
P. sidoides	*Geraniaceae*	Prodelphinidin rich extract	Influenza virus	[81]
Alchemilla vulgaris	*Rosaceae*	Ethylacetate extract	Ectromelia viruses	[82]
Ilex asprella	*Aquifoliaceae*	Sulfur-containing triterpenoid saponins	Herpes simplex virus	[83]
Saururus chinensis	*Saururaceae*	Ethyl acetate extract	Epstein-Barr virus	[84]
Maytenus imbricata	*Celastraceae*	Proanthocyanidin	Mayaro virus	[85]
I. indigotica	*Brassicaceae*	Bisindole alkaloids	Influenza virus, coxsackievirus B3	[86]
Illicium oligandrum	*Schisandraceae*	Spirooliganones	Coxsackievirus B3, influenza virus A	[87]
B. marginatum var. *stenophyllum*	*Apiaceae*	Saikosaponins	Influenza virus	[88]
Aloe hijazensis	Liliaceae	Anthraquinones	Avian paramyxovirus type-1, avian influenza virus type A	[89]
Illicium jiadifengpi	*Schisandraceae*	Sesquiterpenes	Coxsackievirus B3	[90]
R. nasutus	Acanthaceae	Naphthoquinone	Rhinovirus	[91]
Erycibe obtusifolia	*Convolvulaceae*	Quinic acid derivatives	Respiratory syncytial virus	[92]
P. ginseng	Araliaceae	Aqueous extract	Influenza A virus	[93]
Wikstroemia indica	*Thymelaeaceae*	Biflavonoid	Respiratory syncytial virus	[94]
Scutellaria baicalensis	Lamiaceae	Flavonoids	Influenza A virus	[95]
Alangium chinense	Cornaceae	Sesquiterpenes	Coxsackievirus B3	[96]
Ziziphus jujuba	*Rhamnaceae*	Cyclopeptide alkaloids	Porcine epidemic diarrhea virus	[97]
I. indigotica	*Brassicaceae*	Indole alkaloid	Influenza virus A	[98]
P. lactiflora	*Paeoniaceae*	Paeonol and 1,2,3,4,6-penta-O-galloyl-β-D-glucopyranose	Human rhinovirus	[99]
Pueraria lobata	*Fabaceae*	Isoflavones, saponins	HIV-1 virus	[100]
S. flavescens	*Fabaceae*	Alkaloids	HBV	[101]

active against SARS-associated virus [75]. *Astragalus membranaceus* [77], *Pelargonium sidoides* [81], *Isatis indigotica* [86], *Bupleurum marginatum* [88], *Panax ginseng* [93], and *I. indigotica* [98] are proven to be competent against influenza virus. *Forsythia viridissima* [76], *Euphorbia ebracteolata* [79], *Rhinacanthus nasutus* [91], and *Paeonia lactiflora* exhibited a potential against rhinovirus [99]. Keeping in view the therapeutic potential of antiviral roots, these might serve as probable candidates to counter this dreadful virus.

Conclusion and Take Home Message

A lack of vaccine against COVID-19 resulted in the use of varying amalgamated drug therapies for treating this slayer virus. The rise of novel strategies on existing drugs opens new gates in antiviral drug discovery. The case studies of COVID-19 survivors mentioned in this paper will boost researchers working in this field and also motivates scholars working on different aspects of this virus. This petite case series encompasses around 40 triumphantly case studies that will definitely reflect the current achievements in controlling the pandemic all over the world. Although all cases of COVID-19 patients mentioned herein this article as case study no. 1-40 responded well when treated with requisite combination drug approach/therapy, it still needs further clinical and scientific validation due to insubstantial sample size.

What is new?

This article describes case series of COVID-19 survivors treated successfully via amalgamated drug therapies and different approaches adopted by physicians depending upon the patient medical condition associated with this virus. The literature pertaining to antiviral plants (roots) as probable candidate against COVID-19 mentioned herein this article may prove to curb the menace virus.

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List of Abbreviations

ARDS	Acute respiratory distress syndrome
AT-001	Aldose reductase inhibitor
COVID-19	Coronavirus disease
CVVHDF	Continuous veno-venous hemodiafiltration
EBP	Extracorporeal blood purification
ECMO	Extracorporeal membrane oxygenation
HBV	Hepatitis B virus
HIV	Human immunodeficiency virus
IL	Interleukin
IVIg	Intravenous immunoglobulin
PVAD	Percutaneous ventricular assist device
RNA	Ribonucleic acid
SARS-CoV-2	Severe acute respiratory syndrome coronavirus-2
tPA	Tissue plasminogen activator
VV-ECMO	Veno-venous extracorporeal membrane oxygenation

Consent for publication

Not applicable.

Ethical approval

Not applicable.

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