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Research Article

Public Awareness and Bio-management of COVID-19 by Four Medicinal Herbs in District Bhimber, Azad Kashmir, Pakistan

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Abstract: The current research work is focused on awareness and bio-management of COVID-19 through four selected natural medicinal herbs (MHs) in District Bhimber, Azad Jammu, and Kashmir (AJK), Pakistan. It was observed that the mortality rate is extremely high in people having weak immune systems, especially with pre-existing health problems. We have conducted questionnaire surveys protocol in different societies about COVID-19 assessment. After the field survey of the coronavirus, we used extracts of selected herbs against the patients of COVID-19 in a local hospital. In these preliminary experimental trials, we have tried to compile the effects of different MHs and their bioactive components that have the potential to combat the infection of COVID-19. The treatment of MHs can also be improved the immune system of the patients and future risk of viral attack can be minimized. The extracts of selected MHs (*Allium sativum* L, *Zingiber officinale* Roscoe, *Piper nigrum* L., and *Vitex negundo* L.) were given to already symptomatic patients with COVID-19 in the District Headquarter (DHQ) hospital Bhimber, AJK. The crude extracts of MHs showed 90 % positive results against COVID-19 patients in the preliminary experimental trials. The '*Allium sativum* and *Zingiber officinale*' were showed the best recovery rate with 95 % and 87 % respectively. Thus, it was proved that MPHs can help in the reduction of the mortality rate. Therefore, it is concluded that the MHs have also been considered as the best healing agents against this epidemic virus as well as boost-up the immune system of human beings. This article will help research laboratories and industries in the identification and scrutinization of potential medicinal herbs against COVID-19 and other viruses as well in the future.

Keywords: Medicinal herbs, Antiviral plants, Healing agents, Immunity enhancer, COVID-19.

1. INTRODUCTION

COVID-19 (Corona Virus Disease) was the first time originated in the province of Hubei, Wuhan City of our neighboring country (China) in the mid of December 2019. The first case of COVID-19 was observed from the person who visits the wet market of Wuhan City, China. Then the coronavirus was gradually spread in other Provinces of China and many other countries. Thus, the disease was declared as a global pandemic by World Health Organization (WHO) on 12th March 2020 [1].

It has rapidly spread throughout the world by traveling off the infecting people in different countries. The virus spread very quickly and become an epidemic in the whole world. The COVID-19 creating a lot of concern for people which leads to heigh-lightened levels of anxiety. So, the sudden exploration of the pandemics reached up to the levels of stress. This stressful situation is a common response to anxiety. Coronavirus disease gradually mutated and spread with a great infection rate and death ratio all over the world [2]. Identification of the Coronaviruses (CoV) was done first time in 1960. The disease CoV indicated mild influenza-like symptoms. These CoV diseases infected a wide range of vertebrates which includes snakes, birds, bats, camels, and many others [3]. However, it was observed that different virulent strains with emerging variables explored after few years causing deadly more epidemics [4].

According to WHO, a new virulent strain of virus known as SARS (Severe Acute Respiratory Syndrome) was identified in China. Then it was

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affected twenty-six (26) countries worldwide with 8098 cases in 2003. Similarly, another outbreak appeared with another strain of Coronavirus, known as MERS (Middle East Respiratory Syndrome) in 2012. The MERS-CoVi outbreak was explored from Saudi Arabia first time then suddenly spread into twenty-seven (27) countries and observed with 2494 cases worldwide [5, 6]. Another investigation indicated the establishment of the coronavirus in the year 1948 [7].

In the current study, we have tried to demonstrate the behavioral changes of humans due to the corona epidemic and their bad impacts on the public due to a lack of awareness about the COVID-19 virus. Here, "public awareness" elaborated much more information due to internet search at the public's level about the understanding of the COVID-19 [8]. Public awareness at the global level is also critically important because the empirical analysis is one of the major factors that support the diagnosis of the coronavirus. It is also considered more helpful in the prevention of the latest COVID-19 [9, 10].

Management of the coronavirus needs preliminary knowledge about the methods of disease transmission and their causal agents. This basic knowledge is important to produce very effective control measure strategies for viral diseases eradication/reduction [11]. Similarly, social awareness is also a key factor for the management of infectious diseases like a corona. Individual precautionary measures which include self-hygiene avoids from crowds, use of protective materials like sterile gloves and face masks are also reduce the chance of spreading the epidemic disease [12]. Therefore, these are facilities are helpful in the quick identification and treatment of new cases of the corona virus [13].

Some other preventive methods have been developed by various countries as self-isolation or self-quarantine at home, quarantine at country level, ban on public gatherings like schools, colleges, and universities, sealing borders, ban on transport, and also complete lockdown at city levels. With the help of the government, different control groups were formed in many countries that information about the individuals who suffer from fever, flu, and cough. Then government advice to those people for the COVID-19 test and also convey to them the possible preventive measures against the coronavirus. In this way, different organizations at the government level are trying to improve awareness of preventive measures like hand washes, the use of masks, and wearing gloves. Similar preventive measures were adopted by the Government of Pakistan against the COVID-19 to provide good safety tools for people. All services and control measures strategies were adopted when the first case of COVID-19 was confirmed in Karachi city of Sindh province in January 2020 and ensured the safe mode of life. It was observed that all cases of COVID-19 linked with the travel history of foreign passengers and their transmission almost imported from other countries. Therefore, The government of Pakistan tried best to provide mitigation strategies against the COVID-19 with their possible preventive measures [14].

The current scenario about the bio-management of COVID-19 is mainly focused on the preparation of vaccines in different countries and succeeded few countries but still, Pakistan did not able to prepare a vaccine for the pro-treatment of COVID-19. However, few other treatments are prescribed under different situations to minimize the severity rate of corona up to some level [15]. Alternatively, herbal treatments are considered very effective against COVID-19 with minimum side effects. Some antiviral agents were obtained from medicinal plant herbs (MPHs) in past.

Many herbalists explored various medicinal plants as anti-viral agents. It was observed that crude extracts of medicinal plants are used in their natural shape as first-generation drugs (FGD) or the active metabolites of plants are isolated for viral control as second-generation drugs [16]. However, more successfully, plant-based MPHs can address this issue of genetic variability of corona-virus in a better way. Herbs are also considered very competent for stunting the replication process of DNA viruses and RNA viruses within the specific/ targeted host cells. The capability of herbal plants is positive to retard the survival of viruses in the host cells [16]. In contrast to synthetic drugs, some metabolites extracted from MPHs can reduce the replication process of the coronavirus without disturbing the metabolic mechanism of the respective host [17]. Coronavirus can be managing by the use of extracts from different MPHs in a

better way. The following MPs have very effective constituents or metabolites against coronavirus such as *Glycyrrhiza radix*, *Dioscorea batatas, Psoralea corylifolia, Mollugo cerviana, Rheum officinale, Polygonum multiflorum, Trichosanthes cucumerina*, and *Salvia miltiorrhiza* [18, 19].

In another review, MPHs extracts of a plant named; *Tinospora cordifolia* has been used for patients infected by SARS-CoVi-2 strains [20]. Similarly, extracts from four different plants named; *Lindera aggregata, Artemisia annua, Lycoris radiata,* and *Pyrrosia lingua* have very dominant anti-viral potential in a host cell against the SARS-CoVi strain. It was also observed that chemicals like alkaloid and lycorine are present in *Lycoris radiata* which are maximum inhibitory potential against infection of SARS-CoV strain [20]. Phenolic compounds which are derived from plants also indicated anti-SARS-CoV activity in targeted host cells [21]. Another study has indicated that the extracts of *Houttuynia cordata* also considered very effective for the treatment of a virus named as SARS-CoV [22].

The primary objective of the survey by questionnaire method was to spread awareness about COVID-19 and prepared the mind of people for precautionary measures like handwashing with soap, use of gloves, sanitizers, and face masks, etc. These are few examples of herbal plants for the treatment of different types of viruses. Although, a lot of MHs are still unexplored against viruses. So, the current study mainly focused on MHs treatment against COVID-19 virus recovery. Precautionary measures are also compiled after a survey of a selected area by online questionnaire methods in this study before MHs treatment to the patients of COVID-19 in DHQ hospitals of district Bhimber, AJ&K.

2. MATERIALS AND METHODS

2.1 Questionnaire Method for Survey

The current research was focused on surveys of COVID-19 through an online structured questionnaire. The questionnaire method was used to collect information from different areas of District Bhimber, AJK during April and May 2020. The questionnaire protocol was developed on the educational material published by the World health organization (WHO). The questionnaire was divided into the following parts as; i) Demographic data of all participants, ii) General awareness about the COVID-19 disease, iii) Knowledge of COVID-19 symptoms, iv) To measure public knowledge about the COVID-19 disease transmission, v) Documented the preventive measures, vi) Gathered information about the treatment and practices of the COVID-19 patients, vii) Collected knowledge about the herbal medicinal plants (HMPs) treatment and compared with previous literature. Responses of the questionnaire were reported in percentage (Table 1) as well as "Yes" or "No" (Table 2). The participant was given a percentage score ranging from 1 to 100%. The participants were classified as having good knowledge about the disease if he/she scored >80 % which was considered a more satisfying percentage in the most previous literature survey. The socio-demographic details that included gender, age groups, occupational level, and education sectors of different regions have been selected for the COVID-19 survey [2, 23]. In this way, we were able to collect data from across various areas of District Bhimber, AJ&K.

2.2 Management through Herbal Medicinal Plants Treatments

Four medicinal plant herbs (MPHs) were selected for the treatment of COVID-19 because these plants are already used against different viral diseases in literature [32-35]. Therefore, these MPHs extracts were used against COVID-19 and received promising results. The extracts of fruits and seeds of *Piper nigrum* were prepared with 5% and 8% concentrations for the treatment of COVID-19 [24]. Piperamides metabolites present in the seeds of the piper plant which is responsible for anti-viral activity [25]. Leaf extracts of *Vitex negundo* were also prepared at the rate of the same concentration as mentioned above. Before extracts preparation, whole plants were dried and prepared powdered. the powder was soaked in distilled water for 2 to 3 hours. The prepared extracts in distilled water were taken orally. Chinese took powder of *V. negundo* with daily tea [26]. *Allium sativum* extract was also prepared from underground stem/bulb at 5% and 8% concentration in sterilized water. The fourth plant extract was prepared from their rhizomes.

Table 1. Survey of COVID-19 awareness by different type of participants.

Level	Characteristics	Query	Percentage (%)	Awareness Scoring (Mean ± SD)
Gender	Men	301	34.09	24.31 ± 1.06
	Women	582	65.91	27.57 ± 1.79
Ages (years)	16-26	530	13.52	17.34 ± 0.86
	27-37	1250	31.89	21.48 ± 1.01
	38-48	1040	26.53	20.76 ± 2.05
	49-59	750	19.13	16.82 ± 0.95
	≥ 60	350	8.93	11.03 ± 1.02
Occupational groups	Teachers of public institutions	550	12.47	16.87 ± 1.00
	Teachers of Private institutions	300	6.80	10.75 ± 1.52
	Students (Male)	1180	26.76	18.56 ± 2.00
	Students (Female)	930	21.09	19.98 ± 1. 85
	Retired persons	220	4.99	8.43 ± 0.81
	Health workers	160	3.63	6.17 ± 0.54
	Local Govt. workers	670	15.19	11.58 ± 0.94
	Industry workers	400	9.07	9.64 ± 0.69
Educational Level	Primary Schools	350	7.43	8.69 ± 0.37
	Middle Schools	570	12.10	10.11 ± 0.96
	High Schools	760	16.13	12.45 ± 1.00
	Intermediate Colleges	1230	26.11	21.48 ± 1.87
	Degree Colleges	1050	22.29	19.25 ± 1.54
	Postgraduate Colleges	750	15.92	11.85 ± 1.00

Zingiber officinale extract was used in concentrated form. The extract of *Zingiber officinale* blocked viral attachment and it was reported in the literature as a good inhibitor of human respiratory syncytial virus (HRSV) as followed Mao *et al*. [27] with some modifications.

These all prepared extracts were used in preliminary experimental trials in District Headquarter Hospital (DHQ), Bhimber, AJ&K for the treatment of COVID-19 patients in the quarantine ward. The results were measured and documented after one week on basis of symptoms.

3. RESULTS AND DISCUSSION

COVID-19 belongs to a large coronavirus family and is well known by name of virulent Severe Acute Respiratory Syndrome-Coronavirus-2 (SARS-CoV-2) virus. The current research is focused on a survey of COVID-19 by demographic analysis and management through treatments by local herbs in District Bhimber, AJ & K, Pakistan. Scientists are mainly focusing on herbal treatments for the cure of the epidemic viral disease because these bio-treatments have no side effects. Sometimes, medicinal plants do not effective against the specific target disease but their use did not show

Table 2. A general survey of the coronavirus disease (COVID-19) and the analysis rating.

Sr. No.	Questionnaire for Public Awareness	Answer (%)
1	Whether you observe COVID-19 in people around you or not?	Yes :- 20.11 % No :- 79. 89 %
2	Are you knowing well about basic knowledge of the COVID-19 virus?	Yes :- 80.45% No :- 19.55 %
3	Is COVID-19 responsible for respiratory disorder?	Yes :- 90.34 % No :- 9.66 %
4	Hand-washing with soap has the same effect as without soap from preventing the spread of the COVID-19 virus?	Yes :- 14.0 % No :- 86.0 %
5	Is the COVID-19 virus cause of death for patients with a chronic disease?	Yes :- 75.08 % No :- 24.92 %
6	The incubation period of the COVID-19 virus is 14 days?	Yes :- 98. 55 % No :- 01.45 %
7	Do patients feel respiratory symptoms before the COVID-19 attack?	Yes :- 18.67 % No :- 81.33 %
8	Is the COVID-19 virus an airborne viral infection?	Yes :- 97. 45 % No :- 2.55 %
9	We have enough hospitals, doctors and ventilation instruments to face the epidemic COVID-19 virus disease?	Yes :- 16.38 % No :- 83.62 %
10	We are spreading information about the COVID-19 virus between our family and friends or not?	Yes :- 72.41 % No :- 23.59 %
11	What is the recovery ratio of the COVID-19 by herbal extracts treatment?	Yes :- 65.82 % No :- 34.18 %
12	The high temperature in summer may kill the COVID-19 virus **or** not**?**	Yes :- 41.78 % No :- 58.12 %
13	The Ministry of Health considered the COVID-19 virus as an infectious disease or not?	Yes :- 98.17 % No :- 1.83 %
14	The COVID-19 may be a repeat cycle in a more severe form in the future?	Yes :- 93.69 % No :- 6.31 %

any negative impact on the body. Therefore, with the emerging methodology of vaccines and other treatments, herbal treatment is recommended as one of them. The herbal mixture was recommended by the Chinese National Health Commission (CNHC) for the management of COVID-19 [4]. It means that extracts of medicinal plants are observed as effective treatments of the virus.

The levels of demographic data analysis composed of gender interviews, different age level discussions, occupational level, and education sectors survey as mentioned in Table 1. It was observed that a total of 883 male and female participants were involved in the survey. The demographic data of the participants indicated a maximum percentage (65.91 %) of women as compared to men (34.09 %). The family group of ages 27-37 years with 31.89 % of the informants know well about the clinical symptoms of COVID-19. The awareness about COVID-19 was observed maximum (26.76%) by male students

in educational groups. Awareness creation about COVID-19 was observed higher (26.11%) at the intermediate college level (Table 1). Similar findings were explored by Elgendy *et al.* [28]. Awareness about the virus is the best way to reduce their infection or patients.

A 14 question survey was conducted about the exploration of COVID-19 awareness. It was observed that maximum peoples (79.89%) were aware of the pandemic of the virus. Most of the people knowing the COVID-19 (80.45%). During the survey, it was also depicted that 90.34% of people considered COVID-19 positive. Maximum peoples were also aware well about precautionary measures like washing hands with soap (86.0%). Some other questions were also explored and documented their answers as shown in Table 2. These findings were strongly supported by Alahdal *et al.* [29].

Medicinal Herbs (MHs) crude extracts contained several metabolites which have the potential for an effective anti-viral drug. Many different anti-viral metabolites of plants including peptides, terpenoids, lignin, flavonoids, polysaccharides, polyacetylenes, and alkaloids were very effective against different targeted viruses [30, 31]. In the current research, four herbal plants named; *Allium sativum*, *Vitex negundo*, *Piper nigrum*, and *Zingiber officinale* were selected for antiviral activity. The responses of each medicinal plant documented in Table 3 from previous literature with their references as justification [32-35]. After their confirmation from literature, these plant extracts were used against the epidemic virus in hospital trials for analyzing the bio-efficacy of selected MHs directly.

The potential of the four MHs were measured and compiled results about COVID-19 virus recovery rate (%) after their treatments. The first treatment is given with 5-gram concentration treatments for three days and it was observed maximum recovery rate (90 %) with *Allium sativum* treatment. *Zingiber officinale* extracts also indicated better results with an 84 % recovery rate. In the second trial, we observed the recovery rate of COVID-19 patients at a concentration of 8gram extract treatment. The two herbs '*Allium sativum* and *Zingiber officinale* were also indicated the best recovery rate of 95 % and 87 % respectively. These findings were measured by using crude extracts of the selected herbs. Hence, these herbs may have chemicals/metabolites with the potential for COVID-19 virus recovery. These findings were supported by different microbiologists [32, 33]. These herbal treatments have no side effects. Therefore, most people were preferred herbal

Table 3. Antiviral activity of herbal medicinal plants

Herbal Plants	Antiviral responses	References
Allium sativum	Antiviral, Proteolytic and hemagglutinating activity	Balachandar *et al.* [32]
Zingiber officinale	Antiviral activity, It combats drug resistance in antivirals against CHIKV.	Kaushik *et al.* [33]
Piper nigrum	Inhibitory effect against COVID-19.	Narkhede *et al.* [34]
Vitex negundo	It inhibits the Chikungunya virus and active against asthma, cough, bronchitis, headache, fever, and influenza.	Khanal *et al.* [35]

Table 4. Responses of selected medicinal herbal plants against COVID-19 in hospital trials

Plants Used	Recovery rate (%) of COVID-19 in hospital trials			
	Dosage (5 g)		Dosage (8 g)	
	Treated Patient	Untreated Patient	Treated Patient	Untreated Patient
Allium sativum	90 %	10 %	95 %	5 %
Zingiber officinale	84 %	16 %	87 %	13 %
Piper nigrum	70 %	30 %	75 %	25 %
Vitex negundo	65 %	35 %	68 %	32 %

treatments against the COVID-19 virus as well as other viral and fungal diseases.

4. CONCLUSION

This study has been focused on the awareness creation among peoples and bio-management of COVID-19 through four selected MHs. This study was spread the general public awareness about the protective measures against viral disease. It was concluded that MHs showed promising results against the virus-infected persons in preliminary trials and considered good alternatives to prevent COVID-19 disease effectively in the local hospital of district Bhimber. Hence, the overall 80 % potential response of four medicinal herbs was calculated against the outbreak of the epidemic disease of COVID-19. As the two MHs '*Allium sativum* and *Zingiber officinale*' were declared best against COVID-19 with a recovery rate of 95 % and 87 % respectively. Therefore, we should focus more on MHs for the treatment of viral diseases like COVID-19. Researchers should focus on specific compounds isolated from these MHs for the management of target disease effectively in the future.

5. CONFLICT OF INTEREST

The authors declare no conflict of interest.

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