

An Insight on Use of Indigenous Medicinal Plants to Cure Common Communicable Diseases and Chronic Non-Communicable Diseases in West Champaran District, Bihar, India

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Abstract: *Ethnopharmacological relevance: In recent few years, there has been an upsurge of communicable viral diseases, which has made us to investigate for an alternative medicinal option. Aim of the study: Present study is aimed to develop an insight on the use of indigenous medicinal plants to cure common communicable diseases and chronic non-communicable diseases in West Champaran district, Bettiah, Bihar. Material and methods: Data was collected by opting interview method, group meeting and questionnaire method from residential area, Bettiah, West Champaran district, Bihar, India. Local residents including old people and young students were selected for interview randomly. Results: Out of the 57 medicinal plants investigated, plants used to treat the health ailments having symptoms similar to that pandemic i.e. cold and cough were 14% and fever 4%, while, the plants used to treat chronic diseases including tuberculosis, bronchitis, blood pressure and leprosy were 5%. Aloe barbadensis was having the highest use value (0.32) and highest relative frequency of citation (0.04), which is being used to cure cold, cough, bronchitis and tuberculosis. Conclusion: The present study successfully demonstrated the use of important medicinal plants for the treatment of non-communicable chronic diseases including tuberculosis, bronchitis, blood pressure and leprosy as well as common communicable diseases including common cold, fever, skin problems, gastric problems, and ear infection.*

Keywords: Communicable disease, non-communicable disease, medicinal plants

List of Abbreviations

FC: Frequency of citation

RFC: Relative Frequency of Citation

UV: Use value

1. Introduction

In recent few decades, the world is facing dual challenge; firstly, to treat non-communicable diseases such as diabetes, high blood pressure and chronic problems; and secondly, the common communicable diseases (cold, cough, fever, skin problems). The major challenge during the pandemic is the resemblance of symptoms of cold, cough and fever with that of the serious pandemic. In addition, patients suffering from non-communicable diseases are vulnerable to communicable diseases. Medicinal plants have known potential to reduce this vulnerability as well as cure these chronic diseases from ancient past (Anbalagan et al., 2020; Cruz et al., 2022; Diop et al., 2018; Mudao et al., 2022; Tembo et al., 2021). In addition, people living in rural areas as well as tribal people have traditional knowledge to treat these diseases. However, there is a lack of documentation of this knowledge.

Therefore, it is imperative to document wild plant species, which are medicinally important. The aim of present study is to document the use of medicinally important plants to cure common communicable diseases and chronic non-communicable diseases during pandemic.

Present study is an effort to document some of the medicinally important plants found in West Champaran district of Bihar, which are being used traditionally to cure diseases.

Similar studies were conducted by Abubark et al. (2022), Cock (2015), Najem et al. (2021), Sulaiman et al. (2022), Tovar et al. (2021), Uzun and Koca (2020).

2. Material and Methods

Study area

The study area was residential area, Bettiah (latitude is 26 degree 48 minutes North and longitude 84 degrees 30 minutes East) which is district head of West Champaran located in the state of Bihar, India (Fig. 1)

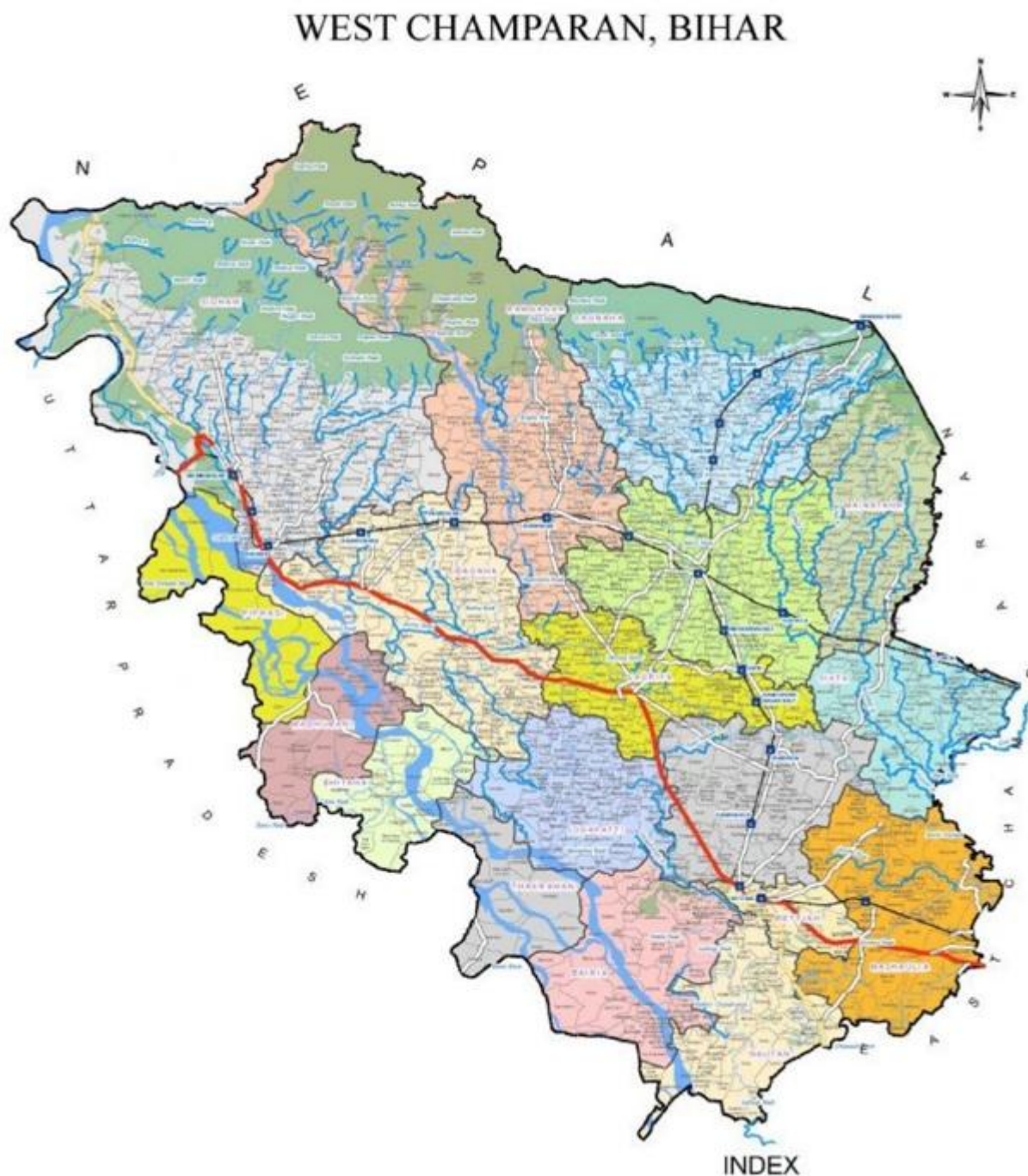


Figure 1: Map of Bettiah, West Champaran showing study area (source: National Informatics Centre, Ministry of Electronics & Information Technology, Government of India)

Data collection

Data was collected by opting questionnaire method from residential area, Bettiah, West Champaran district, Bihar, India during January 2022. Local residents including old people and young students were selected for interview randomly. Semi-structured questionnaire was designed to collect information regarding use of medicinal plants for their health ailments including common diseases (cold, cough, fever, headache, skin diseases, gastric problems) to chronic non communicable diseases (tuberculosis, blood pressure, leprosy, infertility). During the application of medicinal plant the part of the plant used (whole plant, leaf,

bud, stem, root, bark, fruit and seed) and the specific technique or procedure (extract, paste) was also identified.

Ethical approval for the study was obtained as per national and international guidelines. The socio-demographic details of respondents such as name, age, caste, gender etc. would be kept confidential. All respondents also signed prior-informed consent form after the purpose of the study was explained to them.

Material used

Based on the data collected using questionnaire method, the medicinal plants were collected in the study area. After that the medicinal plant species were identified using flora of Benthem and Hooker collected from the library of the college and was verified using website the World Flora Online (www.worldfloraonline.org) and then assigned vouchernumbers (BB01-BB57).The specimen were submitted in botanical survey of India (BSI), Kolkata for further confirmation.

3. Data analysis

The data obtained were analyzed using MS office 2019. The utilization value of each of medicinal plant was determined using the formula:

$$UV = \frac{\sum_0^n Ui}{N}$$

Where, UV = use value, Ui =the number of plant-disease use combinations informed by each informer for a particular species, N = total number of informers describing the specific species. Since interview was conducted only once, it was taken as an event (Cadena-Gonzalez et al. 2013)

Relative frequency of citation was calculated using the formula:

$$RFC = \left(\frac{FC}{N}\right)$$

Where, FC= number of times a particular species was mentioned by informants, N= total number of times all species were mentioned by all informants. The value of RFC ranges from 0 to 1.

4. Results and Discussion

A total of 57 medicinal plants belonging to 35 families were identified (Table 1). Out of which, the plants which might be used for skin diseases is 14%, treating mouth related diseases including toothache and mouth sore (13%), stomach related ailments (15%), cold and cough (15%), urinary and genital including spermatorrhoea (2%), other ailments including diabetes (2.75%), filaria (0.9%) and body pain(3%) and fever (5%)(Fig.2). Among the plant parts used for indigenous medicine, leaves were 40% followed by stem and rhizome (15%), and fruits and seeds (15%), flower and bud (10%), whole plant (8%), bark (7%), and roots (5%).*Aloe barbadensis* Mil. reported the highest use value (0.32). Similar results were also obtained by other researchers (Abubark et al., 2022; Islam et al., 2022; Oladele et al., 2020; York et al., 2011). As shown in Table 2, the highest relative frequency of citation was for *Aloe barbadensis* Mil.(0.04). The relationship of use value of selected plant species with their relative frequency of citation has been shown in Fig.3. It was found that use value increase with increase in relative frequency of citation.

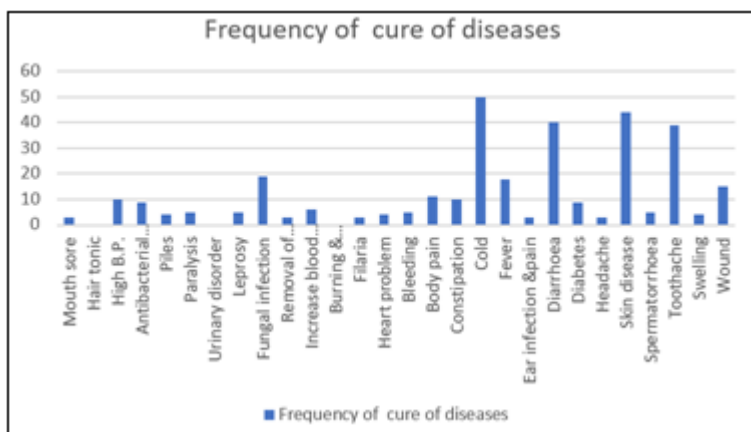


Figure 2: Diagram showing frequency of cure of diseases by the medicinal plants

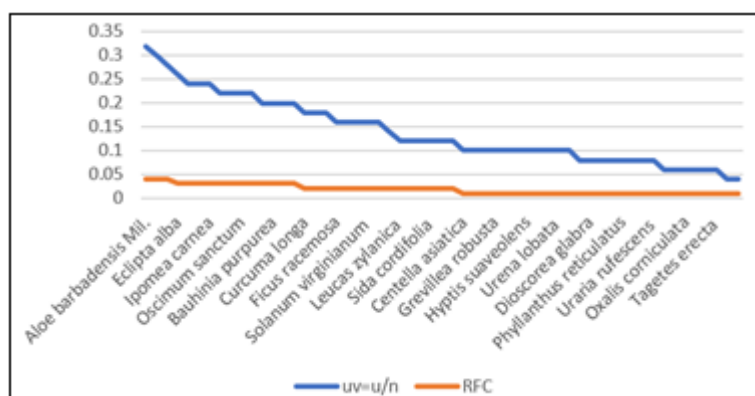


Figure 3: Relationship of use value (UV) with relative frequency of citation (RFC)

Table 1: Table showing Plants species with their medicinal uses

S.N.	Plant species	Collection number	Family	Common name	Medicinal uses
1	<i>Achyranthes aspera</i> L.	BB01	Amaranthaceae	Chirchiri	Whole plant is boiled and made lotion and applied on all kind of skin diseases, stem is applied as tooth brush to treat toothache
2	<i>Adhatodavastica</i> (L.) Nees.	BB02	Acanthaceae	vasak	Root and bark decoction (30g for 3 days) is given to cure cold, cough, bronchitis and asthma; the flower is known as Gulkand and is used for treatment of tuberculosis; a warm decoction of leaves is used to treat scabies and other skin diseases
3	<i>Aegle marmelose</i> (L.)Correa	BB03	Rutaceae	Bel, stone apple	fruit is used to cure diarrhoea
4	<i>Aloe barbadensis</i> Mill.	BB04	Asphodelaceae	aloe vera, ghritikumari	leaves are used to cure skin diseases, its paste used along with tulasi for mouth sore,used along with ajwain(<i>Trachyspermumammi</i>) for gastric problem
5	<i>Artemisia nilagirica</i> (C. B. Clarke)Pamp.	BB05	Asteraceae	Damnak	Leaves are mixed with leaves of <i>Achyranthus</i> , the extract is mixed with mustard oil and warmed on sunlight. The lotion used to cure body pain; antibacterial and antifungal
6	<i>Azadirachtaindica</i>	BB06	Meliaceae	Neem	Leaves are used to cure skin diseases, and is antifungal, antibacterial
7	<i>Hibiscus-rosasinensis</i> L.	BB07	Malvaceae	Gudhal	Flowers are eaten early morning to stop bleeding from any part like nose, mouth, rectum , ear; leave is used as a laxative; flower is used in fertility treatments
8	<i>Holarrhenaantidysenterica</i> (Roth) Wall.ex A.DC.	BB08	Apocynaceae	kutaj	Bark is anthelmintic, astringent, amoebicidal and is used to treat amoebic dysentery
9	<i>Bacopa monnieri</i> (L.)Wettst.	BB09	Scrophulariaceae	Saraswati	It cures skin diseases, urinary diseases, cough, throat infection
10	<i>Bauhinia purpurea</i> Wall.	BB10	Leguminaceae	Kachanar	Flowers are cooked and used in treatment of constipation
11	<i>Calendula officinalis</i>	BB11	Asteraceae	Calendula, pot marigold	Oil is used for treatment of skin disease
12	<i>Calotropisgigantea</i> (L.) Dryand.	BB12	Apocynaceae	Madar	Stem is burnt and ashes are applied on wound.
13	<i>Caricapapaya</i> L.	BB13	Caricaceae	papaya	used as a diuretic , to treat kidney stone
14	<i>Curcuma longa</i> L.	BB14	Zingiberaceae	Haldi	Rhizome is used to cure abdominal diseases, given with warm milk to reduce pain due to any injury.
15	<i>Centellaasiatica</i> (L.)Urb.	BB15	Apiaceae	Brahami	Whole plant is used to treat skin diseases such as leprosy, eczema; it is used along with <i>Aegle</i> to reduce hotness.
16	<i>Croton bonplandianum</i> Baill.	BB16	Euphorbiaceae	Bantulsi	used for high blood pressure, cut, methanol leaf extract is antibacterial and antifungal
17	<i>Datura stramonium</i> Thunb.	BB17	Solanaceae	Dhatura	seeds along with Til oil applied on Paralytic parts of the body
18	<i>Dioscoreaglabra</i> Roxb.	BB18	Dioscoreaceae	Chilmilia	Rhizomes are used in piles
19	<i>Eclipta alba</i> L. ex B.D. Jacks.	BB19	Asteraceae	Bhrigraj	hair tonic, antibacterial, cures skin diseases
20	<i>Ficusbenghalensis</i> L.	BB20	Moraceae	Bar	Latex is filled with puffed sugar ball and taken in morning for treatment of spermatorrhoea
21	<i>Ficusracemosa</i> Willd.	BB21	Moraceae	Gular	fruit is cooked as pudding
22	<i>Grevillea robusta</i> A. Cunn. ex R.Br.	BB22	Proteaceae	Sudarshan	Leaf powder is given in treatment of leprosy
23	<i>Hyptissuaveolens</i> (L.) Poit.	BB23	Lamiaceae	Ban tulsi	leaves are kept in a glass of water for overnight , helps in normal micturation
24	<i>Ipomeacarnea</i> Jacq.	BB24	Convolvaceae	Behya	Latex is applied on fungal infection between toes in rainy season
25	<i>Jatropacurcas</i> L.	BB25	Euphorbiaceae	Jamal ghota	stem twig is used as tooth brush in the treatment of mouth sore
26	<i>Leucas zeylanica</i> (L.) W.T. Aiton	BB26	Lamiaceae	bajani	Leaves are pasted and given with water in gastric trouble
27	<i>Macrotylomauniflorum</i>	BB27	Fabaceae	Kulthi	Seed is used for treatment of fever, hemorrhoids and kidney stone
28	<i>Madhucalongifolia</i> var. <i>latifolia</i> (Roxb.)A.Chev.	BB28	Sapotaceae	Mahua	Bark powder is used in toothache. Flower is eaten for vigour and vitality, fruits are cooked with milk and given as tonic
29	<i>Mallotusphilippensis</i> (Lam.) Mull. Arg.	BB29	Euphorbiaceae	Ruyana	small twigs are used as tooth brush to reduce toothache
30	<i>Melia azerdarach</i> L.	BB30	Meliaceae	Neem	Leaves are passed and taken with water to remove microbes from stomach

31	<i>Mimosa himalayana</i> Gamble	BB31	Leguminaceae	awarikanta	New buds and leaves are pasted with water and given in the treatment of fever
32	<i>Moringa oleifera</i> Lam.	BB32	Moringaceae	Sajuwan	Leaves, flowers and fruits are cooked as vegetable and given to enhance the blood quantity
33	<i>Nerium indicum</i> Mill.	BB33	Apocynaceae	Kaner	Its leaves is used to cure skin diseases
34	<i>Nyctanthesarbor-tristis</i> L.	BB34	Oleaceae	Ratrani, Harsingar	Bark decotation is given in fever, leaves are boiled in water, black pepper and salt 2-4 times to treat cough and fever
35	<i>Oscimum sanctum</i>	BB35	Lamiaceae	Tulsi	Leaves are used to cure cold and fever
36	<i>Oxalis corniculata</i> L	BB36	Oxalidiaceae	Amauta	Leaves are chewed during mouth soar.
37	<i>Phyllanthus reticulatus</i> Poir.	BB37	Phyllanthaceae	Siket	Stem is used as toothbrush to reduce toothache
38	<i>Rauwolfiaserpentine</i> (L.) Benth. ex. Kurz	BB38	Apocynaceae	Sarapagandha, Lal bhitia	Root powder is given in stomach related problems
39	<i>Ricinus communis</i> L.	BB39	Euphorbiaceae	Ledy,Redy, Andi	seed oil is applied on forehead for cooling
40	<i>Scopariadulcis</i> L.	BB40	Plantaginaceae	Chinia, Chiniabuti	Leaves are chewed to cure burning sensation in stomach, leaves are pasted with black pepper and given to check burping.
41	<i>Shorearobusta</i> Gaertn.	BB41	Dipterocarpaceae	Tree, Sal	Seeds are powdered with triphala, Rauwolfia, Lodh, Kawaru and given morning and evening in the treatment of filaria
42	<i>Sidacordifolia</i> L.	BB42	Malvaceae	Kharinta, Barial	Used to treat fever, common cold, flu
43	<i>Smilax ovalifolia</i> Roxb.	BB43	Smilacaceae	Dayeenlata, Ram Datuwan	New tender stems are fried with oil spices and made vegetable. It is given in stomach pain. Stem twig is used in tooth brush
44	<i>Solanum americanum</i> Mill.	BB44	Solanaceae	Khursani	Whole plant is boiled in earthen vessels and vapour is taken in the treatment of swelling
45	<i>Solanum virginianum</i> L.	BB45	Solanaceae	chherGorakha	Leaves are pasted and applied on forehead in headache, fruits are dried and fried with rectified butter and given in dry cough
46	<i>Swertia angustifolia</i> Buch.-Ham. ex D. Don	BB46	Gentianaceae	Chiraita	Plant decoction is given in digestive trouble
47	<i>Syzygiumaromaticum</i> (L.) Merr. & L. M. Perry	BB47	Myrtaceae	clove	flower bud is used for toothache
48	<i>Tageteserecta</i> L.	BB48	Asteraceae	Gendaphol, Genda	its leaves extract used as drops to treat bacterial ear infection in ear and ear pain,flower applied on irritated skin to heal it
49	<i>Tectonagrandis</i> L.f.	BB49	Verbenaceae	Sagwan	Apical bud is applied on ringworm for 2 days
50	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	BB50	Combretaceae	Arjun	Bark decotation is given in heart related problem, blood pressure, improper breathing
51	<i>Terminalia chebula</i> Retz.	BB51	Combretaceae	Harre	Fruit powder is eaten in cough and digestive disorder
52	<i>Trichodesmaindicum</i> (L.) Lehm.	BB52	Boraginaceae	Bhuechapada	leaf paste is applied to cure skin disease
53	<i>Urariarufescens</i> (DC.) Schindl.	BB53	Fabaceae	Lampatiya	Leaf paste is applied to cure skin disease
54	<i>Urenalobata</i> L.	BB54	Malvaceae	chidchidia	Roots are powdered and given with water in gastric troubles
55	<i>Vallarissolanaceae</i> (Roth.) Kuntze	BB55	Apocynaceae	Kuntze	stem twig is used as tooth brush to reduce toothache
56	<i>Vernonia amygdalina</i> Del.	BB56	Asteraceae	Sugar plant	Leaf powder is given in treatment of diabetes
57	<i>Zingiberofficinale</i> Roscoe	BB57	Zingiberaceae	Adrak	Rhizome is used to cure colic pain, clears throat

Table 2: Table showing relative frequency of citation of plants selected.

S. No.	Plant species	Use value (UV)	Relative frequency of citation (RFC)
1.	<i>Achyranthus aspera</i>	0.24	0.03
2.	<i>Adhathodavastica</i>	0.30	0.04
3.	<i>Aegle marmelose</i>	0.28	0.04
4.	<i>Aloe barbadensis</i> Mil.	0.32	0.04
5.	<i>Artemisia nilagirica</i>	0.22	0.03
6.	<i>Azadirachtaindica</i>	0.24	0.03
7.	<i>Hibiscus rosa-sinensis</i>	0.10	0.01
8.	<i>Holorenaantidysentrica</i>	0.10	0.01
9.	<i>Bacopa monnieri</i>	0.20	0.02
10.	<i>Bauhinia purpurea</i>	0.20	0.02
11.	<i>Calendula officinalis</i>	0.08	0.01
12.	<i>Calatropisgigantica</i>	0.20	0.02

13.	<i>Carica papaya</i>	0.06	0.01
14.	<i>Carcuma longa</i>	0.18	0.02
15.	<i>Centellaasiatica</i>	0.10	0.01
16.	<i>Croton bonlaplandianous</i>	0.20	0.03
17.	<i>Datura stramonium</i>	0.10	0.01
18.	<i>Dioscoreaglabra</i>	0.08	0.01
19.	<i>Eclipta alba</i>	0.26	0.03
20.	<i>Ficusbenghalensis</i>	0.10	0.01
21.	<i>Ficusracemosa</i>	0.16	0.02
22.	<i>Grevillea robusta</i>	0.10	0.01
23.	<i>Hyptissuaveolens</i>	0.10	0.01
24.	<i>Ipomeacarneas</i>	0.24	0.03
25.	<i>Jatropacurcas</i>	0.08	0.01
26.	<i>Leucas zylanica</i>	0.12	0.01
27.	<i>Madhucalongifoliavarlatifolia</i>	0.08	0.01
28.	<i>Macrotylomauniflorum</i>	0.16	0.02

29.	<i>Mallotusphilippensis</i>	0.18	0.02
30.	<i>Melia azadirach</i>	0.10	0.01
31.	<i>Mimosa himalyana</i>	0.06	0.01
32.	<i>Moringa oleifera</i>	0.12	0.01
33.	<i>Nerium indicum</i>	0.04	0.01
34.	<i>Nyctanthesarboritites</i>	0.22	0.02
35.	<i>Oxalis corniculata</i>	0.06	0.01
36.	<i>Oscimum sanctum</i>	0.22	0.02
37.	<i>Phyllanthus reticulatus</i>	0.08	0.01
38.	<i>Rauwolfiaserpentina</i>	0.16	0.02
39.	<i>Ricinus communis</i>	0.12	0.01
40.	<i>Scopariadulcis</i>	0.08	0.01
41.	<i>Shorearobusta</i>	0.06	0.01
42.	<i>Sidacordifolia</i>	0.12	0.02
43.	<i>Smilax ovalifolia</i>	0.06	0.01
44.	<i>Solanum americanum</i>	0.08	0.01
45.	<i>Solanum virginianum</i>	0.16	0.02
46.	<i>Swertia angustifolia</i>	0.10	0.01
47.	<i>Syzygiumaromaticum</i>	0.12	0.02
48.	<i>Tagetuserecta</i>	0.06	0.01
49.	<i>Tectonagrands</i>	0.14	0.02
50.	<i>Terminalia arjuna</i>	0.18	0.02
51.	<i>Terminalia chebula</i>	0.22	0.03
52.	<i>Trichodesmaindicum</i>	0.12	0.02
53.	<i>Urariarufescens</i>	0.08	0.01
54.	<i>Urenalobata</i>	0.10	0.01
55.	<i>Vallarissolanaceae</i>	0.10	0.01
56.	<i>Vernonia amygdalina</i>	0.16	0.02
57.	<i>Zingiber officinalis</i>	0.04	0.01

5. Conclusion

The present study successfully demonstrated the use of important medicinal plants for the treatment of non-communicable chronic diseases including tuberculosis, bronchitis, blood pressure and leprosy as well as common communicable diseases including common cold, fever, skin problems, gastric problems, and ear infection. Further investigation on these medicinal plants should be conducted to determine their bioactive agents and antimicrobial activities.

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Ethical Approval: The author submitted on ethical policy of the study in Material and methods section of the article.

Availability of data and materials

All data required are within the manuscript and, the author can't make available data which are against ethical policy.

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