

CONSENSUS IN THE USE OF ETHNOMEDICINAL PLANTS DURING COVID-19 PANDEMIC IN AND AROUND DHAKA CITY

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Abstract

The present article deals with recording ethnomedicinal plants used by the people living in and around Dhaka city and also focuses on the plant species used during the pandemic to get relief from COVID-19. The information was gathered using open-ended and semi-structured questionnaires from 348 informants belonging to different classes of life. The survey has resulted in the recording of a total of 160 medicinal plant species belonging to 62 families and used for 157 ailments through 250 different formularies. *Azadirachta indica* A. Juss. was the most cited species in the study area. The highest factor informant consensus (FIC) was found in the Cuts and Wounds category, and *Cynodon dactylon* (L.) Pers. is the most cited species for this category. *Acmella calva* (DC.) R.K. Jansen was the culturally bound species attaining 100% Fidelity Level (FL) value. Among the ethnomedicinal plants, 40 species were found in the survey that were used by people to get relief from COVID-19. This interesting ethnomedicinal use is a new record for these 40 species. Most notable species are *Ocimum tenuiflorum* L., *Justicia adhatoda* L., *Centella asiatica* (L.) Urban, *Citrus aurantifolia* (Christm. & Panzer) Swingle, *Syzygium aromaticum* (L.) Merr. & L.M. Perry, *Mentha arvensis* L., *Zingiber officinale* Rosc., *Camellia sinensis* (L.) O. Kuntze, and *Nigella sativa* L. Since ancient times, these species have been very popular and used to treat several ailments. The use of these species during the pandemic is a new hope for COVID-19 management. But this is a preliminary report. Further long-term study is needed to confirm the claim of these plants' use against COVID-19. Due to excessive use during COVID-19, these species have been scarce in the habitats in and around Dhaka city. Conservation measures should be applied to save these species from extinction.

Introduction

COVID-19, a newly emerging global pandemic, has been one of the major causes of mortality around the globe in the past few years. During this pandemic till vaccines were discovered, the scarcity of conventional modern medicines forced people to look for alternatives from nature, one of which is ethnomedicine. Ethnomedicinal plants are important natural resources that have been used by traditional healers and local people for centuries in the treatment of various diseases. For the scientific community, it serves as a gateway to identify new plant products with potential medicinal and commercial value, as well as a foundation for future investigation into modern drug development through the consensus on documented medicinal plants (Khan *et al.* 2014). The use of medicinal plants, though more or less common among all classes of people, is particularly relevant in urban areas, where access to quality healthcare is limited during critical times. The COVID-19 pandemic that started in 2019–20 has further highlighted the importance of natural remedies in treating this disease and others.

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A good number of research works on the documentation and evaluation of ethnobotanical knowledge in Bangladesh are available. Most noteworthy works are Hassan and Khan (1986), Mia and Huq (1988), Alam (1992), Chowdhury *et al.* (1996), Alam *et al.* (1996), Uddin *et al.* (2001), Yusuf *et al.* (2002), Khan *et al.* (2002), Uddin *et al.* (2006), Yusuf *et al.* (2006), Uddin and Roy (2007), Uddin *et al.* (2008), Uddin *et al.* (2012), Haque *et al.* (2014), and Uddin and Hassan (2014). Apart from these, ethnobotanical research works in certain parts or in and around Dhaka city were done by Rahmatullah *et al.* (2009a), Ahmed *et al.* (2015), Ocvirk *et al.* (2013), Nusrat *et al.* (2015) and Uddin *et al.* (2019). These studies mainly focused on the ethnomedicinal, anti-diabetic, and anti-coagulant properties of plant species. According to the above articles on ethnomedicine, there is no concept of the use of ethnomedicines for COVID-19 because COVID-19 is a newly borne pandemic disease spreading all over the world and it costs millions of lives globally. This disease has no proper modern treatment except vaccines. In the absence of modern treatment, the affected people looked for alternatives in nature to save themselves from this disease. In the present study, an attempt was made to record ethnomedicinal plants used to treat different diseases by the people in and around Dhaka city during the COVID-19 pandemic environment and also to focus on the plant species that were used during the pandemic to get relief from COVID-19; to identify the threats to ethnomedicinal plants and to make recommendations for conservation measures for the ethnomedicinal plants used during COVID-19.

Materials and Methods

Dhaka, the capital city of Bangladesh, is located in the Bengal Plain and has witnessed continuous expansion since gaining independence. On its' southern border, the city is bordered by the Buriganga river, while the eastern boundary is formed by the Balu and the Shitalakhya rivers. To the north lies the Tongi Canal, and to the west, the Turag and the Buriganga rivers define its limits (Banglapedia, 2014; Sayed *et al.*, 2015). In the past, Dhaka was a part of the natural Sal (*Shorea robusta* C.F.Gaertn.) forest of Bhawalgarh, encompassing various water bodies. However, due to rapid urbanization and development, most of the natural vegetation and water bodies have suffered degradation (Rahman *et al.*, 2011). At present, Dhaka lacks natural forests, but different stakeholders such as the City Corporation, RAJUK, and Public Work Department have been undertaken plantation initiatives along road dividers, footpaths, city parks, and lawns (Rahman *et al.*, 2011).

Dhaka, the urban centre of Bangladesh, has a tropical climate known for its hot, damp, and humid conditions. It undergoes a well-defined monsoon period, with an average yearly temperature of 27.5°C and an annual precipitation of approximately 2000 mm, with more than 80% of it occurring during the monsoon season (Dewan and Yamaguchi, 2009). The city is situated on flat terrain at a low elevation near the sea, making it vulnerable to flooding during the monsoon season due to intense rainfall and cyclones (Hough, 2004).

The survey was conducted from January 2022 to January 2023 for a period of 13 months, with a total of sixteen field visits (Table 1). The interviews were done at different times of the day and in different parts of the city using open-ended, semi-structured questionnaires (Alexiades, 1996) so that different classes of people could be interviewed for the survey. A total of 348 informants were interviewed. They were mostly male, and their ages ranged from 18 to 96 years old. The education levels of the informants ranged from illiterate to M. Sc. degrees. Professionally, they were mostly rickshaw pullers, small vendors and housewives. During the field survey, information on the uses of plants to treat different diseases, the parts of plants used, and modes of preparation and administration were collected. The local names were collected with the help of local people.

Table 1. Data collections sites in and around Dhaka city.

Visit No.	Name of place	GPS (Latitude, Longitude)
1	Purbachal (1)	23°50'44.8"N, 90°29'50.8"E
2	Uttara, Diabari	23°52'09.8"N, 90°23'36.6"E; 23°52'30.8"N, 90°21'21.5"E
3	Airport, Matikata, Basundhara	23°50'06.0"N, 90°25'02.8"E; 23°49'13.6"N, 90°23'25.7"E; 23°49'11.5"N, 90°27'15.0"E
4	Jatrabari	23°42'37.0"N, 90°26'07.3"E
5	Keraniganj	23°41'48.2"N, 90°21'03.5"E
6	Abdullahpur	23°39'41.5"N, 90°21'29.5"E
7	Bachila, Noya Bazar, Hajaribag	23°44'46.2"N, 90°20'57.6"E; 23°43'39.0"N, 90°20'20.1"E; 23°44'10.1"N, 90°21'43.5"E
8	Kakrail, Motijheel	23°44'16.6"N, 90°24'16.2"E; 23°44'04.2"N, 90°25'15.6"E
9	Khilgaon	23°44'56.7"N, 90°25'12.4"E
10	Nandipara	23°44'48.6"N, 90°26'40.1"E
11	Demra	23°43'17.9"N, 90°28'59.6"E
12	Purbachal (2)	23°50'46.3"N, 90°30'53.9"E
13	Tongi (Near Dhaka)	23°53'06.2"N, 90°24'17.9"E
14	Mirpur	23°48'15.9"N, 90°20'52.2"E
15	Rupganj	23°48'02.2"N, 90°31'22.3"E
16	Gulshan	23°46'58.0"N, 90°25'12.6"E

The ethnomedicinal plants mentioned by the dwellers in and around Dhaka city were identified by their vernacular names and physical specimens by a group of experts led by a taxonomist in the field. In case of confusion, voucher specimens were prepared following standard herbarium techniques (Alexiades, 1996; Martin, 2010). These specimens were identified later by comparing them with various renowned works such as Prain (1903), Siddiqui *et al.* (2007); Ahmed *et al.* (2008a, b), Ahmed *et al.* (2009a, b, c, d), Uddin and Hassan (2016) and Uddin *et al.* (2021). Based on the information obtained from the people in the study area, all the reported ailments were categorized into 14 broad categories and tabulated. Several diseases were placed in one ailment category based on the body systems treated. To measure the level of consensus between the usage of plants in a definite ailment category and its users in the study area, the informant consensus factor (FIC) value was determined using the formula of Heinrich *et al.* (1998). To determine the most frequently used plant species for treating a particular ailment, fidelity level (FL) was determined following the formula of Friedman *et al.* (1986). Citation frequency (CF) values are useful to determine the most common medicinal plants in the study area. The CF values of medicinal plants were estimated using the formula of Friedman *et al.* (1986).

Results and Discussion

A total of 160 medicinal plant species belonging to 62 families were used by the people in and around Dhaka city for 157 ailments through 250 different formularies. This result indicates the huge diversity of medicinal plants and also shows the diversity of modes of use for different

ailments. For each species, scientific name, local name, family, habitat, parts used, ailments, and modes of treatment are provided (Table 2). For each species, updated scientific name and family name is used (Powo, 2023). The ten most abundant families are Fabaceae, Asteraceae, Rutaceae, Lamiaceae, Amaranthaceae, Malvaceae, Cucurbitaceae, Moraceae, Solanaceae and Arecaceae (Table 2).

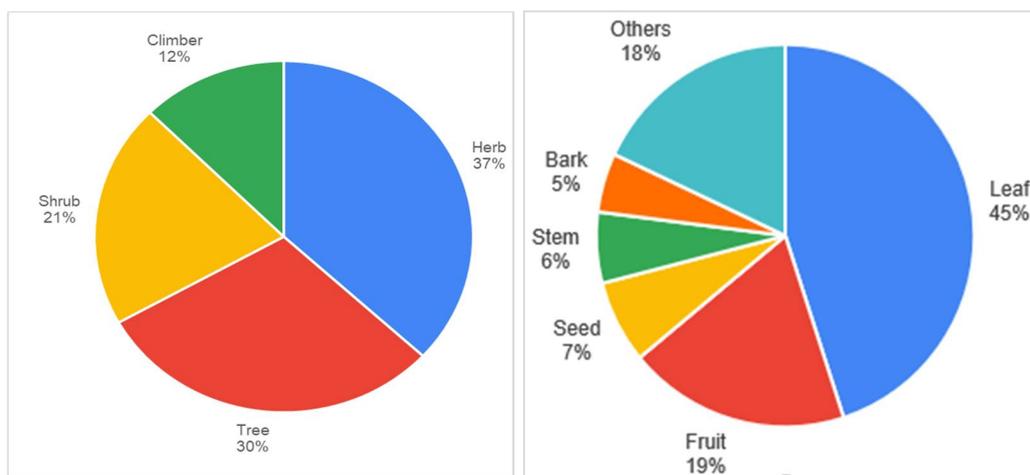


Fig. 1. Percentage habit of recorded ethnomedicinal plants Fig. 2. Percentage of plant parts used in treating ailments

The majority of medicinal plants are herbs (36%), followed by trees (30%), shrubs (21%), and climbers (13%) (Fig. 1). Leaves are the most commonly used parts, followed by fruits, seeds, stems and barks (Fig. 2). This suggests the sustainable use of natural resources in the study area. Among the 250 formularies, 81% were for internal applications, and the remaining 19% were for external applications (Table 2).

Among all the recorded species, *Azadirachta indica* A. Juss. has the most citations (Fig. 3). The next most cited plant species is *Ocimum tenuiflorum* L., followed by *Centella asiatica* (L.) Urban, *Cynodon dactylon* (L.) Pers., *Coccinia grandis* (L.) Voigt, *Terminalia arjuna* (Roxb. ex-DC.) Wight & Arn., *Zingiber officinale* Rosc, *Justicia adhatoda* L., *Litsea glutinosa*, (Lour.) Rob., *Nigella sativa* L., *Mangifera indica* L., *Phyllanthus emblica* L., *Calotropis gigantea* (L.) W.T.Aiton., *Citrus aurantifolia* (Christm. & Panzer) Swingle, and *Bombax ceiba* L.

Besides, some ethnopharmacologically important plant species were determined using the informant consensus factor (FIC) parameter (Heinrich *et al.* 1998). The FIC value was determined to measure the agreement on each disease category among the informants living in and around Dhaka city. Fig. 4 indicates the result where FIC values ranged from 0.88 to 0.29, with the highest value (0.88) found in the Cut and Wounds category. The second-highest FIC value (0.86) was for COVID-19, followed by glandular and intestinal problems, worm and insect problems, mouth and dental problems, cardiovascular and circulatory problems, excretory problems, dermatological disorders, analgesics and antipyretics, skin and health care, digestive and liver problems, gynaecological or sexual disorders, and others. Medicinal plants that are efficient in treating a particular ailment have higher FIC values.

Table 2. List of ethnomedicinal plants (H = Herb, S = Shrub, T = Tree, C = Climber).

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
<i>Abroma augusta</i> (L.) L.f.	Ulot Kombol	Malvaceae	S	Stem	Heart problem	Stem soaked in water and taken
				Stem	Constipation	Stem soaked in water and taken
				Stem	Urinal burn	Stem soaked in water and taken
				Stem	Male weakness	Stem soaked in water and taken
<i>Achyranthes aspera</i> L.	Apang	Amaranthaceae	H	Stem	Cold, cough	Juice taken
				Leaf	Headache	Leaf chewed and taken
				Root	Stop bleeding	Juice applied
				Whole plant	Jaundice	Juice taken
				Root	Diarrhoea	Root crushed and juice taken
				Root	Piles	Juice applied
<i>Acmella calva</i> (DC.) R.K.Jansen	Surjokonna	Asteraceae	H	Flower	Toothache	Flower chewed
				Root	Worm	Juice taken
<i>Aegle marmelos</i> (L.) Corr.	Bel	Rutaceae	T	Fruit	Analgesic	Fruit taken
				Leaf	Scabies	Leaf crushed with <i>Terminalia arjuna</i> leaf, boiled and then the water is used.
				Fruit	Dysentery	Fruit taken
				Fruit	Stomach problem	Young fruit taken
<i>Agaricus bisporus</i> (J.E.Lange) Imbach	Masroom	Agaricaceae	H	Fruit body	Diabetes	Cooked and taken
				Leaf	Strength	Leaf crushed with <i>Terminalia arjuna</i> leaf, boiled and then the water is used.
<i>Allium cepa</i> L.	Peyaj	Amaryllidaceae	H	Latex	Hair fall	Latex applied on bare head
<i>Allium sativum</i> L.	Rosun	Amaryllidaceae	H	Bulb	Heart problem	One seed taken regularly
				Bulb	High pressure	Bulb taken raw
<i>Alocasia macrorrhizos</i> (L.) G.Don	Mankochu	Araceae	S	Stem	Body pain	Juice taken regularly with oil
<i>Aloe vera</i> (L.) Burm.f.	Alovera	Asphodelaceae	H	Leaf	Thermo-regulation	Leaf juice taken
				Leaf	Constipation	Leaf juice taken
				Leaf	Gastritis	Leaf juice taken
				Leaf	Cold, cough	Leaf juice taken
				Leaf	Skin care	Leaf paste applied
				Leaf	Hair treatment	Leaf paste applied
<i>Alstonia scholaris</i> (L.) R. Br.	Chatim	Apocynaceae	T	Leaf	Nutrition	Leaf juice taken
				Leaf	Diarrhoea	Leaf juice taken
				Latex	Gonorrhoea	Latex mixed with sugar and then taken
				Bark	Pregnancy issues	Soaked in water and then taken

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
<i>Amaranthus spinosus</i> L.	Katanote	Amaranthaceae	H	Root	Dysentery	Root crushed with molasses and taken
				Whole plant	Jaundice	Cooked and taken
<i>Amaranthus tricolor</i> L.	Lalshak	Amaranthaceae	H	Whole plant	Blood increase	Cooked and taken
				Whole plant	For vitamins	Cooked and taken
<i>Amaranthus viridis</i> L.	Noteshak	Amaranthaceae	H	Whole plant	Weakness	Cooked and taken
				Whole plant	Eye sight issues	Cooked and taken
<i>Ananas comosus</i> (L.) Merr.	Anaros	Bromeliaceae	H	Fruit	Fever	Ripe fruit taken
				Leaf	Stomach pain	Leaf juice taken
				Leaf	Worms	Leaf juice taken in empty stomach
<i>Andrographis paniculata</i> (Burm.f.) Nees	Kalomegh	Acanthaceae	H	Stem	Blood purification	Stem soaked in water at night and taken in the morning
				Stem	Skin problem	Stem soaked in water whole night and taken in the morning
				Leaf	Jaundice	Leaf juice taken
				Leaf	Constipation	Soaked in water then water is taken
				Leaf	COVID-19	Leaf juice taken
				Leaf	Worm	Leaf juice taken
				Leaf	Fever	Juice taken
				Leaf	Itching	Leaf soaked in water and taken
				Leaf	Liver problem	Leaf juice taken
				Leaf	Constipation	Leaf soaked in water and taken
				Leaf	Stomach problem	Leaf juice taken
				Leaf	Cold	Leaf juice taken
				Leaf	Worm	Leaf juice taken
<i>Arachis hypogaea</i> L.	Badam	Fabaceae	H	Seed	Heart problem	Raw seeds taken
				Seed	Diet maintenance	Roasted seed taken
<i>Artocarpus heterophyllus</i> Lamk.	Kathal	Moraceae	T	Latex	Skin problem	White latex applied
<i>Artocarpus lakoocha</i> Roxb.	Deowa	Moraceae	T	Fruit	Appetizer	Fruit taken
<i>Asparagus racemosus</i> Willd.	Sotomuli	Asparagaceae	C	Latex	Skin disease	Latex taken
				Root	Male weakness	Raw root taken
				Root	Impotent	Raw root taken
<i>Averrhoa carambola</i> L.	Kamranga	Oxalidaceae	T	Root	Male weakness	Raw root taken
<i>Azadirachta indica</i> A. Juss.	Neem	Meliaceae	T	Fruit	High pressure	Fruit taken
				Leaf	Fever	Leaf dried and taken like pill
				Leaf	Body pain	Leaf juice taken
				Leaf	Rheumatic pain	Leaf juice applied

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
				Leaf	Blood purifier	Leaf taken
				Leaf	Antiseptic	Leaf juice applied
				Leaf	Itching	Leaf juice mixed with water and bathe with it
				Leaf	Skin problem	Pasted with turmeric and applied
				Leaf	Itching	Crushed with turmeric and applied
				Leaf	Pox	Juice mixed with water and bathe
				Leaf	Allergy	Leaf cooked and taken with rice
				Leaf	Scabies	Leaf paste applied
				Leaf	Smallpox	Juice mixed with water and bathe
				Leaf	Jaundice	Leaf juice taken
				Leaf	Constipation	Leaf juice taken
				Leaf	Diarrhoea	Leaf dried and taken like pill
				Leaf	Diabetes	Leaf juice taken
				Leaf	Stomach ache	Leaf juice taken
				Bark	Stomach pain	Powder soaked in water and taken
				Leaf	Gastritis	Leaf juice taken
				Stem	Tooth and gum problem	Used as brush
				Leaf	Cholera	Leaf dried and taken like a pill
				Leaf	Kidney problem	Leaf juice taken
				Leaf	Hair fall	Leaf juice mixed with coconut oil and applied
				Leaf	Worms	Leaf juice taken
				Leaf	Louse	Leaf paste applied to the head
				Leaf	Insecticide	Leaf used to preserve crops
<i>Bacopa monnieri</i> (L.) Wettst.	Brammi Shak	Plantaginaceae	H	Whole plant	Health tonic	Cooked and taken
<i>Barringtonia acutangula</i> (L.) Gaerth.	Hizol	Lecythidaceae	T	Leaf	Dysentery	Leaf juice taken
				Bark	Dysentery	Bark juice taken
<i>Benincasa hispida</i> (Thunb.) Cogn.	Kumra	Cucurbitaceae	C	Leaf	Headache	Leaf chewed and taken
				Leaf	Constipation	Leaf cooked and taken
				Leaf	Stomachache	Leaf chewed and taken
				Fruit	Body maintenance	Cooked and taken
<i>Bombax ceiba</i> L.	Simul	Malvaceae	T	Root	Heart disease	Juice taken
				Root	Constipation	Young root taken
				Root	Dysentery	Root juice taken
				Bark	Dysentery	Bark juice taken
				Root	Gastritis	Young root taken

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
<i>Borassus flabellifer</i> L.	Tal	Arecaceae	S	Root	Semen increase	Young root taken
				Root	Ca2+ deficiency	Young root taken
				Stem	Diarrhoea	Warm juice taken
				Leaf	Ear problem	Young leaf burnt and the liquid applied on the ear
<i>Brassica juncea</i> (L.) Czern.	Sorisha	Brassicaceae	H	Stem	Cold, cough	Warm juice taken
				Leaf	Asthma	Warm juice taken
				Seed	Body pain	Seed oil massage
				Seed	Neck pain	Seed oil massage
				Seed	Cold, cough	Seed oil taken
<i>Cajanus cajan</i> (L.) Millsp.	Arhar	Fabaceae	S	Seed	Cold, cough	Oil boiled with garlic and massage
				Seed	Cold, cough	Seed oil massage on the throat
				Leaf	Jaundice	Leaf juice taken
				Fruit	Weakness	Cooked and taken
				Young Shoot	Gastritis	Paste taken
<i>Calotropis gigantea</i> (L.) W.T.Aiton.	Akondo	Apocynaceae	S	Leaf	Body pain	Warm leaf juice massaged
				Leaf	Rheumatic pain	Warm leaf juice massaged
				Leaf	Sexual weakness	Leaf soaked in water and then water taken
				Leaf	Cold, cough	Warm leaf juice mixed with mustard oil and then massaged
				Latex	Insect bite	Latex applied
<i>Camellia sinensis</i> (L.) O. Kuntze	Cha	Theaceae	S	Leaf	Snakebite	Leaf juice applied on bitten place
				Leaf	Headache	Boiled in water and water drunken
				Leaf	Corona	Leaf powder boiled in water and then taken
				Leaf	Body fitness	Boiled in water and water taken
				Leaf	Weight reduction	Boiled in water and water taken
<i>Canavalia gladiata</i> (Jacq.) DC.	Mou Shim	Fabaceae	C	Fruit	Appetizer	Cooked and taken
<i>Careya arborea</i> Roxb.	Kumvi	Lecythidaceae	T	Leaf	Cold, cough	Paste taken with a bamboo stick
<i>Carica papaya</i> L.	Pepe	Caricaceae	S	Latex	Ringworm	Latex applied on the infected skin
				Fruit	Constipation	Fruit taken
				Fruit	Gastritis	Young fruit taken in the morning
				Fruit	Stomach problem	Cooked with less spices and taken
				Leaf	Malaria	Leaf juice taken

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
<i>Cassia fistula</i> L.	Sonalu	Fabaceae	T	Fruit	Dysentery	Fruit pulp taken
<i>Catharanthus roseus</i> (L.) G.Don	Noyontara	Apocynaceae	S	Flower	Diabetes	Flower juice taken
<i>Centella asiatica</i> (L.) Urban	Thankuni	Apiaceae	H	Leaf	Body pain	Leaf chewed and taken
				Leaf	High pressure	Leaf juice taken
				Leaf	Skin problem	Leaf juice applied on skin
				Leaf, Stem	Skin problem	Cooked and taken
				Leaf	Jaundice	Leaf juice taken
				Leaf	Liver problem	Leaf taken
				Leaf	Dysentery	Leaf juice taken
				Leaf	Diarrhoea	Leaf juice taken
				Leaf	Constipation	Leaf juice taken
				Leaf	Upset stomach	Leaf juice taken
				Leaf	Diabetes	Leaf juice taken
				Leaf	Gastritis	Leaf juice taken in the morning
				Leaf	Leucorrhoea	Leaf juice taken
				Leaf	Eye cataract	Leaf juice applied on eye
				Leaf	COVID-19	Leaf chewed and taken
				Leaf	Skin glamour	Leaf juice applied on skin
				Leaf	Weight reduction	Leaf juice taken
				Leaf	Worm	Leaf juice taken
<i>Chenopodium album</i> L.	Bethua	Amaranthaceae	H	Leaf	Weakness	Whole plant cooked and taken
<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.	Ujaru Lota	Asteraceae	S	Leaf	Stop bleeding	Juice given to the wounded place
				Leaf	Fracture	Leaf paste applied
				Leaf	Ulcer	Leaf juice is taken
				Leaf	Gastritis	Leaf juice is taken
<i>Cinnamomum tamala</i> (Buch. -Ham.) T.Nees & C.H.Eberm.	Tejpata	Lauraceae	T	Leaf	Gastritis	Leaf juice taken
				Leaf	COVID-19	Dry leaf boiled with Clove and water taken
				Leaf	Cold, cough	Dry leaf boiled and water taken
				Leaf	Hair fall	Dry powder applied on bath water
<i>Cinnamomum verum</i> J.Presl	Daruchini	Lauraceae	T	Bark	Acne	Powdered stem applied with honey
				Bark	COVID-19	Bark boiled and water taken
				Bark	Hair fall	Dry bark powder mixed with water and then bathe with it
<i>Cissus quadrangularis</i> L.	Harvanga	Vitaceae	C	Stem	Rheumatic pain	Cooked and taken
				Stem	Fracture	Stem paste applied on broken bone
<i>Citrus aurantium</i> L.	Malta	Rutaceae	S	Fruit	COVID-19	Fruit juice taken
<i>Citrus aurantifolia</i> (Christm. & Panzer) Swingle	Lebu	Rutaceae	S	Fruit	High pressure	Juice taken
				Fruit	Digestion	Fruit juice applied
				Leaf	Nausea	Leaf crushed and smell taken

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
				Fruit	Weakness	Fruit juice taken
				Fruit	Tooth problem	Fruit taken
				Fruit	Cancer	Fruit boiled and then taken
				Fruit	Sleep problem	Fruit juice taken
				Fruit	COVID-19	Fruit juice taken
				Fruit	Antioxidant	Fruit juice applied
				Fruit	Skin care	Fruit juice applied
<i>Citrus maxima</i> (Burm.) Merr.	Jambura	Rutaceae	S	Fruit	Jaundice	Fruit taken
<i>Clerodendrum infortunatum</i> L.	Vat	Lamiaceae	S	Root	Dysentery	Root crushed and taken with water
				Leaf	Stomach problem	Leaf juice taken
				Root	Tooth problem	Root chewed
				Stem	Tooth problem	Stem used as brush
				Leaf	Toothache	Leaf chewed
				Young Shoot	Asthma	Juice taken
				Leaf	Cold, cough	Leaf juice taken
				Young Shoot	Worm	Juice taken
<i>Clitoria ternatea</i> L.	Aparajita	Fabaceae	C	Flower	Cold, cough	Flower chewed and taken
<i>Coccinia grandis</i> (L.) Voigt	Telakucha	Cucurbitaceae	C	Leaf	Fever	Leaf juice taken
				Leaf	Chest pain	Leaf juice taken
				Leaf	Rheumatic pain	Cooked and taken
				Leaf	Blood purifier	Cooked and taken
				Leaf	Blood clotting	Leaf paste applied
				Leaf	Body burning	Cooked and taken
				Leaf	Jaundice	Leaf juice taken
				Leaf	Constipation	Leaf cooked and taken
				Leaf	Piles	Leaf crushed with salt and applied
				Leaf	Diabetes	Leaf juice taken
				Leaf	Diabetes	Cooked and taken
				Leaf	Gastritis	Cooked and taken
				Leaf	Ear problem	Leaf paste prepared with mustard oil, salt and then juice applied
				Leaf	Kidney stone	Leaf juice taken
				Leaf	Cold, cough	Cooked and taken
				Leaf	Head cool	Cooked and taken
<i>Cocos nucifera</i> L.	Dab	Areaceae	T	Fruit	Jaundice	Fruit water taken
				Fruit	Diarrhoea	Fruit water taken
				Fruit	Pregnancy problem	Fruit water taken with faith
				Root	Toothache	Young root juice taken evening

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
<i>Colocasia esculenta</i> (L.) Schott	Kochu	Araceae	H	Fruit	COVID-19	Fruit water taken three times a day
				Stem	Pain	Cooked and taken
				Stem	Rheumatic pain	Cooked and taken
				Stem	Blood purifier	Cooked and taken
				Leaf	Stop bleeding	Paste applied on the wounded part
<i>Combretum indicum</i> (L.) DeFilipps	Modhumonjuri	Combretaceae	C	Rhizome	Blood dysentery	Cooked and taken
				Leaf	Constipation	Leaf cooked and taken
<i>Corchorus capsularis</i> L.	Pat	Malvaceae	H	Leaf	Allergy	Leaf cooked with black pepper and taken
<i>Crinum asiaticum</i> L.	Gorosun	Amaryllidaceae	H	Leaf	Upset stomach	Fried leaf taken
<i>Crotalaria pallida</i> Aiton	Jhunjhuni	Fabaceae	H	Bulb	Liver problem	Soaked in water and then small amount is taken
<i>Cucumis sativus</i> L.	Shosha	Cucurbitaceae	C	Leaf	Stomach pain	Cooked with other veggies and taken
				Fruit	Heart problem	Fruit taken
				Fruit	Stomachache	Fruit taken with salt
				Fruit	Dark spots	Fruit applied on the place
				Fruit	Reduce obesity	Fruit taken
<i>Cuminum cyminum</i> L.	Jira	Apiaceae	H	Fruit	Weight reduction	Fruit taken
				Seed	Gastritis	Seed chewed and taken
<i>Curcuma longa</i> L.	Holud	Zingiberaceae	H	Rhizome	Body pain	Rhizome taken with milk
				Rhizome	Blood purifier	Raw rhizome taken in the morning
				Rhizome	Skin problem	Paste applied to skin
				Rhizome	Acnes spots	Rhizome paste applied
				Rhizome	Jaundice	Raw rhizome taken
				Rhizome	Skin glamour	Rhizome paste applied on skin
<i>Curcuma zedoaria</i> (Christm.) Roscoe	Sothi	Zingiberaceae	H	Root	Gastritis	Root juice taken
<i>Cuscuta reflexa</i> Roxb.	Sornolota	Convolvulaceae	C	Stem	Fever	Crushed and juice taken
				Stem	Body pain	Stem paste applied
				Stem	Rheumatic pain	Cooked and taken
				Stem	Fracture	Paste applied
				Leaf	Allergy	Leaf boiled and applied
				Stem	Jaundice	Stem juice taken
				Stem	Diarrhoea	Stem paste applied
				Stem	Gastritis	Cooked and taken

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode				
<i>Cynodon dactylon</i> (L.) Pers.	Durba	Poaceae	H	Stem	Stomach problem	Stem boiled and taken				
				Stem	Excessive menstruation	Stem juice taken				
				Stem	Worm	Juice used				
				Leaf	Stop bleeding	Leaf juice given to the wounded place				
				Whole plant	Wound healing	Crushed and paste applied on the wounded place				
				Leaf	Ulcer	Leaf juice taken				
				Leaf	Urinary problem	Leaf juice taken				
				Whole plant	Gastritis	Plant crushed and juice taken				
				Leaf	Gum strong	Leaf chewed and juice taken				
<i>Datura metel</i> L.	Dhutura	Solanaceae	S	Leaf	Insomnia	Leaf juice taken				
				Leaf	Rheumatic pain	Young leaf cooked and taken				
				Leaf	Itching	Young leaf cooked and taken				
				Leaf	Skin problem	Young leaf cooked and taken				
				Root	Constipation	Soaked in water and then water taken				
				Fruit	Mental problem	Fruit taken after purifying it.				
				Leaf	Cold, cough	Leaf juice taken				
				Fruit	High pressure	Fruit juice taken				
				Leaf	Constipation	Soaked in water and then water taken				
<i>Dillenia indica</i> L.	Chalta	Dilleniaceae	T	Fruit	Dysentery	Fruit juice taken				
				Leaf	Dysentery	Soaked in water and then water taken				
				Leaf	Urinary problem	Soaked in water and then water taken				
				Leaf	Stomach problem	Soaked in water and then water taken				
				Fruit	Vitamins	Soaked in water and then water taken				
				<i>Dioscorea alata</i> L.	Pastalu	Dioscoreaceae	C	Tuber	Health care	Cooked and taken
				<i>Diospyros malabarica</i> (Desr.) Kostel.	Gab	Ebenaceae	T	Leaf	Constipation	Soaked in water and then water taken
								Leaf	Dysentery	Soaked in water and then water taken
				<i>Eclipta prostrata</i> (L.) L.	Keshraj	Asteraceae	H	Young Shoot	Hand pain	Five shoots crushed with lime and applied in hands
Leaf	Headache	Leaf juice taken								
Whole plant	Stop bleeding	Paste applied on wounded part								
Whole plant	Dandruff	Paste applied on head								

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
				Whole plant	Jaundice	Cooked and taken
				Fruit	Toothache	Chewed on the infected tooth
				Whole plant	Hair fall	Paste applied on head
				Leaf	Blackening hair	Leaf crushed and applied on head
				Leaf	Head cool	Paste applied on head
<i>Elaeocarpus floribundus</i> Blume	Jolpai	Elaeocarpaceae	T	Fruit	Appetizer	Fruit taken
				Fruit	Vitamin c	Fruit taken
<i>Elettaria cardamomum</i> (L.) Maton	Alach	Zingiberaceae		Fruit	COVID-19	Boiled and water taken
<i>Enydra fluctuans</i> Lour.	Helenchia	Asteraceae	H	Whole plant	Asthma	Cooked and taken
				Whole plant	Eye sight improve	Cooked and taken
				Whole plant	Vitamins	Cooked and taken
<i>Euryale ferox</i> Salisb	Tal Makhna	Nymphaeaceae	H	Fruit	Constipation	Taken with molasses
<i>Ficus hispida</i> L. f.	Kak Dumur	Moraceae	T	Stem	Eye cataracts	Young branch latex applied on eye
<i>Ficus racemosa</i> L.	Dumur	Moraceae	T	Fruit	Diabetes	Fruit taken
				Fruit	Cold, cough	Ripe fruit taken raw or unripe fruit cooked and then taken
				Leaf	Cold, cough	Leaf cooked and taken
<i>Glinus oppositifolius</i> (L.) Aug.DC.	Gima Shak	Molluginaceae	H	Leaf	Skin problem	Whole plant cooked and taken
				Leaf	Body pain	Cooked and taken
<i>Glycosmis pentaphylla</i> (Retz.) A.DC.	Motkila	Rutaceae	S	Stem	Tooth problem	Stem used as brush
<i>Glycyrrhiza glabra</i> L.	Josthimodhu	Fabaceae	S	Leaf	Worms	Leaf juice taken
				Stem, Root	Throat problem	Dried and then soaked water taken
				Stem and Root	Cold, cough	Stem or root dissolved in water and then taken
<i>Gynura procumbens</i> (Lour.) Merr.	Diabetic Plant	Asteraceae	S	Leaf	Diabetes	Leaf juice taken
<i>Heliotropium indicum</i> L.	Hatishur	Boraginaceae	H	Leaf and Stem	Fever	Juice taken
				Leaf	Abscess	Warm leaf juice applied
				Root	Delivery problem	Root juice taken
				Root	Strength	Root crushed and juice taken
				Flower	Ophthalmia	Flower juice applied
<i>Hibiscus rosa-sinensis</i> L.	Joba	Malvaceae	S	Bark	Dysentery	Soaked in water and then taken
				Flower	Pregnancy problem	Flower juice mixed with milk and taken to have baby

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
<i>Hyptis suaveolens</i> (L.) Poit.	Tokma	Lamiaceae	H	Flower	Hair treatment	Flower juice applied on head
				Flower	Head cool	Flower paste applied on head and then washout
				Seed	Body cool	Seed soaked in water and taken
				Seed	Constipation	Seed mixed with water and then taken
				Seed	Dysentery	Seed soaked in water and taken
				Leaf	Constipation	Leaf juice taken
				Seed	Diabetes	Seed soaked in water and taken
<i>Imperata cylindrica</i> (L.) Raeusch.	Uluchan	Poaceae	H	Whole plant	New hair growth	Whole plant crushed and the paste applied on head
				Leaf	Abscess	Leaf mixed with Onion and paste applied
<i>Ipomoea aquatica</i> Forssk.	Kolmi	Convolvulaceae	H	Leaf	Insect bite	Leaf paste applied
				Leaf	Body pain	Leaf juice massaged
				Leaf	COVID-19	Leaf juice taken
<i>Justicia adhatoda</i> L.	Basok	Acanthaceae	S	Leaf	Asthma	Leaf juice taken
				Leaf	Stomachache	Leaf taken with molasse
				Leaf	Dysentery	Leaf chewed in morning empty stomach
<i>Kalanchoe daigremontiana</i> Raym.-Hamet & H.Perrier	Pathor Chuna	Crassulaceae	H	Leaf	Semen increase	Leaf chewed in morning empty stomach
				Leaf	Fever	Leaf juice applied
<i>Kalanchoe pinnata</i> (Lam.) Pers.	Pathor kuchi	Crassulaceae	H	Leaf	Urinary problem	Leaf juice taken
				Leaf	Stomach problem	Leaf juice applied
				Leaf	Stomach problem	Leaf juice applied
<i>Lagenaria siceraria</i> (Molina) Standl.	Lau	Cucurbitaceae	C	Fruit	Stomach problem	Fruit cooked and taken
<i>Laportea interrupta</i> (L.) Chew	Chotra	Urticaceae	H	Root	Dysentery	Root juice taken
<i>Lawsonia inermis</i> L.	Mehedi	Lythraceae	S	Leaf	Dandruff	Leaf paste applied on head
				Leaf	Nail problem	Leaf juice applied
				Leaf	Gastritis	Leaf juice taken
				Leaf	Abortion	Leaf juice is taken
				Leaf	Hair fall	Leaf juice applied on head
				Leaf	Head cool	Paste applied on head
<i>Lens culinaris</i> Medik.	Mosur Dal	Fabaceae	H	Leaf	Hair color	Paste applied on head
				Seed	Skin glamour	Soaked in water and then pasted
				Seed	Skin glamour	Soaked in water and then pasted
<i>Leucas aspera</i> (Willd.) Link	Dondo Kolosh	Lamiaceae	H	Leaf	Face swollen	Leaf juice taken
				Leaf	Cold, cough	Leaf cooked and taken
				Whole plant	Cold, cough	Crushed and juice taken
				Leaf	Cold, cough	Leaf juice taken

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
<i>Limonia acidissima</i> L.	Kodbel	Rutaceae	T	Young Shoot	Diabetes	Cooked with potato and taken
				Leaf	Worm	Leaf juice applied
				Fruit	Apatite	Fruit taken
				Fruit	Constipation	Young fruit dried and then taken with water and sugar
<i>Litsea glutinosa</i> (Lour.) C.B.Rob.	Menda	Lauraceae	T	Leaf, Stem	Body burning sensation	Soaked in water and then taken
				Leaf	Jaundice	Leaf soaked in water and then water taken
				Leaf	Dysentery	Leaf soaked in water and then water taken
				Leaf	Constipation	Leaf soaked in water and then water taken
				Bark	Dysentery	Bark crushed and soaked in water and then water taken
				Leaf	Urinary problem	Leaf soaked in water and then water taken
				Leaf	Stomach problem	Leaf soaked in water and then water taken
				Leaf	Cold, cough	Leaf soaked in water and then water taken
				Leaf	Burning sensation	Leaf soaked in water and then taken
				Bark	Burning sensation	Bark soaked in water and then taken
				Leaf	Head cool	Leaf paste applied
<i>Mallotus nudiflorus</i> (L.) Kulju & Welzen	Pitali	Euphorbiaceae	T	Stem, Root	Tooth problem	Used as brush
<i>Mangifera indica</i> L.	Amm	Anacardiaceae	T	Fruit	Abscess	Fruit powder applied
				Fruit	High pressure	Fruit juice taken
				Bark	Jaundice	Bark juice taken
				Fruit	Jaundice	Fruit water taken
				Bark	Dysentery	Bark juice taken
				Bark	Diarrhoea	Bark soaked in water with molasses and then taken
				Flower	Dysentery	Flower bud Juice taken on empty stomach
				Leaf	Dysentery	Leaf juice taken
				Leaf	Gastritis	Leaf juice taken on empty stomach
				Seed	Diabetes	Seed taken
				Flower	Gastritis	Flower bud taken directly on empty stomach
				Leaf	Stomach pain	Leaf chewed and taken
				Leaf	Toothache	Leaf chewed and taken
Fruit	Vitamin C	Young fruit is taken				
Fruit	Heart problem	Young fruit taken				

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
<i>Melia azedarach</i> L.	Ghoranim	Meliaceae	T	Leaf	Louse	Leaf paste applied on the head
<i>Mentha arvensis</i> L.	Pudina	Lamiaceae	H	Leaf	Digestion	Leaf taken raw
				Leaf	Gonorrhea	Leaf juice taken with milk
				Leaf	COVID-19	Leaf warm juice taken
				Leaf	Asthma	Leaf boiled in water and then taken
<i>Mikania scandens</i> (L.) Willd.	Asamlota	Asteraceae	C	Leaf	Closed nose	Leaf juice vapors taken by nose
				Leaf	Headache	Leaf paste applied
				Leaf	Wound healing	Leaf juice applied on the wounded place
				Leaf	Gastritis	Leaf juice taken
<i>Mimosa pudica</i> L.	Lojjaboti	Fabaceae	S	Leaf	Stomachache	Leaf juice taken
				Root	Dysentery	Root crushed and juice taken with water
<i>Momordica charantia</i> L.	Korola	Cucurbitaceae	C	Root	Sleep problem	Root tie on hand
				Fruit	Diabetes	Cooked and taken
				Fruit	Diabetes	Fruit juice taken
<i>Moringa oleifera</i> Lam.	Sajna	Moringaceae	T	Leaf	Diabetes	Juice taken
				Fruit	Fever	Cooked and taken
				Leaf	Rheumatic pain	Leaf juice taken
				Bark	Rheumatic pain	Bark fried and chewed with rice seed powder
				Leaf	Jaundice	Cooked and taken
				Leaf	Dysentery	Leaf juice taken
				Leaf	Diabetes	Cooked and taken
				Leaf	Weakness	Cooked and taken
				Leaf, Bark	Cold, cough	Bark or leaf crushed and taken
				Bark	Asthma	Bark juice taken
<i>Murraya paniculata</i> (L.) Jack	Kamini	Rutaceae	T	Leaf	Tooth problem	Leaf chewed
<i>Musa paradisiaca</i> L.	Kola	Musaceae	H	Fruit	Dysentery	Unripe fruit crushed with sugar and taken
				Fruit	Eye sight	Fruit taken
				Leaf	Skin problem	Leaf paste applied
				Cone	Jaundice	Cooked and taken
				Fruit	Dysentery	Unripe fruit crushed with sugar and taken
				Cone	Constipation	Cooked and taken
				Fruit	Constipation	Cooked and taken
				Fruit	Diarrhoea	Unripe fruit cooked and taken
				Cone	Upset stomach	Cooked and taken
				Fruit	Stomach problem	Unripe fruit crushed and taken
				Cone	Diabetes	Cooked and taken

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
				Fruit	Dysentery	Fruit soaked in water and then water taken
				Fruit	Weakness	Fruit taken
				Fruit	Diarrhoea	Fruit soaked in water and then water taken
<i>Nelumbo nucifera</i> Gaertn.	Poddo	Nelumbonaceae	H	Leaf	Pain	Leaf juice taken
<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Kodom	Rubiaceae	T	Leaf	Rheumatic pain	Body massage with the warm juice of leaf
				Bark	Dysentery	Bark soaked in water and then taken
<i>Nigella sativa</i> L.	Kalojira	Ranunculaceae	H	Leaf	Worm	Young leaf chewed and taken
				Seed	Pain	Seed oil massage to get remedy
				Seed	Skin problem	Seeds are taken
				Seed	Gastritis	Seeds are taken
				Seed	Stomach problem	Seeds are taken
				Seed	Strength	Seeds are taken
				Seed	COVID-19	Seed paste taken
				Seed	Cold, cough	Seed paste taken
				Seed	COVID-19	Seeds taken regularly to get remedy from COVID-19
				Seed	Cold, cough	Seed boiled with ginger, tea leaf and clove and water taken
<i>Nyctanthes arbor-tristis</i> L.	Shiuli	Oleaceae	S	Leaf	Fever	Leaf crushed and juice taken
				Leaf	Piles	Leaf crushed and juice taken
				Leaf	Cold, cough	Leaf crushed and juice taken
<i>Ocimum tenuiflorum</i> L.	Tulshi	Lamiaceae	S	Leaf	Headache	Warm juice taken
				Leaf	Skin problem	Crushed with mango leaf, guava leaf and then paste mixed with bath water
				Leaf	Cold, cough	Leaf juice taken
				Leaf	Cold, cough	Leaf chewed and taken
				Leaf	COVID-19	Leaf chewed and taken
				Leaf	Cold, cough	Leaf boiled and taken with honey
				Leaf	Sore throat	Warm juice taken
<i>Oroxylum indicum</i> (L.) Benth. ex Kurz.	Kanai dinga	Bignoniaceae	T	Leaf	Stomach problem	Young leaf chewed and taken
<i>Oryza sativa</i> L.	Dhan	Poaceae	H	Seed	Strong hair	Boiled and water applied
				Seed	Upset stomach	Processed seed (<i>cheera</i>) taken with yogurt
<i>Paederia foetida</i> L.	Gondho Vadhuli	Rubiaceae	C	Leaf	Liver problem	Cooked and taken
				Leaf	Dysentery	Leaf juice taken with sugar
<i>Persicaria orientalis</i> (L.) Spach	Bishkatali	Polygonaceae	H	Whole plant	Fish killing	Plant crushed and applied
<i>Phoenix sylvestris</i> (L.) Roxb.	Khejur	Arecaceae	T	Fruit	Migraine	Unripe fruit taken
				Fruit	Increase weight	Fruits are taken regularly

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
<i>Phyllanthus acidus</i> (L.) Skeels	Orboroi	Phyllanthaceae	T	Fruit	Cold, cough	Fruit taken
<i>Phyllanthus emblica</i> L.	Amloki	Phyllanthaceae	T	Fruit	Chest pain	Crushed with <i>Terminalia bellirica</i> and <i>T. chebula</i> fruits and taken after drying
				Fruit	Heart problem	Powder soaked in water and taken
				Fruit	High pressure	Crushed with <i>T. chebula</i> fruit and taken
				Fruit	Appetite	Crushed with <i>Terminalia bellirica</i> and <i>T. chebula</i> fruits and taken after drying
				Fruit	Aversion to food	Fruit taken
				Fruit	Digestion	Fruit taken
				Fruit	Liver problem	Crushed with <i>T. chebula</i> fruit and taken
				Fruit	Excretory problem	Crushed with <i>Terminalia bellirica</i> and <i>T. chebula</i> fruits and taken after drying
				Fruit	Constipation	Fruit taken
				Fruit	Constipation	Crushed with <i>Terminalia bellirica</i> and <i>T. chebula</i> fruits and taken after drying
				Fruit	Gastritis	Crushed with <i>Terminalia bellirica</i> and <i>T. chebula</i> fruits and taken after drying
				Fruit	Impotent	Crushed with <i>Terminalia bellirica</i> and <i>T. chebula</i> fruits and taken after drying
				Fruit	Strength	Crushed with <i>Terminalia bellirica</i> and <i>T. chebula</i> fruits and taken after drying
				Fruit	Mouth problem	Raw fruit taken
				Fruit	Mouth ulcer	Raw fruit taken
				Fruit	Antioxidant	Fruit juice applied
				Fruit	Hair fall	Soaked in water and applied on head
Fruit	Skin care	Fruit juice applied				
<i>Phyllanthus reticulatus</i> Poir.	Sitki	Phyllanthaceae	S	Stem	Tooth problem	Used as brush
<i>Physalis minima</i> L.	Photka	Solanaceae	H	Seed	Diabetes	2 or 3 seeds are chewed and taken
<i>Piper betle</i> L.	Pan	Piperaceae	C	Leaf	Digest	Leaf taken
				Leaf	Diabetes	Leaf taken
<i>Piper longum</i> L.	Pipul	Piperaceae	H	Leaf	Fever	Crushed with black pepper seed and taken
				Leaf	Fever	Leaf juice taken
				Leaf	Headache	Leaf juice taken

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
<i>Piper nigrum</i> L.	Gol Morich	Piperaceae	C	Leaf	Cold, cough	Leaf juice taken
<i>Piper retrofractum</i> Vahl	Chui Jhal	Piperaceae	C	Stem	Better digestion	Stem cooked and taken
<i>Plantago ovata</i> Forssk.	Esobgul	Plantaginaceae	S	Seed coat	Constipation	Seed coat powder mixed with water and taken
					Indigestion	Seed coat powder mixed with water and taken
<i>Prunus domestica</i> L.	Alu bokhara	Rosaceae	T	Fruit	Diabetes	Fruit taken
<i>Psidium guajava</i> L.	Peyara	Myrtaceae	T	Fruit	Constipation	Fruit taken
				Leaf	Dysentery	Juice taken
				Leaf	Diabetes	Leaf juice taken
				Leaf	Toothache	Young leaf chewed
				Leaf	Tooth pain	Boiled with <i>Azadirachta indica</i> leaf and <i>Aegle marmelos</i> leaf and then mouthwash with the water
<i>Punica granatum</i> L.	Dalim	Lythraceae	S	Leaf	Tooth decay	Leaf chewed twice a day
				Fruit	Blood increasement	Fruit taken
				Leaf	Pox	Juice taken
				Leaf	Blood dysentery	Leaf crushed with Mango leaf and, Guava leaf then taken.
				Fruit	Diarrhoea	Fruit taken
				Flower	Dysentery	Paste applied
				Fruit	Cold, cough	Fruit taken
				Fruit	Cold, cough	Fruit peel boiled in water and then taken
<i>Pyrus communis</i> L.	Naspati	Rosaceae	T	Fruit	Heart water remove	Fruit taken
<i>Ricinus communis</i> L.	Verenda	Euphorbiaceae	S	Seed	Pain	Seed oil massage to get remedy
				Seed	Rheumatic pain	Seed oil massage to get remedy
<i>Salvia hispanica</i> L.	Chiya Seed	Lamiaceae	H	Seed	Constipation	Soaked in water and then taken
				Seed	Skin, organ nutrition	Soaked in water and then taken
<i>Saccharum officinarum</i> L.	Akh	Poaceae	H	Stem	Jaundice	Stem juice taken
				Stem	Jaundice	Stem juice taken
<i>Scoparia dulcis</i> L.	Bon Dhone	Plantaginaceae	H	Leaf	Cold, cough	Juice taken
				Leaf	Body pain	Leaf juice taken
<i>Senna alata</i> (L.) Roxb.	Dad mordon	Fabaceae	S	Leaf	Ringworm	Leaf juice applied
<i>Senna alexandrina</i> Mill.	Sonapata	Fabaceae	S	Leaf	Constipation	Leaf powder taken
<i>Sesamum indicum</i> L.	Til	Pedaliaceae	H	Seed	Cold, cough	Seed oil applied
<i>Shorea robusta</i> C.F.Gaertn.	Sal	Dipterocarpaceae	T	Bark	Diarrhoea	Bark juice taken
				Stem	Impotence	Mixed with molasses and taken

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
<i>Sida cordifolia</i> L.	Berela	Malvaceae	S	Root	Weakness	Root juice taken with sugar regularly
<i>Smilax perfoliata</i> Lour.	Kumari lota	Smilacaceae	C	Stem	Fracture	Paste applied
				Stem	Strength	Young stem chewed and taken
				Stem	Sexual problem	Stem taken
<i>Solanum indicum</i> Roxb.	Tuni begun	Solanaceae	S	Fruit	Blood purifier	Chewed or juice taken
<i>Solanum nigrum</i> L.	Titbegun	Solanaceae	H	Leaf	Itching	Leaf burned and ash applied
<i>Solanum sisymbriifolium</i> Lam.	Kata Begun	Solanaceae	H	Seed	Allergy	Cooked and taken
<i>Spinacia oleracea</i> L.	Palong	Amaranthaceae	H	Leaf	Vitamins	Cooked and taken
<i>Spondias pinnata</i> (L.f.) Kurz	Amra	Anacardiaceae	T	Fruit	High pressure	Fruit taken
				Fruit	Appetite	Fruit taken
<i>Stephania japonica</i> (Thunb.) Miers	Aknadi	Menispermaceae	C	Leaf	Leukorrhea	19 leaves crushed and paste taken with molasses for 7 days
<i>Sterculia villosa</i> Roxb.ex Sm.	Udal	Malvaceae	T	Stem	Strength	Young stem soaked in water and taken
<i>Stevia rebaudiana</i> Bertoni	Chinipata	Asteraceae	H	Leaf	Cold, cough	Leaf juice taken
<i>Streblus asper</i> Lour.	Shewra	Moraceae	T	Leaf	Diabetes	Leaf juice taken
<i>Strychnos nux-vomica</i> L.	Kuchila	Loganiaceae	T	Leaf	Diabetes	Cooked and taken
<i>Swietenia macrophylla</i> King	Mehogoni	Meliaceae	T	Seed	Diabetes	Taken raw
<i>Syzygium aromaticum</i> (L.) Merr. & L.M. Perry	Lobongo	Myrtaceae	T	Flower	Tooth problem	Flower chewed
				Flower	Cold, cough	Flower chewed
				Flower	Shore throat	Flower chewed with <i>Nigella sativa</i>
<i>Syzygium cumini</i> (L.) Skeels	Jam	Myrtaceae	T	Fruit	Blood increase	Fruit taken
				Leaf	Diarrhoea	Leaf juice taken
				Leaf	Dysentery	Leaf juice taken
				Seed	Diabetes	Seed powder taken regularly
				Seed	Gastritis	Seed powder taken regularly
				Seed	Male strength	Seed crushed and then taken
				Fruit	Strength	Fruit pulp taken
<i>Tagetes erecta</i> L.	Gada	Asteraceae	H	Leaf	Stop bleeding	Leaf juice given to the wounded place
				Leaf	Liver problem	Leaf juice taken
<i>Tamarindus indica</i> L.	Tetul	Fabaceae	T	Fruit	High pressure	Fruit taken
				Fruit	Skin care	Fruit juice applied
				Fruit	Antioxidant	Fruit juice applied
<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Arjun	Combretaceae	T	Leaf	Fever	Leaf juice taken
				Bark	Heart problem	Powder soaked in water and taken
				Bark	Heartache	Powder soaked in water and taken
				Bark	High pressure	Powder soaked in water and taken

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
				Bark	Constipation	Powder soaked in water and taken
				Bark	Gastritis	Powder soaked in water and taken
				Leaf	Diabetes	Leaf taken
				Leaf	Gastritis	Leaf juice taken
				Bark	Semen increase	Powder soaked in water and taken
				Bark	Burning sensation	Bark chewed or bark juice taken
				Bark	Ca ²⁺ deficiency	Powder soaked in water and taken
				Bark	Dizziness	Powder soaked in water and taken
<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Bohera	Combretaceae	T	Fruit	Heart problem	Powder soaked in water and taken
				Fruit	Stomach problem	Fruit taken
<i>Terminalia chebula</i> Retz.	Horitoki	Combretaceae	T	Fruit	Heart problem	Powder soaked in water and taken
				Fruit	Appetite	Powder soaked in water and taken
				Fruit	Constipation	Powder soaked in water and taken
				Fruit	Stomach problem	Powder soaked in water and taken
				Fruit	Weakness	Unripe fruit soaked in water and then taken
<i>Trigonella foenum-graecum</i> L.	Methi	Fabaceae	H	Seed	Diabetes	Seed taken
				Leaf	Strength	Leaf cooked and taken
<i>Typhonium trilobatum</i> (L.) Schott.	Kharkan	Araceae	H	Leaf	Pain	Cooked and taken
<i>Vachellia nilotica</i> (L.) P.J.H.Hurter & Mabb.	Babla	Fabaceae	T	Young Shoot	Urinary problem	Shoot chewed and juice taken for 5-7 days
<i>Vigna mungo</i> (L.) Hepper	Mashkolai	Fabaceae	H	Seed	Increase lactation in mothers	Seeds are cooked with Squash and taken
<i>Vitex negundo</i> L.	Nishinda	Lamiaceae	S	Leaf	Worm	Leaf juice taken
<i>Vitis vinifera</i> L.	Angur	Vitaceae	C	Fruit	Eye sight	Fruit taken
				Fruit	Blood purification	Fruit taken regularly
<i>Xanthium strumarium</i> L.	Ghagra	Asteraceae	H	Leaf	Body pain	Leaf juice taken
				Leaf	Blood purifier	Leaf cooked and taken
				Latex	Stop bleeding	Latex applied
				Leaf	Itching	Leaf cooked and taken
				Root	Dysentery	Root paste taken
<i>Zanthoxylum rhetsa</i> (Roxb.) DC.	Bajna	Rutaceae	T	Seed	Body pain	Seed oil massage
				Spine	Cold, cough	Spine powdered and taken with water

Table 2 Contd.

Scientific name	Local name	Family	Habit	Part used	Ailment	Treatment mode
<i>Zingiber officinale</i> Rosc.	Ada	Zingiberaceae	H	Rhizome	Gastritis	Raw rhizome taken with salt
				Rhizome	Stomach pain	Raw rhizome taken with salt
				Rhizome	Nausea prevention	Raw rhizome taken with salt
				Rhizome	Weakness	Rhizome taken
				Rhizome	Cold, cough	Boiled with tea leaf and drunk
				Rhizome	COVID-19	Raw rhizome taken
				Rhizome	COVID-19	Raw rhizome taken with clove, black pepper and black cumin.
<i>Ziziphus mauritiana</i> Lam.	Boroi	Rhamnaceae	T	Rhizome	Sore throat	Raw rhizome taken
				Fruit	High pressure	Raw fruit taken
				Leaf	Itching	Leaf juice applied in bath water
				Leaf	Dysentery	Leaf paste taken
				Leaf	Dead body wash	Leaf boiled in water and then bath

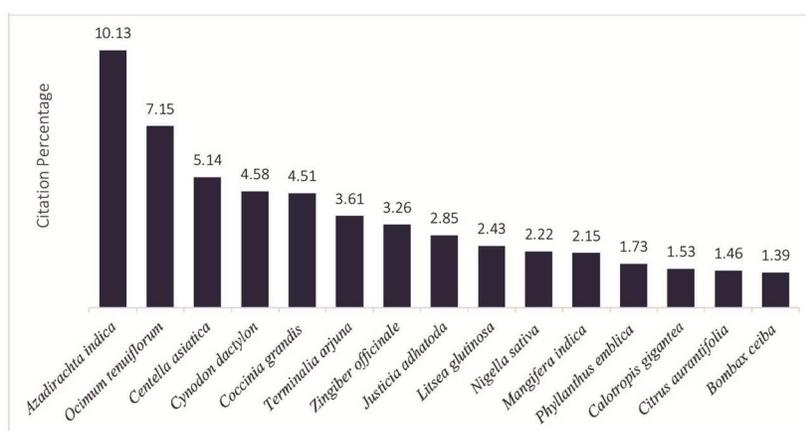


Fig. 3. Most cited top fifteen species.

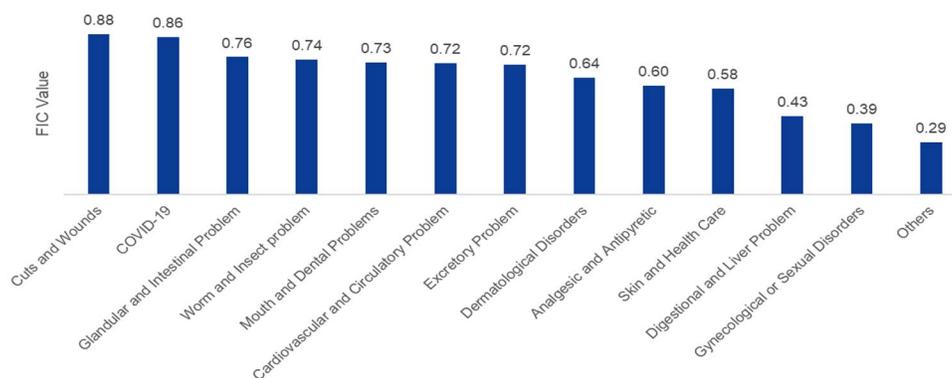


Fig. 4. Disease clusters with FIC value.

The high FIC value for Cuts and Wounds showed that this ailment is possibly common in the study area and that a small number of taxa are used by a large number of people to treat this ailment. This is also applicable in case of COVID-19 category (the second highest FIC value), as the potential risk of being attacked by the Corona virus and the fear of not getting proper treatment led people to collect different species from the study area in the hope of getting relief from this disease. The higher FIC value also establishes better communication among the people in treating the particular disease. It also indicates that the species traditionally used to treat these ailments are worth searching for bioactive compounds.

The fidelity level (FL) was calculated to determine the most medicinally important plant species. Medicinal plants that are widely used for a particular disease by local people show higher FL values than those that are used to treat multiple ailments. The FL values for 17 species were calculated (Table 3), among which *Acmella calva* (DC.) R.K. Jansen has 100% FL, which means this species is only used for toothache treatment. There is no controversy about this use. In the case of other species, the values show less than 100% FL, which means those species have some other uses as well.

Table 3. Fidelity level (FL) from all disease categories.

Disease	Disease categories	Scientific name	Local name	FL%
Toothache	Mouth and Dental Problems	<i>Acmella calva</i>	Surjokonna	100.00
Cold and Cough	COVID-19	<i>Ocimum tenuiflorum</i>	Tulshi	96.12
Cold and Cough	COVID-19	<i>Justicia adhatoda</i>	Basok	95.12
Fracture	Cuts and Wounds	<i>Cissus quadrangularis</i>	Harvanga	92.31
Stop bleeding	Cuts and Wounds	<i>Cynodon dactylon</i>	Durba	87.88
Corona	COVID-19	<i>Nigella sativa</i>	Kalajira	78.13
Hair fall	Skin and Health Care	<i>Lawsonia inermis</i>	Mehedi	76.47
Wound healing	Cuts and Wounds	<i>Mikania scandens</i>	Asamlota	66.67
Heart problem	Cardiovascular and Circulatory Problem	<i>Terminalia arjuna</i>	Arjun	61.54
Dysentery	Excretory Problem	<i>Centella asiatica</i>	Thankuni	60.81
Body Pain	Analgesic and Antipyretic	<i>Calotropis gigantea</i>	Akondo	59.09
Diabetes	Glandular and Intestinal Problem	<i>Coccinia grandis</i>	Telakucha	58.46
Gastritis	Glandular and Intestinal Problem	<i>Mangifera indica</i>	Amm	51.61
Cold and Cough	COVID-19	<i>Zingiber officinale</i>	Ada	40.43
Semen increase	Gynecological or Sexual Disorders	<i>Bombax ceiba</i>	Shimul	30.00
Worms	Worm and Insect problem	<i>Azadirachta indica</i>	Neem	17.69
Itching	Dermatological Disorders	<i>Azadirachta indica</i>	Neem	14.97

One of the interesting findings of this survey is the first-time record of 40 plant species getting relief from COVID-19. These species are *Abroma augusta* (L.) L.f., *Aloe vera* (L.) Burm.f., *Andrographis paniculata* (Burm.f.) Wall.ex Nees, *Borassus flabellifer* L., *Brassica juncea* (L.) Czern., *Calotropis gigantea* (L.) W.T.Aiton., *Camellia sinensis* (L.) O. Kuntze, *Careya arborea* Roxb., *Centella asiatica* (L.) Urban, *Cinnamomum tamala* Nees & Eberm., *Cinnamomum verum* J.Presl, *Citrus aurantium* L., *Citrus aurantifolia* (Christm. & Panzer)

Swingle, *Clerodendrum infortunatum* L., *Clitoria ternatea* L., *Coccinia grandis* (L.) Voigt, *Cocos nucifera* L., *Datura metel* L., *Elettaria cardamomum* (L.) Maton, *Enhydra fluctuans* Lour., *Ficus racemosa* L., *Glycyrrhiza glabra* L., *Justicia adhatoda* L., *Leucas aspera* (Willd.) Link, *Litsea glutinosa* (Lour.) Robinson, *Mentha arvensis* L., *Moringa oleifera* Lamk., *Nigella sativa* L., *Nyctanthes arbor-tristis* L., *Ocimum tenuiflorum* L., *Phyllanthus acidus* (L.) Skeels, *Piper nigrum* L., *Punica granatum* L., *Scoparia dulcis* L., *Sesamum indicum* L., *Stevia rebaudiana* (Bertoni) Bertoni, *Syzygium aromaticum* (L.) Merr. & L.M.Perry, *Zanthoxylum rhetsa* (Roxb.) DC. and *Zingiber officinale* Rosc. Among them, 10 species were widely used by most people. These species are Holy Basil (*Ocimum tenuiflorum* L.), Malabar nut (*Justicia adhatoda* L.), Pennywort (*Centella asiatica* (L.) Urban), Lemon (*Citrus aurantifolia* (Christm. & Panzer) Swingle), Cloves (*Syzygium aromaticum* (L.) Merr. & L.M. Perry), Spearmint (*Mentha arvensis* L.), Ginger (*Zingiber officinale* Rosc.), Tea (*Camellia sinensis* (L.) O. Kuntze), and Black cumin (*Nigella sativa* L.).

The local informants of the Purbachal area reported that, during the pandemic the distribution of *Centella asiatica* (L.) Urban and *Andrographis paniculata* (Burm.f.) Wall.ex Nees were sharply declined. Local people and as well as people from different areas were collected these species in the hope of treating the COVID-19 disease. Dream stories about the use of *Centella asiatica* (L.) for COVID-19 treatment were spread among the people of Purbachal and Keraniganj. According to the dream, the use of three leaves of *Centella asiatica* (L.) can cure COVID-19. According to the people, *Centella asiatica* (L.) leaves were very scarce during COVID-19, and even three leaves were sold in the market for 100 Taka. Hot, salt water with *Zingiber officinale* Rosc., *Nigella sativa* L., *Ocimum tenuiflorum* L., *Syzygium aromaticum* (L.) Merr. & L.M. Perry, raw *Camellia sinensis* (L.) O. Kuntze, *Mentha arvensis* L. and leaves, *Andrographis paniculata* (Burm.f.) Wall.ex Nees, were regularly used by the people who were out of vaccines. There is really no Corona Virus, as said by a good number of people, including rickshaw pullers and people from slums. They led their normal life during the pandemic situation, and they did not maintain any isolation from each other. The rate of death in slums and rickshaw pullers was very low as compared to higher society, as reported by the informants during the survey. The cited plants in the report are very preliminary in their uses against COVID-19. To validate these plants' use against COVID-19, further long-term research is necessary.

Traditionally, the oil of black cumin (*Nigella sativa* L.) seed is used to treat impotence by the people of Lawachara National Park (Uddin *et al.*, 2017). Moreover, Rahmatullah *et al.* (2009b) reported that black cumin is taken with crushed roots of *Mapania caudata* Kük. to treat helminthiasis. The present survey explored a new use of this species, that is many informants in and around Dhaka regularly took black cumin to get relief from COVID-19. The roots and leaves of black pepper (*Piper nigrum* L.) are used to treat fever, cough, and rheumatism by the Chakma community of Bangladesh (Roy *et al.*, 2008). Rahman *et al.* (2018) have mentioned its antimicrobial and cytotoxic activities against the germs that attack our respiratory system. The present study also found the same result where the local informants mentioned the effectiveness of the leaves and seeds of black pepper against symptoms of COVID-19. Indian pennywort (*Centella asiatica* (L.) Urban) has many uses, and in most cases, its whole body is taken to treat different ailments. Roy *et al.* (2008), Uddin *et al.* (2012), and Uddin and Hassan (2014) recorded that this plant's body is used to treat dysentery, diarrhoea, and other stomach-related disorders. Moreover, its leaf juice, when applied to the eyes, can help treat cataracts (Uddin *et al.*, 2017). The present study found that people believed so much in the efficacy of Indian pennywort against COVID-19 that this species became scarce during the pandemic period due to over-exploitation. Lemon (*Citrus aurantifolia* (Christm. & Panzer) Swingle) is used to treat jaundice (Uddin *et al.*, 2017) and fever (Uddin *et al.*, 2012). The present study revealed that majority of the informants who

participated in the survey took lemon juice in the belief of being relieved of COVID-19. The decoction produced from the rhizome of ginger (*Zingiber officinale* Rosc.) is used to treat neck pain (Uddin *et al.*, 2017). Moreover, to treat flu and bronchitis, ginger rhizome is taken with betel leaf and also taken as a syrup by the local people of Lawachara National Park (Uddin *et al.*, 2012). Informants of the present study linked this species with the treatment of COVID-19. Holy basil (*Ocimum tenuiflorum* L.) is considered the most sacred plant in Hindu scriptures. Its leaf paste is applied to reduce high blood-pressure (Uddin *et al.*, 2017), and leaf juice is taken to treat colds and coughs (Uddin *et al.*, 2017; Uddin and Hassan, 2014). Moreover, informants in the present study took leaf juice of this species to get relief from COVID-19 during the pandemic period. The whole plant of green chiretta (*Andrographis paniculata* (Burm. f.) Wall. ex Nees) is used by the people of Lawachara National Park to treat diseases like malaria (Uddin and Hassan, 2014), diabetes, dermatitis, and anthelmintic disorders (Uddin *et al.*, 2017). Many informants in the present study were mentioned this plant to use in the treatment of COVID-19. The leaf juice of Malabar nuts (*Justicia adhatoda* L.) helps in treating colds and coughs (Uddin *et al.*, 2017) and fever, malaria, impotence, and jaundice (Uddin and Hassan, 2014). The study revealed that many informants in and around Dhaka city took the leaf juice of Malabar nuts when the primary symptoms of COVID-19 developed. The leaf juice of spearmint (*Mentha arvensis* L.) is used to treat stomach aches (Uddin *et al.*, 2017). This study revealed a new use of this species: many informants of Dhaka took hot leaf juice of spearmint to get relief from COVID-19. Uddin *et al.* (2015) recorded the use of tea (*Camellia sinensis* (L.) O. Kuntze) leaves in the treatment of diarrhoea. The present study also revealed that many informants drank tea regularly in the hope of being relieved from COVID-19.

The present survey recorded a number of threats to the local ethnomedicinal plants that were mentioned by the informants in and around Dhaka city and were also observed by this team of experts in the field. Most of the people mentioned rapid infrastructural development, construction works, urbanization, pollution, overexploitation, ignorance about ethnomedicinal plants, deforestation, and a lack of local medicinal plants in nurseries as the major threats. Urbanization and construction works have been observed in more or less all parts of Dhaka that were visited during this survey. In the Purbachal area green spaces are more abundant compared to other parts that were surveyed. But the deforestation of the local forest and the emigration of some of the local people from that area have resulted in the reduction of many local ethnomedicinal plants and also to the sharp decline of the ethnomedicinal knowledge bank. Many informants from the surveyed areas reaffirmed that the knowledge bank on ethnomedicines has shrunk from that of previous generations, and a lack of ethnomedicinal practices has contributed to the sharp decline of maintaining local ethnomedicinal plants in the homestead vegetation. Moreover, a lack of such plants in the local nurseries and too much dependency on aesthetic plants for home décor have also accelerated this process. Besides, people also exploit and over-exploit ethnomedicinal plants from time to time, especially when there is no alternative source of medicine during a crisis period. This was evident in the Purbachal area, where local dwellers mentioned *Centella asiatica* (L.) Urban and *Andrographis paniculata* (Burm.f.) Wall.ex Nees as plants that became scarce due to overexploitation during the COVID-19 pandemic period.

A study by Setzer *et al.* (2006) showed that more than 80% of rural people around the globe depend on herbal medicines. Besides, the world market for herbal medicines based on traditional knowledge was estimated at US\$ 60 billion (Brevoort, 1998) more than 24 years ago. These studies prove how immensely important ethnomedicinal knowledge is! Yet its' practices and knowledge banks have been ignored by city dwellers and government and non-government authorities to a large extent. There has been no government effort so far that actually upheld or tried to uphold the local ethnomedicinal knowledge of our country. However, the practices of

conserving this knowledge have only been limited to the researches of scientific communities. So, the urgent focus has to be given by all of the respective communities to conserve ethnomedicinal plants, their practices, and the people who practice this knowledge. On top of that, a number of other recommendations have been provided.

Incentives can be given to nurseries to display and sell local ethnomedicinal plants with discounts on them. Local people, especially city dwellers should be enlightened with the importance of ethnomedicinal plants. The chance of building industries on ethnomedicinal plants and their active compounds can be examined. Besides these, ethnomedicinal plants can be planted on government properties such as road dividers, road pavements, parks and lakes. A national knowledge bank on ethnomedicinal plants and the practices regarding them can be built. Compensation for the destruction of ethnomedicinal plants due to urbanization and industrialization with more secured plantations can be done. Pollution in sensitive areas such as rivers where ethnomedicinal plants are found to be growing abundantly should be stopped. Deforestation needs to be banned and a master plan regarding sustainable and urban development can be formulated.

The present work is one of the initial efforts to quantify ethnomedicinal information in Bangladesh, focusing on COVID-19 disease. This study will provide a better option for the selection of widely used medicinal plants in the search for bioactive compounds for further research. The record of 160 ethnomedicinal plant species belonging to 62 families and used for 157 ailments through 250 different formularies is an indication of the richness of ethnomedicinal plants in the study area. The highest citations of *Azadirachta indica* A. Juss. reaffirmed that this is one of the most important ethnomedicinal plants in Bangladesh. *Cynodon dactylon* (L.) Pers. is generally used for cuts and wounds treatment in all around Bangladesh and this was proved by having the highest FIC value in the present study. *Acmella calva* (DC.) R.K. Jansen was the culturally bound species attaining 100% Fidelity Level (FL) value. The most important finding of this present study is the record of 40 species under COVID-19 category. These species were used by local informants to get relief from COVID-19. Among these 40 species, most notable species are Holy Basil (*Ocimum tenuiflorum* L.), Malabar Nut (*Justicia adhatoda* L.), Pennywort (*Centella asiatica* (L.) Urban), Lemon (*Citrus aurantifolia* (Christm. & Panzer) Swingle), Cloves (*Syzygium aromaticum* (L.) Merr. & L.M. Perry), Spearmint (*Mentha arvensis* L.), Ginger (*Zingiber officinale* Rosc.), Tea (*Camellia sinensis* (L.) O. Kuntze), and Black cumin (*Nigella sativa* L.). The record of these 40 species against COVID-19 is a preliminary report. Further long-term study is needed to confirm the claim for these plants' use against COVID-19. Due to sudden excessive use during COVID-19, these species became very scarce in the habitats in and around Dhaka city. There is an urgent need to formulate suitable conservation strategies for the naturally growing ethnomedicinal plants to overcome their depletion.

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