TRIBAL HEALTH BULLETIN

ISSN 0971-4677

Biannual Publication
on
Tribal Health

Vol. 27 (1&2)
2020

Approved by UGC, New Delhi

Indexed in Indian Science Abstracts & Medicinal and Aromatic Plants Abstracts

Indian Ethnomedicinal plants used for treatment of Asthma - An overview.

- Vartika Jain and S. K. Verma

Bringing together tribal traditional healers and public health functionaries on the occasion of International Day of the World's Indigenous Peoples, 2019.

- Nishant Saxena, Dinesh Kumar and Aparup Das

Living style of people in a malaria endemic village: A study among binjhal tribe of odisha, India.

- Mahendra Panda , K.C. Satapathy and Amarendra Mahapatra

Lifestyle and cultural correlates of the Baiga tribe depicted through their traditional hut model established in ICMR-NIRTH, Jabalpur, India.

- Nishant Saxena, Poonam Vaiyam, Suyesh Srivastava, Manjunathachar HV, Vijay Kachhi, A.K. Goel, Ravikanta S. Thakur, Manish Adey, Jagat L. Prajapati, Dinesh Kumar and Aparup Das

Health Status and Practices of Munda Tribe on the Margins of Traditionality& Modernity.

- Poly Varghese, Joseph Xavier and Melville Pereira

National Institute for Research in Tribal Health (Indian Council of Medical Research), Jabalpur

INFORMATION FOR CONTRIBUTORS

Tribal Health Bulletin, peer reviewed journal on Tribal Health, publishes original papers, review articles, notes and communications on various aspects of tribal health. Authors should submit the typescripts in duplicate neatly typed in double space with a wide margin of at least 4 cm on each side (along with soft copy in a CD-ROM). Articles should be sent together with a certificate that the contribution is the own original work of the author(s) and has not been published or sent for publication elsewhere. Contributors are requested to send their articles, manuscripts, and review material to **the Editor, Tribal Health Bulletin, National Institute for Research in Tribal Health (ICMR), Nagpur Road, P.O. Garha, Jabalpur482003. (M.P.), India. Authors may also submit papers in electronic format to: E.mail: bulletin_rmrct@yahoo.com.**

The research paper should include (i) title page with running title (ii) abstract (iii) nomenclature of symbols used (iv) tables/figures typed/drawn on separate sheets along with their captions in serial order as they appear in the text. The text of observational and experimental articles is usually (but not necessarily) divided into the following sections: Introduction, Methods, Results, and Discussion. Experimental investigation papers must state in the Methods section that 1) informed consent was obtained from all human adult participants and from parents or legal guardians of minors, with the name of the appropriate institutional review board having approved the project (wherever applicable). 2) the maintenance and care of experimental animals complies with the guidelines for the human use of laboratory animals (wherever applicable). The title page should include: title of the article, authors' names and institutional affiliations, the corresponding author's name, mailing address, telephone and e-mail address. The title should be brief, clear, concise, and should provide broad indication of the content of the paper. An abstract of about 200 words for research papers and about 150 words for review articles should be provided along with the paper. References should be numbered in the order in which they appear in the text. Abbreviate journal names according to the Index Medicus system. At the end of the article, the full list of references should follow in the Vancouver style. (See International Committee of Medical Journal Editors: Uniform requirements for manuscripts submitted to biomedical journals- www.icmje.org).

Journal articles

The following information is included for journal articles:

author(s), article title, abbreviated journal title, year, volume number, page numbers.

Example:

Halpern SD, Ubel PA, Caplan AL. Solid-organ transplantation in HIV-infected patients. N Engl J Med. 2002;347:284-7.

Morgenstern H. The changing association between social status and coronary heart disease in a rural population. Soc Sci Med. 1980;14A:191201.

For a journal article written by more than six authors, list the first six authors followed by the phrase 'et al'

Books / Monographs

The following information is included, in the following order: author(s), book title, edition number (if not the first), city, publisher, year.

Example:

Murray PR, Rosenthal KS, Kobayashi GS, Pfaller MA. Medical microbiology. 4th ed. St. Louis: Mosby; 2002.

Chapter in a book

The following information is included: author(s) cited, chapter title, editor(s), title of the book in which the work appears, city, publisher, year, volume number (if applicable) and page numbers.

Example:

Meltzer PS, Kallioniemi A, Trent JM. Chromosome alterations in human solid tumors. In: Vogelstein B, Kinzler KW, editors. The genetic basis of human cancer. New York: McGraw-Hill; 2002. p. 93-113.

Scientific or technical report

Issued by funding/sponsoring agency: Yen GG (Oklahoma State University, School of Electrical and Computer Engineering, Stillwater, OK). Health monitoring on vibration signatures. Final report. Arlington (VA): Air Force Office of Scientific Research (US), Air Force Research Laboratory; 2002 Feb. Report No.: AFRLSRBLTR020123. Contract No.: F496209810049

Dissertation

Borkowski MM. Infant sleep and feeding: a telephone survey of Hispanic Americans [dissertation]. Mount Pleasant (MI): Central Michigan University; 2002.

Conference proceedings

Harnden P, Joffe JK, Jones WG, editors. Germ cell tumours V. Proceedings of the 5th Germ Cell Tumour Conference; 2001 Sep 13-15; Leeds, UK. New York: Springer; 2002.

Conference paper

Christensen S, Oppacher F. An analysis of Koza's computational effort statistic for genetic programming. In: Foster JA, Lutton E, Miller J, Ryan C, Tettamanzi AG, editors. Genetic programming. EuroGP 2002: Proceedings of the 5th European Conference on Genetic Programming; 2002 Apr 3-5; Kinsdale, Ireland. Berlin: Springer; 2002. p. 182-91.

Electronic Material

CD-ROM

For referencing a CD-ROM, follow the format for a book and indicate the medium in square brackets after the title, i.e. [CD -ROM].

Example:

Anderson SC, Poulsen KB. Anderson's electronic atlas of hematology [CD-ROM]. Philadelphia: Lippincott Williams & Wilkins; 2002.

Journal article on the Internet

To reference a journal article published on the internet, provide the bibliographic details as for a print journal, with the following additions:

Abood S. Quality improvement initiative in nursing homes: the ANA acts in an advisory role. Am J Nurs [Internet]. 2002 Jun [cited 2002 Aug 12];102(6):[about 1 p.]. Available from: http://www.Nursingworld.org/AJN/2002/june/Wawatch.htm Article

TRIBAL HEALTH BULLETIN

Vol. 27 No. 1&2 2020

- **Indian Ethnomedicinal plants used for treatment of Asthma - An overview.** 1

  - Vartika Jain and S. K. Verma

- **Bringing together tribal traditional healers and public health functionaries on the occasion of International Day of the World's Indigenous Peoples, 2019.** 37

  - Nishant Saxena, Dinesh Kumar and Aparup Das

- **Living style of people in a malaria endemic village: A study among binjhal tribe of odisha, India.** 41

  - Mahendra Panda, K.C. Satapathy and Amarendra Mahapatra

- **Lifestyle and cultural correlates of the Baiga tribe depicted through their traditional hut model established in ICMR-NIRTH, Jabalpur, India.** 55

  - Nishant Saxena, Poonam Vaiyam, Suyesh Srivastava, Manjunathachar HV, Vijay Kachhi, A.K. Goel, Ravikanta S. Thakur, Manish Adey, Jagat L. Prajapati, Dinesh Kumar and Aparup Das

- **Health Status and Practices of Munda Tribe on the Margins of Traditionality& Modernity.** 65

  - Poly Varghese, Joseph Xavier and Melville Pereira

Editor-in-Chief : Dr. Aparup Das
Editor : Dr. S. Rajasubramaniam

Editorial Board

Dr. T. Chakma	Scientist G
Dr. K.B. Saha	Scientist E
Dr. Jyothi Bhat	Scientist E
Dr. R.K. Sharma	Scientist E

National Institute for Research in Tribal Health, Jabalpur

Biannual Publication on Tribal Health

Published by the Editor,
Tribal Health Bulletin,
National Institute for Research in Tribal Health (NIRTH),
(Indian Council of Medical Research)
Department of Health Research,
Ministry of Health & Family Welfare,
Govt. Of India,
Nagpur Road, P.O. Garha,
Jabalpur-482 003 (M.P.), India.
Ph. : +91-761-2370800, 2370818
Email : bulletin_rmrct@yahoo.com
Website: www.nirth.res.in

Statements and opinions expressed and published in the *TRIBAL HEALTH BULLETIN* are solely of author(s)/contributor(s). The Editorial Board disclaim any responsibility for the accuracy of statements made by the authors(s)/contributor(s). Proper citation should be made if any part of the article published in the bulletin is quoted.

Indian Ethnomedicinal plants used for treatment of Asthma - An overview

Vartika Jain[1] and S. K. Verma[2]

Abstract: *India has a rich legacy of traditional medicine in terms of both Ethnomedicine and Ayurveda where different plants are employed for treatment of many ailments. Efforts were made to find out the plants used for treatment of asthma in traditional Ethnomedicine and Ayurveda in India. This revealed use of 465 plants by various folk communities and 47 unique plants from Ayurveda, giving a total figure of 512 anti-asthmatic plants. Further analysis revealed maximum use of leaves followed by the roots, whole plant and other parts. Interestingly, 196 species have anti-inflammatory, 32 anti-histaminic and 35 species have demonstrated mast cell stabilizing activity which might be among few major reasons behind their use against asthma. Treatment of asthma in modern medicine is costly with some adverse effects. Therefore, the present paper shall prove helpful in further screening of Ethnomedicinal plants for carrying out scientific validation studies to assess their efficacy and developing novel effective phyto-therapeutic molecules.*

Keywords: Respiratory trouble, Bronchodilator, Dynamism, Ethnobotany, Ayurveda

INTRODUCTION

Asthma is a multifactorial, chronic inflammatory disease of the airways. It is common and potentially serious respiratory disease which is comprised by variable airflow obstruction, airway inflammatation and bronchial hyper-responsiveness. The clinical presentations and treatment response are extremely heterogenous[1]. It is one of the most common chronic diseases globally and affects approximately 300 million people world over. Its prevalence is 1-18% in different populations living in different parts of the world. In India, the prevalence of asthma is about 2% and the estimated cost of treatment per year for the 2015 was calculated to be about 139.45 billion Indian rupees[2]. Despite major advancement in the treatment of asthma, the disease remains uncontrolled in a significant proportion of patients. The long term goal of asthma management is symptom control, reduction in the risk of exacerbations, limiting airway damage and checking the side effects of medication[3].

Plants have been an integral component of traditional medicinal system. Ethnic communities living in remote areas are utilizing plant species growing in their vicinity for treatment of various ailments since time immemorial. India is a rich country in ethnic and floristic

[1]Department of Botany, Government Meera Girls' College, Udaipur-313001, Rajasthan, India

[2]Department of Medicine, Pacific Medical College and Hospitals, Udaipur-313001, Rajasthan, India, Email: skvermaster@gmail.com; vartikajain31@gmail.com

*Corresponding address: 28, Shivaji Nagar, Udaipur-313001, Rajasthan, India; Ph: 9414168910

diversity and possesses a treasure of ethnomedicinal plants which have been documented by various researchers and compiled from time to time[4-6]. In addition to this, Ayurveda is one of the well known traditional systems of medicine prevalent in India which utilizes plant/ animal/ mineral based medications[7]. All over the world, not less than 80% of population still relies on traditional medicines for primary healthcare treatment of various diseases and even in developed countries like UK, North America, Australia, treatment with herbal medicine is coming to mainstream. One of the main reasons behind increasing popularity of plant-based medicines is their safety profile besides many other reasons, for example, no time to show allopathic physician, high cost and adverse effects of modern medicines etc[8].

Looking to increasing prevalence of asthma, economic burden and side effects of modern medications, there is still a need to search, evaluate and authenticate new natural, safe, people's friendly effective anti-asthmatic medicine of low cost. Earlier, efforts have been made by some researchers to compile a list of anti-asthmatic plants which are not adequate[9-10]. In view of that, the present work was undertaken to get better insight into the available plants and further phytochemical investigations may be undertaken for development of new molecules for the treatment of bronchial asthma.

METHODOLOGY

An exhaustive literature survey was carried out to find out the plants being used for treatment of asthma by different tribes of India. For this purpose, various databases like Pubmed, Science Direct, Google, Google Scholar and two major databases on Ethnobotany of India *Dictionary of Indian Folk Medicine and Ethnobotany*[5] and *Compendium of Indian Folk Medicine and Ethnobotany*[6] were thoroughly scrutinized. Ayurvedic literature was also consulted to note down the plants which have been mentioned for treatment of asthma[7] and unique anti-asthmatic plants of Ayurveda which have yet not been reported in Ethnomedicine are given in Table 2. Research papers and few important compilations of Indian medicinal plants were consulted to find out any relevant phyto-pharmacological studies as a direct or indirect evidence for treatment of asthma[9-188] and depicted in Table 1. Conservation status of plant species was also determined following the IUCN red list categories[189] criteria version 3.1 and results are given in Table 3.

Correct botanical identities of plants were adopted from a well-known International plant database[190] but name changes of some traditionally well-known families, such as Mimosaceae, Fabaceae, Caesalpiniaceae, Sterculiaceae and Tiliaceae were kept as such. An alphabetical list of the plant species by their botanical names in italics and authority along with family in bracket, plant part used, and pharmacological activity is given in Table 1. Well-known old synonyms for some of the plants species are given after the abbreviation syn. Family names for same genus are given only once at their first occurrence.

RESULTS AND DISCUSSION

The present study reveals that 465 plant species of 328 genera (belonging to 116 families) are being utilized by ethnic communities for the treatment of asthma

Table 1 : List of Ethnomedicinal plants used for treatment of Asthma in India

S. No.	Botanical name and family	Plant part[#]	Pharmacological activity[Ψ]
1.	*Abelmoschus esculentus* (L.) Moench (Malvaceae)	fr,sd	-
2.	*Abelmoschus ficulneus* Wight & Arn.	sd	-
3.	*Abelmoschus moschatus** Medik. syn. *Hibiscus abelmoschus* L.	br,sd	-
4.	*Abies densa* Griff. (Pinaceae)	lf	-
5.	*Abies pindrow* (Royle ex D. Don) Royle	lf	ANI, Bronchoprotective[12,18]
6.	*Abies spectabilis** (D.Don) Mirb. syn. *Abies webbiana* Lindl.	lf, bk	ANTu[12]
7.	*Abutilon indicum** (L.) Sweet (Malvaceae)	fl, lf	IMS[17]
8.	*Acacia catechu** (L.f.) Willd. (Mimosaceae)	st, sb	ANI, AS[12]
9.	*Acacia farnesiana* (L.) Willd.	bk	ANI[12]
10.	*Acacia nilotica* subsp. *indica* (Benth.) Brenan	gm, bk	ANSP[12]
11.	*Acalypha ciliata* Forssk. (Euphorbiaceae)	wp	-
12.	*Acalypha indica*† L.	lf, wp	AG, ANI[20]
13.	*Acanthus ilicifolius* L. (Acanthaceae)	wp, px	AG, ANI[12]
14.	*Achillea millefolium*† L. (Asteraceae)	lf, wp, infl, rt, sd	AG, ANI, ANSP, AP, BD[17,21]
15.	*Achyranthes aspera**† L. syn. *Achyranthes aspera* var. *aspera*; *Aerva aspera* (L.) Spreng (Amaranthaceae)	rt,sd	AH, ANI, MCS, SL[9, 12,16, 18]
16.	*Achyranthes aspera* var. *rubrofusca* (Wight) Hook.f.	rt,lf	-
17.	*Aconitum ferox** Wall. ex Ser. syn. *Aconitum atrox* (Bruhl) Mukherjee (Ranunculaceae)	rt	-
18.	*Aconitum violaceum* Jacquem. ex Stapf.	rt, fl	-
19.	*Acorus calamus**† L. (Acoraceae)	rt, rh	AH, ANS, ANI, AG, BD, ANSP, ANTu[9,12,19]
20.	*Actaea spicata* var. *acuminata* H. Hara (Ranunculaceae)	rt	-
21.	*Adenanthera pavonina* L. (Mimosaceae)	rb	ANI[22]
22.	*Adiantum caudatum* L. (Pteridaceae)	wp	-
23.	*Adiantum incisum* Forssk.	wp	ANSP[12]
24.	*Adiantum lunulatum*† Burm.f.	wp, lf	-
25.	*Aegle marmelos**† (L.) Correa (Rutaceae)	fr, lf	AH, ANI, ANSP, ANS, AP, AG[9,12,14]
26.	*Aerva lanata* (L.) Juss. (Amaranthaceae)	lf, wp, fl	MCS[10]
27.	*Ailanthus excelsa*† Roxb. (Simaroubaceae)	sb, bk, cm	AP, ANSP, ANL, ANS, EP[12,23]
28.	*Ailanthus triphysa* (Dennst.) Alston syn. *Ailanthus malabarica* (Desf.) DC.	bk	-
29.	*Albizia amara* (Roxb.) B.Boivin (Mimosaceae)	fl,sd	ANSP[12]
30.	*Albizia julibrissin* Durazz.	bk,sd	-
31.	*Albizia lebbeck**† (L.) Benth.	bk, fl	ANL, ANI, BD, MCS[9,16, 18]
32.	*Albizia myriophylla* Benth.	px	-
33.	*Alhagi pseudalhagi** (M. Bieb.) Desv. ex B. Keller & Shap. (Fabaceae)	lf	EP[19]
34.	*Alliaria petiolata* (M.Bieb.) Cavara and Grande. (Brassicaceae)	lf	-
35.	*Allium cepa* L. (Amaryllidaceae)	bb	MCS[18]
36.	*Allium sativum** L.	bb	ANI[12]

37.	*Alpinia galanga* (L.) Willd. (Zingiberaceae)	rt, rh	ANI, EP[12]
38.	*Alstonia scholaris*† (L.) R. Br. (Apocynaceae)	la, px, lf, sb, bk	AG, ANI, ANTu, ANS, BD, EP, IS[9,12,18,24]
39.	*Alysicarpus bupleurifolius* (L.) DC (Fabaceae)	rt	-
40.	*Amaranthus viridis* L. (Amaranthaceae)	lf	AG, AP[93]
41.	*Amomum sericeum* Roxb. (Zingiberaceae)	sd	-
42.	*Amomum subulatum** Roxb.	fr, sd	-
43.	*Amorphophallus paeoniifolius*† (Dennst.) Nicolson syn. *Amorphophallus campanulatus* Decne.; *Amorphophallus paeoniifolius* var. *campanulatus* Sivadasan (Araceae)	tu	AG, ANI[25]
44.	*Amorphophallus sylvaticus* (Roxb.) Kunth	cm	AG, ANI[26]
45.	*Anacardium occidentale* L. (Anacardiaceae)	fr	ANI, BD[27]
46.	*Andrographis paniculata* (Burm.f.) Wall. ex Nees (Acanthaceae)	wp	ANI, AS, AG, ANSP, AP, ANL, EP, IMS, MCS[12,17, 19]
47.	*Anemone rivularis* Buch.-Ham. ex DC. (Ranunculaceae)	wp	-
48.	*Angelica glauca* Edgew. (Apiaceae)	rh	BD[28]
49.	*Annona squamosa* L. (Annonaceae)	bk, lf	ANI[29]
50.	*Anogeissus latifolia* (Roxb.ex DC.) Wall. ex Guillem & Perr. (Combretaceae)	sb, bk	ANI[30]
51.	*Anthemis cotula* L. (Asteraceae)	fl	-
52.	*Aphanamixis polystachya* (Wall.) R. Parker (Meliaceae)	lf	ANI[12]
53.	*Aquilaria malaccensis* Lam. syn. *Aquilaria agallocha* Roxb. (Thymelaeaceae)	wp	AH, ANL, MCS[9,12]
54.	*Arctium lappa* L. (Asteraceae)	rt	ANL, ANI[32]
55.	*Ardisia elliptica* Thunb. (Primulaceae)	lf	-
56.	*Ardisia solanacea* (Poir.) Roxb.	lf,fl, rb	ANI[31]
57.	*Argemone mexicana** L. (Papaveraceae)	sd	ANI, ANL[9,12]
58.	*Argemone ochroleuca* Sweet	sd	Muscle relaxation[33]
59.	*Aristolochia indica* L. (Aristolochiaceae)	rt/lf	ANI, ANSP[12]
60.	*Arnebia benthamii* (Wall. ex G. Don) I. M. Johnst. syn. *Macrotomia benthamii* A. DC. (Boraginaceae)	rt	-
61.	*Artemisia dracunculus* L. syn. *Artemisia glauca* Pallas ex Willd. (Asteraceae)	rt	-
62.	*Artemisia indica* Willd.	lf	-
63.	*Artemisia nilagirica* (C.B. Clarke) Pamp.	fl tip, lf,tw, wp	ANI, ANS[34]
64.	*Aster asperulus* Wall. ex Nees (Asteraceae)	px	-
65.	*Atropa acuminata* Royle ex Lindl. (Solanaceae)	lf, ap, rt	ANI[35]
66.	*Avicennia officinalis* L. (Acanthaceae)	lf	ANI[12]
67.	*Azadirachta indica* A. Juss. (Meliaceae)	lf,bk	ANI, AH, IM, MCS[9, 12]
68.	*Baccharoides anthelmintica* Moench (Asteraceae)	sd	AH, ANI, MCS[56]
69.	*Bacopa monnieri*† (L.) Wettst. (Plantaginaceae)	wp, lf	ANI, ANTu, MCS[10,19,36]
70.	*Balanites aegyptiaca* (L.) Delile (Zygophyllaceae)	sd	BD, EP[9,13]
71.	*Baliospermum solanifolium** (Burm.) Suresh (Euphorbiaceae)	lf	AG, ANI[37]
72.	*Bambusa bambos* (L.) Voss syn. *Bambusa arundinacea* Willd. (Poaceae)	lf , liquid in internodes	-
73.	*Barleria cristata* L. (Acanthaceae)	wp	ANI[13]
74.	*Barleria prionitis* L.	lf,rt	ANS[38]

75.	*Bergenia ciliata* (Haw.) Sternb. (Saxifragaceae)	rt	ANI[13]
76.	*Bergenia pacumbis* (Buch.-Ham. ex D.Don) C.Y.Wu & J.T.P an	rh	-
77.	*Bergenia stracheyi* (Hook.f. & Thomson) Engl.	rh	-
78.	*Betula utilis* D. Don (Betulaceae)	bl,lf	-
79.	*Biophytum sensitivum*† (L.) DC. (Oxalidaceae)	lf, wp	ANI, AP, AG [13,39]
80.	*Blepharis linariifolia* Pers. (Acanthaceae)	infl	-
81.	*Blumea lanceolaria* (Roxb) Druce (Asteraceae)	lf	-
82.	*Boerhavia diffusa**† L. (Nyctaginaceae)	rt, lf, wp	ANI, AH, ANS, IMS[13,17]
83.	*Boerhavia procumbens* Banks ex Roxb.	rt	ANI, ANS[13,18]
84.	*Boerhavia repens* L.	wp, rt	-
85.	*Bombax ceiba* L. (Malvaceae)	thorn, gm	AG, ANI[13]
86.	*Boswellia serrata** Roxb. ex Colebr. (Burseraceae)	sb, px	ANI, ANS, MCS[9,16]
87.	*Breynia vitis-idaea* (Burm.f.) C.E.C.Fischer syn. *Breynia rhamnoides* Muell.-Arg. (Euphorbiaceae)	lf	-
88.	*Bryophyllum pinnatum* (Lam.) Oken (Crassulaceae)	lf	ANI[103]
89.	*Butea monosperma* (Lamk.) Taub. (Fabaceae)	sd, fl	ANI, Bronchorelaxation[13]
90.	*Byttneria herbacea* Roxb. (Malvaceae)	rt	Antioedemogenic[40]
91.	*Caesalpinia bonduc* (L.) Roxb. (Caesalpiniaceae)	lf	AH, ANL[57]
92.	*Caesalpinia crista* L.	sd	-
93.	*Cajanus cajan* (L.) Millsp. (Fabaceae)	lf	ANSP[15]
94.	*Cajanus lineatus* (Wight & Arn.) Maesen.	lf	-
95.	*Calotropis gigantea*† (L.) Dryand. (Asclepiadaceae)	rt, sd, wp, fl, st, la	AH, ANS, ANI, MCS[16, 18,41]
96.	*Calotropis procera** (Aiton.) Dryand.	lf, rt, gs, la,st, fl, wd ash	MCS, ANI[16]
97.	*Calotropis procera* subsp. *hamiltonii* (Wight) Ali	fl	-
98.	*Cannabis sativa** L. (Cannabaceae)	lf, ash	BD, IM[17,18]
99.	*Capparis decidua** (Forssk.) Edgew. (Capparaceae)	rb, st, bk	AG, ANI[42]
100.	*Capparis divaricata* Lam.	rt	-
101.	*Capsicum chinense* Jacq. (Solanaceae)	fr	-
102.	*Cardamine impatiens* L. (Brassicaceae)	wp	-
103.	*Carissa carandas* L. (Apocynaceae)	rt	ANI[61]
104.	*Caryota urens* L. (Arecaceae)	infl	-
105.	*Cascabela thevetia* (L.) Lippold. syn. *Thevetia peruviana* K. Schum. (Apocynaceae)	fl	-
106.	*Cassia fistula**† L. (Caesalpiniaceae)	rt, fr, bk	ANI[15]
107.	*Cassia javanica* L.	rt	-
108.	*Catunaregam spinosa** (Thunb.) Tirveng (Rubiaceae)	lf, bk,fr	ANI, Bronchorelaxant, MCS[142]
109.	*Celosia argentea* L. syn. *Celosia cristata* L. (Amaranthaceae)	wp	ANTu[14,15]
110.	*Centella asiatica*† (L.) Urb. syn. *Hydrocotyle asiatica* L. (Apiaceae)	wp, lf	ANI, ANL, IM[9,17,49]
111.	*Cheilocostus speciosus*† (J. Koenig) C.D.Specht syn. *Costus speciosus* (J. Koenig.) Sm. (Costaceae)	rt, lf, rh	AG, ANI, AP[51]
112.	*Chenopodium album* L. (Amaranthaceae)	lf	-
113.	*Chlorophytum arundinaceum* Baker (Liliaceae)	rt	-
114.	*Chrozophora plicata* (Vahl) A.Juss. ex Spreng. (Euphorbiaceae)	rt	-

115.	*Cinnamomum tamala** (Buch.-Ham.) T. Nees & Eberm. (Lauraceae)	lf	ANI[54]
116.	*Cinnamomum verum** J. Presl. syn. *Cinnamomum zeylanicum* Breyn.	bk	ANI[14]
117.	*Cissampelos pareira* L. (Menispermaceae)	rt	AG, AP[17]
118.	*Cissus quadrangularis** L. (Vitaceae)	st, wp, px, lf	AH, ANI[50]
119.	*Citrullus colocynthis* (L.) Schrad. (Cucurbitaceae)	fr, rt	ANL, ANI[59]
120.	*Citrus aurantiifolia* (Christm.) Swingle (Rutaceae)	fr	-
121.	*Citrus medica* L.	fr	-
122.	*Clausena heptaphylla* (Roxb.) Wight & Arn. (Rutaceae)	fr	-
123.	*Clematis gouriana* Roxb. ex DC. (Ranunculaceae)	fl	ANI[60]
124.	*Cleome gynandra* L. syn. *Gynandropsis gynandra* (L.) Briq.; *Gynandropsis pentaphylla* (L.) DC. (Capparaceae)	px	ANI[17]
125.	*Clerodendrum cecil-fischeri* A. Rajendran & P. Daniel (Lamiaceae)	lf	-
126.	*Clerodendrum indicum**† (L.) Kuntze syn. *Clerodendrum siphonanthus* R.Br.	rt, st, lf	ANI[52]
127.	*Clerodendrum viscosum* Vent.	lf	AG, ANI[43]
128.	*Clitoria ternatea* L. (Fabaceae)	rt	AH, ANL, ANTu[58]
129.	*Coccinia grandis*† (L.) Voigt. syn. *Cephalandra indica* Naudin; *Coccinia indica* Wight. & Arn. (Cucurbitaceae)	rb, rh, fr, rt,st,lf	AG, ANI, AP, ANTu[53]
130.	*Cocculus hirsutus* (L.) W. Theob syn. *Cocculus villosus* DC. (Menispermaceae)	wp, rt	AG, ANI[46]
131.	*Codariocalyx motorius* (Houtt.) H. Ohashi syn. *Desmodium gyrans* (L.f.) DC.; *Desmodium motorium* (Houtt.) Merr. (Fabaceae)	rt	ANI[71]
132.	*Colebrookea oppositifolia* Sm. (Lamiaceae)	rt	ANI[63]
133.	*Colubrina asiatica* (L.) Brongn (Rhamnaceae)	lf	-
134.	*Commiphora wightii** (Arn.) Bhandari (Burseraceae)	wp, resin	-
135.	*Corallocarpus epigaeus* (Rottler) Hook.f. (Cucurbitaceae)	tu	-
136.	*Corchorus aestuans* L. syn. *Corchorus acutangulus* Lamk. (Tiliaceae)	rt	-
137.	*Crinum asiaticum* L. (Amaryllidaceae)	bb	ANI[62]
138.	*Crinum viviparum* (Lam.) R. Ansari & V.J. Nair syn. *Crinum defixum* Ker-Gawl.	lf	ANI[54]
139.	*Crocus sativus* L. (Iridaceae)	stigma	ANI, ANS[47]
140.	*Croton tiglium* L. (Euphorbiaceae)	sd	ANI[48]
141.	*Cryptostegia grandiflora* Roxb.ex R.Br. (Apocynaceae)	rt	-
142.	*Cucumis melo* L. (Cucurbitaceae)	fr	ANI[67]
143.	*Curculigo orchioides*† Gaertn. (Hypoxidaceae)	rt, tu	MCS, AH, ANS[10,65]
144.	*Curcuma amada* Roxb. (Zingiberaceae)	rh	ANI, AP[14,15]
145.	*Curcuma caesia* Roxb.	rt, rh	-
146.	*Curcuma longa** L.	rh, wp	MCS, ANL, ANI, EP[16]
147.	*Curcuma zedoaria** (Christm.) Roscoe	fr	ANTu[19]
148.	*Cuscuta reflexa* Roxb. (Convolvulaceae)	wp, st	AH[68]
149.	*Cyamopsis tetragonoloba* (L.) Taub. (Fabaceae)	lf	AH[69]

150.	*Cyathea spinolusa* Wall. ex Hook. (Cyatheaceae)	lf	-
151.	*Cycas pectinata* Buch.-Ham. (Cycadaceae)	male cone	-
152.	*Cyclosorus parasiticus* (L.) Farw. syn. *Christella parasitica* H.Lev. (Thelypteridaceae)	rh	-
153.	*Cymbopogon flexuosus* (Nees ex Steud) W.Watson syn. *Cymbopogon travancorensis* Bor (Poaceae)	infl	-
154.	*Cymbopogon martini* (Roxb.) W. Watson	rt	-
155.	*Cynodon dactylon* (L.) Pers. (Poaceae)	lf, wp	ANI, MCS, Antianaphylactic[9,10, 18]
156.	*Cynoglossum zeylanicum* Brand (Boraginaceae)	lf	-
157.	*Dactyloctenium aegyptium* (L.) Willd. (Poaceae)	culm	-
158.	*Dasymaschalon longiflorum* (Roxb.) Finet & Gagnep. syn. *Desmos longiflorus* (Roxb.) Saff. (Annonaceae)	lf	-
159.	*Datura innoxia** Mill. (Solanaceae)	fr,sd,lf	-
160.	*Datura metel*† L.	wp, rt, lf, fl, fr, sd	AG, AP, ANI, ANSP [14,70]
161.	*Datura quercifolia* Kunth.	fr	-
162.	*Datura stramonium**† L.	lf, fl, sd	AG, ANI, ANS[70]
163.	*Dendrobium nodosum* Dalzell. (Orchidaceae)	bb,lf	-
164.	*Desmodium gangeticum* (L.) DC. (Fabaceae)	rt	ANI[72]
165.	*Desmodium oojeinense* H. Ohashi	sb	AG, ANI[14]
166.	*Desmostachya bipinnata* (L.) Stapf. (Poaceae)	rt	AH, ANI[73]
167.	*Dicranopteris linearis*† (Burm. F.) Underwo od. (Gleicheniaceae)	lf, fr, rt	ANI[74]
168.	*Dioscorea bulbifera* L. (Dioscoreaceae)	rt	AG, ANI[75]
169.	*Dioscorea hispida* Dennst.	tu	-
170.	*Dioscorea pentaphylla*† L.	tu	-
171.	*Dioscorea vexans* Prain & Burkill	tu	-
172.	*Diplocyclos palmatus* (L.) C.Jeffrey (Cucurbitaceae)	px	AG, ANI[76]
173.	*Dischidia bengalensis* Colebr. (Apocynaceae)	lf	-
174.	*Dolichandrone falcata* (Wall. ex DC.) Seem (Bignoniaceae)	sb	-
175.	*Drimia indica**† (Roxb.) Jessop (Asparagaceae)	bb	AG, ANI, BD[77]
176.	*Drymaria cordata* (L.) Willd. ex Schult. (Caryophyllaceae)	wp	ANI[180]
177.	*Drymaria villosa* Schltdl. & Cham.	lf	-
178.	*Dysphania botrys* L. syn. *Chenopodium botrys* L. (Amaranthaceae)	wp	-
179.	*Echinops echinatus** Roxb. (Asteraceae)	rt	-
180.	*Echinops niveus* Wall. ex Wall.	rb	-
181.	*Eclipta prostrata*† (L.) L. syn. *Eclipta alba* (L.) Hassk. (Asteraceae)	lf, wp	AG, AH, ANI, ANTu[9,10,78]
182.	*Elaeagnus rhamnoides* (L.) A. Nelson (Elaeagnaceae)	fr	-
183.	*Elettaria cardamomum** (L.) Maton (Zingiberaceae)	fr, sd	ANI[81]
184.	*Elsholtzia blanda* (Benth.) Benth (Lamiaceae)	infl	-
185.	*Elytraria acaulis* (L.F.) Lindau (Acanthaceae)	rt	-
186.	*Emilia sonchifolia* (L.) DC.ex DC. (Asteraceae)	wp	ANI[181]
187.	*Ephedra gerardiana** Wall. ex Stapf. (Ephedraceae)	fr,sh, rt, st, br, ap, tw	ANS[14,15]

188.	*Eragrostis tremula* Hochst. ex Steud. (Poaceae)	fr, sd	-
189.	*Erythrina stricta* Roxb. (Fabaceae)	sb	-
190.	*Erythrina variegata* L.	fl	AG, ANI[82]
191.	*Eucalyptus globulus** Labill (Myrtaceae)	lf	EP[19]
192.	*Euphorbia antiquorum* L. (Euphorbiaceae)	px	ANTu[19]
193.	*Euphorbia caducifolia* Haines	la,fl	-
194.	*Euphorbia granulata* Forssk.	px	-
195.	*Euphorbia hirta*† L.	wp, rt, lf	AG, ANI, ANL, AP, AH, ANS, ANTu[10,17,79]
196.	*Euphorbia neriifolia** L. syn. *Euphrobia ligularia* Roxb. ex Buch.-Ham.	fl, la	-
197.	*Euphorbia nivulia* Buch.-Ham.	st	ANI[84]
198.	*Euphorbia tirucalli* L.	wp	ANI[84]
199.	*Euphorbia royleana* Boiss	st	-
200.	*Euphorbia tithymaloides* L. syn. *Pedilanthus tithymaloides* (L.) Poit.	lf	AG, ANI, AP[83]
201.	*Evolvulus alsinoides*† (L.) L. (Convolvulaceae)	lf, wp	ANS, BD, MCS[80]
202.	*Fagonia cretica* L. (Zygophyllaceae)	wp	ANI[157]
203.	*Fagonia paulayana* J. Wagner & Vierh.	wp	-
204.	*Feronia elephantum* Correa. (Rutaceae)	fr	AH[88]
205.	*Ficus benghalensis** L. (Moraceae)	rt	AH[9]
206.	*Ficus heterophylla* L.f.	rb	-
207.	*Ficus nervosa* B. Heyne ex. Roth	fr	-
208.	*Ficus religiosa**† L.	fr, lf, bk	MCS[9,87]
209.	*Ficus rumphii* Blume syn. *Ficus cordifolia* Roxb.	fr	-
210.	*Finlaysonia obovata* Wall. (Asclepiadaceae)	lf	-
211.	*Flemingia strobilifera* (L.) W. T. Aiton (Fabaceae)	lf	ANI[86]
212.	*Fritillaria cirrhosa* D. Don syn. *Fritillaria roylei* Hook. (Liliaceae)	bb	ANI, AH, ANS[85]
213.	*Ganophyllum falcatum* Blume (Sapindaceae)	lf	-
214.	*Garuga pinnata*† Roxb. (Burseraceae)	lf, infl, sb	ANI[89]
215.	*Gaultheria fragrantissima* Wall. (Ericaceae)	lf	-
216.	*Geranium pratense* L. (Geraniaceae)	rt,fl	-
217.	*Globba marantina* L. (Zingiberaceae)	rh	-
218.	*Globba pauciflora* King ex Baker	rh	-
219.	*Gloriosa superba* L. (Liliaceae)	tu	ANI[90]
220.	*Glycyrrhiza glabra** L. (Fabaceae)	rt	ANTu, EP, ANS[14,19]
221.	*Gmelina arborea* Roxb. (Verbenaceae)	px	ANI[91]
222.	*Gossypium herbaceum* L. (Malvaceae)	tw	-
223.	*Gymnema sylvestre* (Retz.) R.Br. ex Sm. (Asclepiadaceae)	lf	ANI[92]
224.	*Haplanthodes verticillatus* (Roxb.) R.B. Majumdar (Acanthaceae)	rt	-
225.	*Hedychium coccineum* Buch.-Ham ex Smith (Zingiberaceae)	sh	-
226.	*Hedychium spicatum*† Smith	rh	AH, ANI, ANSP, ANS[11,128]
227.	*Hedychium villosum* Wall.	rh	-
228.	*Helicteres isora* L. (Sterculiaceae)	rt, fr	ANSP[11]
229.	*Hemidesmus indicus** (L.) R.Br.ex Schult. (Asclepiadaceae)	rt	ANI, ANSP[9,10]
230.	*Heracleum lanatum* Michx. (Apiaceae)	rt	-
231.	*Heteropogon contortus* P. Beauv. ex Roem. & Schult. (Poaceae)	awn	ANI, Bronchorelaxation[95]
232.	*Hibiscus rosa-sinensis* L. (Malvaceae)	fl	AP, ANI, ANSP[11,17]
233.	*Hiptage benghalensis* (L.) Kurz (Malpighiaceae)	lf	AG, ANI[96]

234.	*Holarrhena pubescens* Wall. ex G. Don (Apocynaceae)	bk, br,lf,sd	AG, ANI[97]
235.	*Hordeum vulgare** L. (Poaceae)	px	-
236.	*Hornstedtia costata* (Roxb.) K.Schum. (Zingiberaceae)	sd	-
237.	*Humboldtia unijuga* Bedd. (Caesalpiniaceae)	rt	-
238.	*Hybanthus enneaspermus* (L.) F. Muell. (Violaceae)	lf	ANI[98]
239.	*Hygrophila auriculata* (Schumach.) Heine. syn. *Asteracantha longifolia* (L.) Nees (Acanthaceae)	sd	-
240.	*Hyoscyamus niger** L. (Solanaceae)	lf, st, sd, wp, fr	BD[18]
241.	*Ichnocarpus frutescens* (L.) W.T. Aiton (Apocynaceae)	rt,sd, px	ANI[99]
242.	*Indigofera cassioides* DC. (Fabaceae)	rt	ANSP[11]
243.	*Indigofera tinctoria*† L.	lf, wp, rt	ANI[100]
244.	*Inula racemosa** Hook.f. (Asteraceae)	rt	ANI, ANL, AH, AP, ANSP, MCS[11,16, 18,128]
245.	*Ipomoea obscura* (L.) Ker.Gawl.	lf	ANI[101]
246.	*Iris kashmiriana* Baker (Iridaceae)	rh	-
247.	*Jasminum arborescens* Roxb. (Oleaceae)	px	-
248.	*Jasminum malabaricum* Wight.	lf	-
249.	*Jasminum syringifolium* Wall.& G.Don	lf	-
250.	*Juniperus communis* L. (Cupressaceae)	fr, fl	ANI[102]
251.	*Juniperus excelsa* M. Bieb.syn. *Juniperus macropoda* Boiss	fr	-
252.	*Jurinea ceratocarpa* (Dcne.) Benth. & Hook.f. (Asteraceae)	rt	-
253.	*Justicia adhatoda**† L. syn. *Adhatoda vasica* Nees.; *Adhatoda zeylanica* Medik. (Acanthaceae)	lf, wp, rt, rb, st, fl, fr	ANL, ANI, ANTu, BD, EP[9,11, 18,19]
254.	*Justicia beddomei* (C.B.Clarke) Bennet	wp	-
255.	*Justicia procumbens* L.	lf	-
256.	*Kalanchoe laciniata* DC.(Crassulaceae)	px	ANI[103]
257.	*Kedrostis foetidissima* (Jacq.) Cogn. (Cucurbitaceae)	rt	ANI[104]
258.	*Kedrostris rostrata* (Rottler) Cogn.	rt	-
259.	*Kyllinga nemoralis* (J.R. Forst. & G. Frost.) Dandy ex Hutch. & Dalziel syn. *Kyllinga monocephala* Rottb. (Cyperaceae)	wp	-
260.	*Lactuca sativa* L. (Asteraceae)	sd	-
261.	*Lagenaria siceraria* (Molina) Standley syn. *Lagenaria vulgaris* Ser. (Cucurbitaceae)	fl	ANL, ANS[105]
262.	*Lagerstroemia parviflora* Roxb. (Lythraceae)	px	-
263.	*Lasia spinosa* Thwaites (Araceae)	px	ANI[106]
264.	*Leea compactiflora* Kurz. (Vitaceae)	tu	-
265.	*Lepidium sativum* L. (Brassicaceae)	px	ANSP, BD[9,10]
266.	*Leptadenia reticulata* (Retz.) Wight. & Arn. (Asclepiadaceae)	lf,fr, fl,	ANS[110]
267.	*Leucas aspera*† (Willd.) Link (Lamiaceae)	rt, lf	AG, ANI, AP[107]
268.	*Leucas cephalotes** (Roth.) Spreng.	wp	AG, ANI[108]
269.	*Leucas indica* R.Br.	lf	-
270.	*Leucas urticifolia* (Vahl) Sm.	wp	-
271.	*Limonia acidissima* Groff. (Rutaceae)	px	-
272.	*Lindenbergia muraria* (Roxb.) ex D. Don Bruhl (Scrophulariaceae)	lf	-

273.	*Lobelia nicotianifolia* Roth ex Schult. (Campanulaceae)	lf	ANSP, ANS [11]
274.	*Loranthus longiflorus* Desr. (Loranthaceae)	bk	-
275.	*Luffa acutangula* (L.) Roxb. (Cucurbitaceae)	fr,lf	-
276.	*Lumnitzera racemosa* Willd. (Combretaceae)	px	ANI[109]
277.	*Madhuca longifolia* var. *latifolia* (Roxb.) A. Chev. syn. *Madhuca indica* J.F. Gmel (Sapotaceae)	fr	AG, AP, ANI [111]
278.	*Maerua oblongifolia* (Forssk.) A. Rich (Capparaceae)	lf	-
279.	*Magnolia champaca* (L.) Baill. ex Pierre. syn. *Michelia champaca* L. (Magnoliaceae)	px	ANI, ANL, AP, MCS[14,115]
280.	*Mangifera indica*† L. (Anacardiaceae)	fr,sd, bk	ANS, ANL, AH[11,18]
281.	*Maranta arundinacea* L. (Marantaceae)	rh	-
282.	*Marsdenia tenacissima* (Roxb.) Moon (Apocynaceae)	rt	ANS[11]
283.	*Melastoma malabathricum* L. syn. *Melastoma normale* D.Don (Melastomataceae)	lf	ANI, AP[112]
284.	*Melia azedarach* L. syn. *Melia dubia* Cav. (Meliaceae)	st,hw	AG, ANS[11]
285.	*Melilotus officinalis* (L.) Pall. (Fabaceae)	wp	-
286.	*Memecylon umbellatum* Burm.f. (Melastomataceae)	lf	ANI[113]
287.	*Mentha arvensis* L. (Lamiaceae)	lf	ANI, ANL[114]
288.	*Mentha canadensis* L. syn. *Mentha arvensis* var. *piperascens* Malinv. ex Holmes	lf	-
289.	*Microtoena patchouli* (C.B. Clarke ex Hook.f.) C.Y. Wu & S. J. Hsuan (Lamiaceae)	px	-
290.	*Mimosa pudica* L. (Mimosaceae)	lf, rt, wp	BD[11]
291.	*Momordica dioica** Roxb. ex Willd. (Cucurbitaceae)	px	AH[9]
292.	*Monochoria vaginalis* (Burm.f.) C.Presl. (Pontederiaceae)	bk, rh	ANI[116]
293.	*Moringa oleifera* Lamk. (Moringaceae)	lf, px, rt	AG, AH, ANI[9]
294.	*Mucuna monosperma* Wight (Fabaceae)	sd	-
295.	*Mukia maderaspatana* (L.) M.Roem. (Cucurbitaceae)	lf	ANI[118]
296.	*Murdannia nudiflora* (L.) Brenan. (Commelinaceae)	rt	-
297.	*Musa balbisiana* Colla (Musaceae)	lf	-
298.	*Musa paradisiaca* L.	fl, lf	ANS[117]
299.	*Mussaenda frondosa* L. (Rubiaceae)	wp, fl	-
300.	*Myrica esculenta** Buch.–Ham. ex D. Don (Myricaceae)	fr, sb, bk	AG, ANL, ANI, ANSP, BD, VD[9,10,11]
301.	*Nardostachys jatamansi** (D. Don) DC. syn. *Nardostachys grandiflora* DC. (Caprifoliaceae)	rt, wp	ANSP, BD [11]
302.	*Nasturtium officinale* R. Br. syn. *Rorippa officinalis* P. Royen (Brassicaceae)	lf	ANI, IM[159]
303.	*Nelumbium speciosum* Willd. (Nelumbonaceae)	fl	-
304.	*Neopicrorhiza scrophulariiflora* (Pennell) D.Y.Hong syn. *Picrorhiza scrophulariiflora* Pennell. (Plantaginaceae)	rt	BD, MCS[16]
305.	*Nerium oleander* L. (Apocynaceae)	px	AG, ANI, AP [11]
306.	*Neuracanthus sphaerostachyus* Dalzell. (Acanthaceae)	wp	ANI, ANS[119]

307.	*Nicotiana tabacum**† L. (Solanaceae)	lf	-
308.	*Nigella sativa* L. (Ranunculaceae)	px	AH, BD, ANS[11,158]
309.	*Nyctanthes arbor-tristis** L. (Oleaceae)	bk, lf, ap	AP, ANSP, ANI, AH [9,10]
310.	*Ochna beddomei* Gamble (Ochnaceae)	rt	-
311.	*Ochna obtusata* DC.	rt	ANI[120]
312.	*Ochna pumila* Buch.-Ham. ex D.Don.	rt	-
313.	*Ocimum americanum* L. (Lamiaceae)	infl, lf	-
314.	*Ocimum basilicum* L.	lf, rt	BD[18]
315.	*Ocimum gratissimum* L.	lf	ANSP, ANTu[11,121]
316.	*Ocimum tenuiflorum**† L.	lf, wp	ANI, ANSP, ANS, ANTu, BD, EP, MCS[9,11,17, 19]
317.	*Oldenlandia umbellata* L. (Rubiaceae)	wp, lf	-
318.	*Opuntia dillenii** Haw. (Cactaceae)	fr	AG, ANI[182]
319.	*Oroxylum indicum* (L.) Kurz. (Bignoniaceae)	rt	ANL, ANS[122]
320.	*Papaver somniferum* L. (Papaveraceae)	sd	ANI[183]
321.	*Paris polyphylla* Sm. syn. *Daiswa polyphylla* (Sm.) Rafin. (Melanthiaceae)	rh	-
322.	*Passiflora foetida* L. (Passifloraceae)	wp, fr	AG, ANI[123]
323.	*Peganum harmala* L. (Nitrariaceae)	st, sd, px	ANS[124]
324.	*Pergularia daemia*† (Forssk.) Chiov. syn. *Daemia extensa* R. Br.; *Pergularia extensa* N.E. Br. (Asclepiadaceae)	lf, wp, fl	AG, AP, ANI [125]
325.	*Persicaria orientalis* (L.) Spach. (Polygonaceae)	lf	-
326.	*Phoenix dactylifera* L. (Arecaceae)	fr	ANI[132]
327.	*Phyla nodiflora* (L.) Greene. syn. *Lippia nodiflora* Cham. (Verbenaceae)	lf, wp	ANI, ANSP[11]
328.	*Phyllanthus amarus* Schumach. & Thonn. (Phyllanthaceae)	fr	ANI[126]
329.	*Phyllanthus emblica*† L.	lf, fr,sd	ANI, ANTu[9,11]
330.	*Phyllanthus reticulatus* Poir.	rt	AG, ANI[127]
331.	*Physalis minima** L.	lf	AG, AP, ANI [129]
332.	*Phytolacca acinosa* Roxb. (Phytolaccaceae)	lf	-
333.	*Picrorhiza kurroa*† Royle ex Benth. (Scrophulariaceae)	rt	ANS[11]
334.	*Piper betle** L. (Piperaceae)	lf, px	AH[9]
335.	*Piper hymenophyllum* (Miq.) Wight	rt,fr	-
336.	*Piper longum**† L.	fr,rt, infl, px	ANI, ANL, ANSP, ANS [9, 11.15]
337.	*Piper nigrum** L.	fr	ANL, ANI[130]
338.	*Piper trioicum* Roxb.	bk	-
339.	*Piper umbellatum* L.	lf,infl	-
340.	*Pistacia chinensis* Bunge (Anacardiaceae)	fr	ANTu[19]
341.	*Pistacia chinensis* subsp. *integerrima** (J.L. Stewart ex Brandis) Rech.	gall	-
342.	*Pistia stratiotes* L. syn. *Pistia stratiotes* var. *cuneata* Engl. (Araceae)	lf	ANL, ANI[133]
343.	*Pittosporum ferrugineum* W.T. Aiton (Pittosporaceae)	lf	-
344.	*Plantago depressa* Willd. (Plantaginaceae)	lf,rt	-
345.	*Plantago lanceolata* L.	lf	ANTu[19]
346.	*Plantago major* L.	wp	ANS[134]
347.	*Plectranthus amboinicus**† (Lour.) Spreng. syn. *Coleus amboinicus* Lour.; *Coleus aromaticus* Benth. (Lamiaceae)	lf, tu	ANTu[19]
348.	*Polygala arvensis* Willd. (Polygalaceae)	rt	ANI[135]
349.	*Polygala chinensis* L.	rt	ANI[136]
350.	*Polygala crotalarioides* Buch.-Ham.ex DC.	wp, px	-

351.	*Polygala sibirica* L.	wp	-
352.	*Polygonum kawagoeanum* Makino (Polygonaceae)	fl	-
353.	*Portulaca quadrifida* L. (Portulacaceae)	wp	ANI[137]
354.	*Potentilla fruticosa* L. (Rosaceae)	rt	-
355.	*Pothos scandens* L. (Araceae)	lf	MSC, ANL[131]
356.	*Primula glomerata* Pax (Primulaceae)	wp	-
357.	*Prunus cerasoides** Buch.-Ham. ex D. Don syn. *Prunus puddum* Roxb. ex Wall. (Rosaceae)	bk	-
358.	*Pterocarpus marsupium*† Roxb. (Fabaceae)	bk, gm, wd	ANI[138]
359.	*Pterospermum xylocarpum* (Gaertn.) Santapau & Wagh (Sterculiaceae)	bk,lf	-
360.	*Pueraria tuberosa* DC. (Fabaceae)	rt	ANI[139]
361.	*Punica granatum** L. (Punicaceae)	fr	ANI[140]
362.	*Pyrus pashia* Buch.-Ham. ex D. Don (Rosaceae)	fr	ANI[141]
363.	*Quercus leucotrichophora* A. Camus (Fagaceae)	gm	-
364.	*Ranunculus arvensis* L. (Ranunculaceae)	lf, wp	ANI[14,15]
365.	*Ranunculus muricatus* L.	wp	AG, ANI[144]
366.	*Ranunculus sceleratus* L.	wp	ANI[143]
367.	*Rauvolfia serpentina* (L.) Benth. ex Kurz. (Apocynaceae)	rt	-
368.	*Rheum australe* D. Don (Polygonaceae)	rh	ANI[145]
369.	*Rheum moorcroftianum* Royle	rt	-
370.	*Rhynchosia minima* (L.) DC. (Fabaceae)	sd, lf	-
371.	*Ricinus communis** L. (Euphorbiaceae)	sd/lf	ANS[18]
372.	*Rorippa indica* (L.) Hiern. syn. *Nasturtium indicum* (L.) DC. (Brassicaceae)	sd	-
373.	*Rosa moschata* Herrm. syn. *Rosa brunonii* Lindl. (Rosaceae)	fl	-
374.	*Rotheca serrata**† (L.) Steane & Mabb. syn. *Clerodendrum serratum* Moon. (Verbenaceae)	rt, st	AH, BD, MCS[10,16]
375.	*Rubia cordifolia** L. (Rubiaceae)	rt	ANI, IMS[146]
376.	*Saccharum spontaneum* L. (Poaceae)	px	ANI[150]
377.	*Salvadora oleoides* Decne. (Salvadoraceae)	fr	AG, ANI[147]
378.	*Salvadora persica*† L.	lf	AG, ANI[149]
379.	*Salvia moorcroftiana* Wall.ex Benth. (Lamiaceae)	rt	-
380.	*Santalum album* L. (Santalaceae)	rt	AG, ANI[184]
381.	*Sapindus emarginatus* Vahl. (Sapindaceae)	fr	-
382.	*Sarcostemma acidum* (Roxb.) Voigt (Asclepiadaceae)	la	ANL, BD[16]
383.	*Saussurea costus** (Falc.) Lipsch (Asteraceae)	rt, px	ANS[148]
384.	*Saussurea gossypiphora* D.Don	wooly hair	-
385.	*Saussurea simpsoniana* (Fielding & Gardner) Lipsch.	wp	-
386.	*Scindapsus officinalis* (Roxb.) Schott. (Araceae)	fr	AG, ANI[185]
387.	*Selinum wallichianum* (DC.) Raizada & H. O. Saxena (Apiaceae)	rt	-
388.	*Semecarpus anacardium**† L.f. (Anacardiaceae)	fl, sd, fr	ANI, ANL[9]
389.	*Senna alata* (L.) Roxb. syn. *Cassia alata* L. (Caesalpiniaceae)	lf,fl	ANI, ANL, MCS[186]

390.	*Senna auriculata* (L.) Roxb.	bk	ANI, AP[55]
391.	*Senna italica* Mill. syn. *Cassia italica* Spreng	wp	-
392.	*Senna occidentalis** (L.) Link	rt,lf	ANI, ANL[44]
393.	*Senna sophera* (L.) Roxb.	wp, lf	AH, ANL, ANI, ANS, BD[14,45]
394.	*Senna tora* (L.) Roxb.	sd	BD, ANTu[10,19,66]
395.	*Sida cordata* Bross. (Malvaceae)	wp	-
396.	*Sida cordifolia* L.	rt	ANI, AP, IS[14]
397.	*Sida rhombifolia* L.	rt	AH, ANI, EP[19.151]
398.	*Sisymbrium officinale* (L.) Scop. (Brassicaceae)	wp	ANI[152]
399.	*Solanum anguivi* Lam. (Solanaceae)	rt	-
400.	*Solanum ferox** L.	sd	-
401.	*Solanum incanum* L.	sd	ANI[162]
402.	*Solanum indicum*† L.	lf, fr, rt	AG, AP[155]
403.	*Solanum lycopersicum* L.	fr	-
404.	*Solanum myriacanthum* Dunal	fr	-
405.	*Solanum seaforthianum* Andrews.	lf	-
406.	*Solanum surattense**† Burm.f.	wp, rt, sd, lf, fr	ANL, EP[14,15]
407.	*Solanum torvum* Swartz.	fr, fl	AG, ANI[153]
408.	*Solanum trilobatum* L.	lf, fr	ANS[154]
409.	*Solanum viarum* Dunal	wp, fr	-
410.	*Solanum virginianum*† L. syn. *Solanum xanthocarpum* Schrad. & H.Wendl.	rt,fr, fl, lf	AH, ANL, ANS, BD, MCS[9,16]
411.	*Sorbaria tomentosa* (Lindl.) Rehder syn. *Spiraea sorbifolia* Hook.f. (Rosaceae)	fr, st	-
412.	*Spilanthes acmella* (L.) L. (Asteraceae)	lf,fl	AG, ANI, IMS[156]
413.	*Stephania glabra* (Roxb.) Miers (Menispermaceae)	tu	ANI[15]
414.	*Sterculia rubiginosa* Vent. (Sterculiaceae)	lf	-
415.	*Sterculia rubiginosa* var. *glabrescens* King	lf	-
416.	*Stereospermum chelonoides**† (L.f.) DC. syn. *Stereospermum suaveolens* (Roxb.) DC. (Bignoniaceae)	Rt	ANI[160]
417.	*Strobilanthes humilis* Gamble (Acanthaceae)	wp	-
418.	*Strychnos nux-vomica** L. (Loganiaceae)	sd	AG, ANI[14]
419.	*Swertia chirayta* H. Karst (Gentianaceae)	px	ANI[14]
420.	*Syzygium cumini* (L.) Skeels (Myrtaceae)	bk,sd	AG, ANI, AP, ANS[14-15]
421.	*Tacca leontopetaloides* (L.) Kuntze (Dioscoreaceae)	sb	-
422.	*Taxus baccata* L. (Taxaceae)	lf,fr,bk	BD, ANI, MCS[18,163]
423.	*Taxus wallichiana* Zucc.	px	-
424.	*Tectaria gemmifera* (Fée) Alston. (Tectariaceae)	rh,st	-
425.	*Tectaria macrodonta* C. Chr.	lf	-
426.	*Tephrosia purpurea*† (L.) Pers. (Fabaceae)	rt, wp	ANI, ANL, BD, MCS[16,164]
427.	*Terminalia arjuna* (Roxb.ex DC.) Wight. & Arn. (Combretaceae)	bk	ANI[14]
428.	*Terminalia bellirica**† (Gaertn.) Roxb.	fr, sd	ANI, ANTu, MCS[9]
429.	*Terminalia chebula**† Retz.	fr, sd	MCS, ANL[187]
430.	*Terminalia cuneata* Roth	sb	-
431.	*Themeda gigantea* Hack. ex Duthie (Poaceae)	px	-

432.	*Thysanolaena latifolia* (Roxb. ex Hornem.) Honda (Poaceae)	px	-
433.	*Tinospora cordifolia**† (Willd.) Miers ex Hook. F. & Thomson (Menispermaceae)	st, rb	AH, AP, MCS[9,16, 17]
434.	*Toddalia asiatica* (L.) Lam. (Rutaceae)	lf	ANI[165]
435.	*Trachyspermum ammi** (L.) Sprague (Apiaceae)	fr	BD, ANS, ANL[9,18]
436.	*Tragia involucrata* L. (Euphorbiaceae)	rt	AH[166]
437.	*Trianthema portulacastrum*† L. syn. *Trianthema monogyna* L. (Aizoaceae)	rt, fr, lf	ANI, AP[169]
438.	*Tribulus terrestris* L. syn. *Tribulus lanuginosus* L. (Zygophyllaceae)	wp, fr	ANI[170]
439.	*Trichopus zeylanicus* Gaertn. (Dioscoreaceae)	fr	ANI[167]
440.	*Trichopus zeylanicus* subsp. *travancoricus* (Bedd.) Burkill.	fr	-
441.	*Trichosanthes cucumerina* L. syn. *Trichosanthes anguina* L. (Cucurbitaceae)	sd	ANI[172]
442.	*Trichosanthes tricuspidata* Lour.	fr, lf	ANI[171]
443.	*Trigonella foenum-graecum* L. (Fabaceae)	lf	ANI, ANS[168]
444.	*Tylophora dalzellii* Hk.f. (Asclepiadaceae)	lf	-
445.	*Tylophora hirsuta* Wight	lf	-
446.	*Tylophora indica** (Burm.f.) Merr.	lf	BD, MCS, ANI, ANS[14,15,188]
447.	*Tylophora rotundifolia* Buch.-Ham. ex Wight	lf,st	-
448.	*Urena lobata* L. syn. *Urena lobata* subsp. *lobata* (Malvaceae)	lf	ANSP[17]
449.	*Vanda spathulata* (L.) Spreng. (Orchidaceae)	fl	-
450.	*Vanda testacea* (Lindl.) Rchb.f.	lf	AG, ANI[178]
451.	*Verbascum thapsus* L. (Scrophulariaceae)	lf,fl	ANI[161]
452.	*Vicia sativa* L. (Fabaceae)	lf	-
453.	*Viola canescens* Wall. (Violaceae)	lf	-
454.	*Viola patrinii* Ging.	fl	-
455.	*Vitex negundo*† L. (Verbenaceae)	lf, sd	BD, AH, ANI, ANL, MCS[9,16, 18]
456.	*Vitex trifolia* L.	lf	ANI[173]
457.	*Withania somnifera*† (L.) Dunal (Solanaceae)	rt	ANI, ANTu[19]
458.	*Woodfordia fruticosa* (L.) Kurz. (Lythraceae)	lf	ANI, ANS, MCS[174]
459.	*Wrightia tinctoria* R.Br. (Apocynaceae)	lf	AG, AP, ANI[175]
460.	*Yucca gloriosa* L. (Asparagaceae)	px	-
461.	*Zanthoxylum armatum** DC. (Rutaceae)	fr,sd	ANS[176]
462.	*Zea mays** L. (Poaceae)	fl	AG, ANI[177]
463.	*Zingiber officinale*†* Roscoe. (Zingiberaceae)	rh	ANI, AH, ANS, ANTu[18, 19]
464.	*Zingiber zerumbet** (L.) Roscoe ex Sm.	rh	-
465.	*Ziziphus xylopyrus* (Retz.) Willd. (Rhamnaceae)	fr	ANI[179]

*Plants also mentioned in Ayurveda

†Plants with high credibility as per Jain, 2004

[#]***Plant parts:*** *ap: aerial part; bb: bulb; bk: bark; br: branch; cm: corm; fl: flower; fr: fruit; gm: gum; gs: gynostegium; hw: heartwood; infl: inflorescence; la: latex; lf: leaf; pt: petiole; px: part not specified; rb: root-bark; rh: rhizome; rt: root; sb: stem bark; sd: seed; sh: shoot; st: stem; tu: tuber; tw: twig; wd: wood; wp: whole plant*

[Ψ]AG– Analgesic; AH- Antihistaminic; ANI– Antiinflammatory; ANL– Antiallergic; ANS- Antiasthmatic; ANSP– Antispasmodic; ANTu– Antitussive; AP– Antipyretic; AS- Antisecretory; BD– Bronchodilator; EP- Expectorant; IM- Immunomodulatory; IMS– Immunostimulatory; MCS– Mast cell stabilizing

Table 2: Plants recommended in Ayurveda for treatment of Asthma

S.No.	Botanical name and family	Plant part used[#]
1.	*Adansonia digitata* L. (Malvaceae)	fr
2.	*Aconitum heterophyllum* Wall. ex Royle (Ranunculaceae)	rt
3.	*Alangium salviifolium* (L.f.) Wangerin (Cornaceae)	rb
4.	*Anacyclus pyrethrum* (L.) Lag. (Asteraceae)	px
5.	*Ananas comosus* (L.) Merr. (Bromeliaceae)	fr
6.	*Apium graveolens* L. (Apiaceae)	sd
7.	*Berberis aristata* DC. (Berberidaceae)	px
8.	*Brassica juncea* (L.) Czern (Brassicaceae)	sd
9.	*Brassica rapa* L. syn. *Brassica campestris* L.	sd oil
10.	*Camellia sinensis* (L.) Kuntze (Theaceae)	lf
11.	*Cedrus deodara* (Roxb. ex D.Don) G. Don (Pinaceae)	fl
12.	*Cinnamomum camphora* (L.) J. Presl. (Lauraceae)	wp
13.	*Cordia dichotoma* G. Forst. (Boraginaceae)	px
14.	*Coffea arabica* L. (Rubiaceae)	fr
15.	*Coptis teeta* Wall. (Ranunculaceae)	rt
16.	*Cyperus rotundus* L. (Cyperaceae)	fl
17.	*Cyperus scariosus* R. Br.	rt
18.	*Dactylorhiza incarnata* (L.) Soo. syn. *Orchis latifolia* L. (Orchidaceae)	tu
19.	*Delphinium denudatum* Wall. ex Hook.f. & Thomson (Ranunculaceae)	rt
20.	*Dendrophthoe falcata* (L.f.) Ettingsh. (Loranthaceae)	wp
21.	*Elephantopus scaber* L. (Asteraceae)	lf, fl
22.	*Fagonia indica* Burm.f. (Zygophyllaceae)	lf
23.	*Ferula foetida* Regel (Apiaceae)	resin
24.	*Ficus carica* L.	fr
25.	*Foeniculum vulgare* Mill. (Apiaceae)	sd
26.	*Hyssopus officinalis* L. (Lamiaceae)	wp
27.	*Linum usitatissimum* L. (Linaceae)	sd
28.	*Lepidium virginicum* L. (Brassicaceae)	sd
29.	*Liquidambar orientalis* Mill.(Altingiaceae)	gm
30.	*Marsilea minuta* L. (Marsileaceae)	wp
31.	*Narthex asafetida* Falc. ex Lindl.	resin
32.	*Pentapetes phoenicea* L. (Sterculiaceae)	rt
33.	*Phyllanthus fraternus* G.L.Webster. (Phyllanthaceae)	wp
34.	*Piper retrofactum* Vahl. (Piperaceae)	rt
35.	*Pluchea lanceolata* (DC.) C.B.Clarke (Asteraceae)	rt
36.	*Saccharum officinarum* L. (Poaceae)	st
37.	*Sapindus mukorossi* Gaertn. (Sapindaceae)	fr
38.	*Solanum americanum* Mill. syn. *Solanum nigrum* L. (Solanaceae)	fr
39.	*Spinacia oleraeca* L. (Amaranthaceae)	sd
40.	*Syzygium aromaticum* (L.) Merr. & L.M.Perry. (Myrtaceae)	fl buds

41.	*Smilax china* L. (Smilacaceae)	rt
42.	*Styrax benzoin* Dryand. (Styracaceae)	gm
43.	*Triticum aestivum* L. (Poaceae)	bran
44.	*Uraria picta* (Jacq.) DC. (Fabaceae)	wp
45.	*Valeriana jatamansi* Jones (Valerianaceae)	rt
46.	*Viola odorata* L. (Violaceae)	fl
47.	*Vitis vinifera* L. (Vitaceae)	px

[#]***Plant parts:*** *fl: flower; fr: fruit; gm: gum; lf: leaf; px: part not specified; rb: root-bark; rh: rhizome; rt: root; sb: stem bark; sd: seed; sh: shoot; st: stem; tu: tuber; wp: whole plant*

Table 3: IUCN Red list categories of Anti-asthmatic Indian Ethnomedicinal plant species

IUCN Red list categories	Botanical name
Critically endangered	*Aquilaria malaccensis, Commiphora wightii, Nardostachys jatamansi, Saussurea costus*
Endangered	*Angelica glauca, Taxus wallichiana*
Vulnerable	*Aconitum violaceum, Cycas pectinata, Santalum album, Vanda spathulata*
Near threatened	*Abies spectabilis, Pterocarpus marsupium*

in India (Table 1). Out of these, five plants belong to Pteridophyta and Gymnosperm groups each, and the remaining 455 are Angiosperms, of which 380 are Dicot (belonging to 87 families) and 75 are Monocot plant species (belonging to 19 families). Further analysis shows that the genus that has the most species is *Solanum* with 12, followed by *Euphorbia* with nine; *Senna* and *Piper* each with six species; *Ficus* with five and rest of the genera have four, three, two or one species. Among the 116 families, some of the dominant families are Leguminosae with 45 plants (including Mimosaceae-9, Caesalpiniaceae-11, and Fabaceae-25) followed by Solanaceae (22), Asteraceae (20), Lamiaceae (18), Euphorbiaceae (17), Zingiberaceae (16), Malvaceae (14), Acanthaceae (14), Cucurbitaceae (13), Apocynaceae (12), Asclepiadaceae (12), Poaceae (11), Ranunculaceae (9), Dioscoreaceae (7), Amaranthaceae (7) and 5 families having 6 plants, 7 families with 5 plants, 9 families contain 4 plants, 16 families containing 3 plant species, 17 families consisting of 2 plant species and 45 families contain 1 plant species. The percentage contribution of plants of these families to total number of anti-asthmatic plants has also been shown in Figure 1. Similar kind of analysis of plants used for treatment of respiratory disorders in Pakistan revealed maximum contribution of Asteraceae followed by Solanaceae and Moraceae[18]. In this study, Solanaceae and Asteraceae ranked second and third respectively which confirms the beneficial role of plants of these families for treatment of asthma and other respiratory troubles.

Analysis of plant part from Table 1 reveals that leaves (24%) were the most frequently utilized part followed by roots (16%), whole plant (10.5%), fruits (10.4%), seeds (7.02%), flowers (5.85%), rhizome and unspecified plant part (5.41% each), stem bark (5.27%), stem

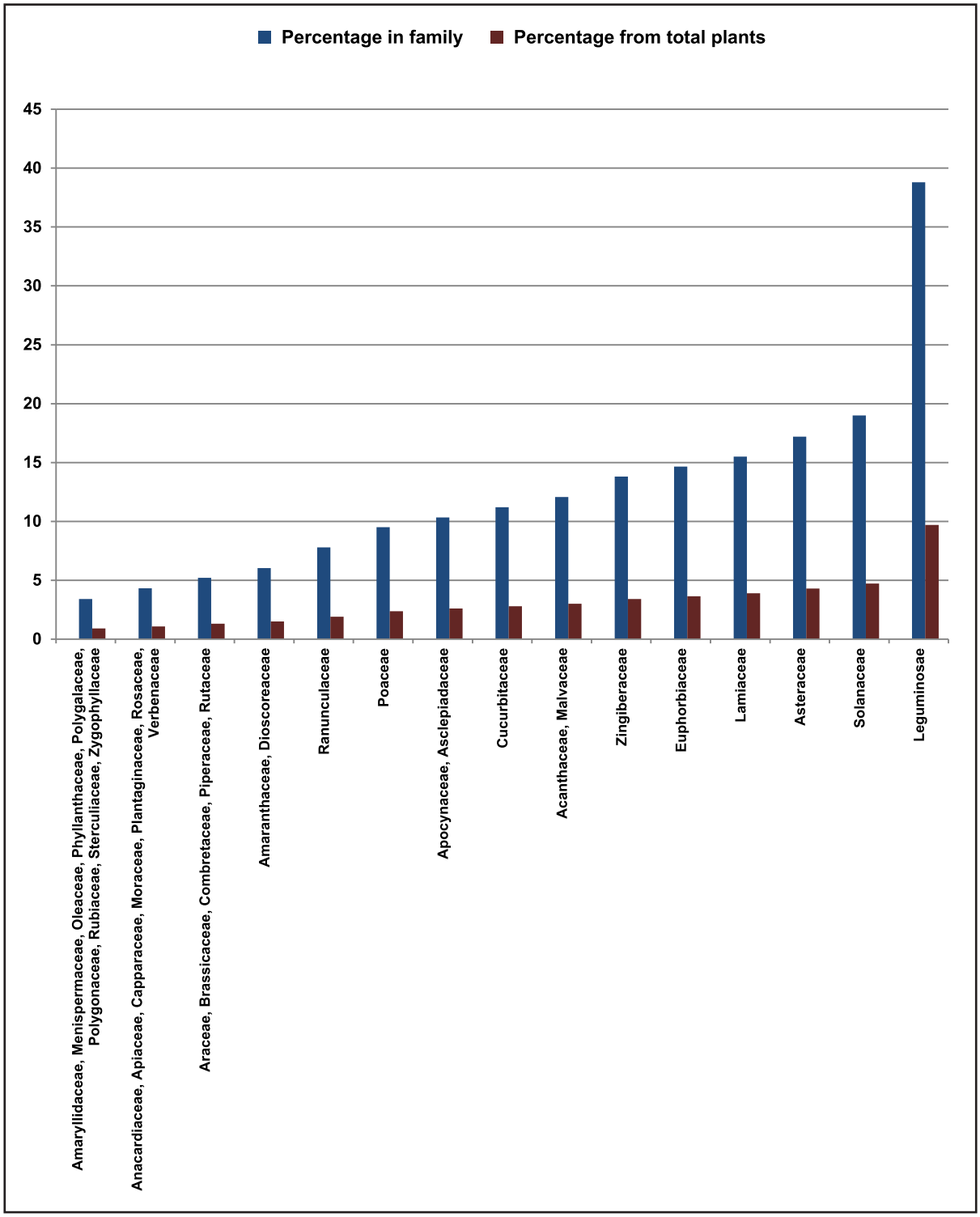


Fig. 1: Percent distribution of Anti-asthmatic Ethnomedicinal plants

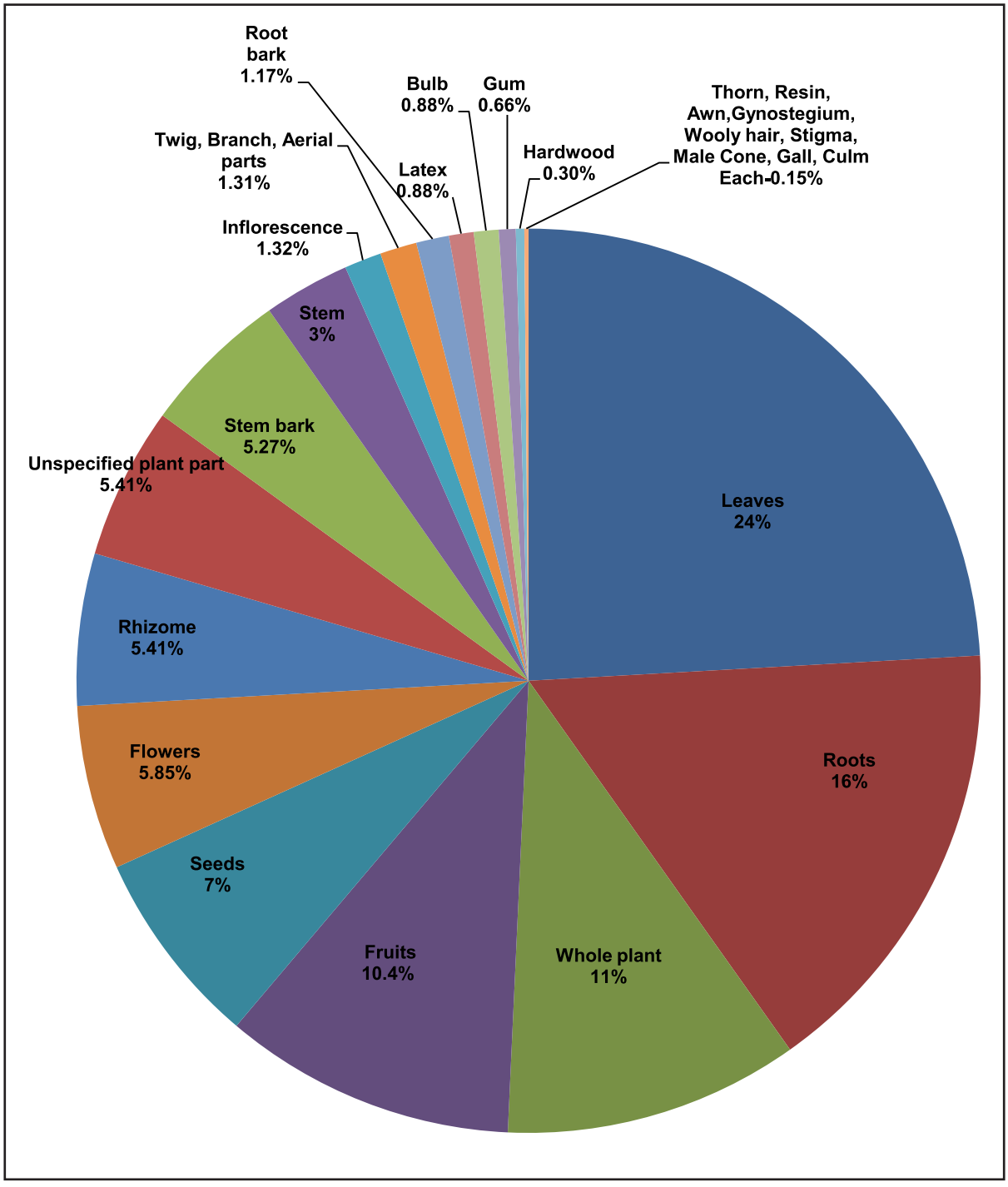


Fig. 2: Plant parts used for treatment of asthma in Indian Ethnomedicine

(3.07%), inflorescence (1.32%) twigs, branches, aerial parts (1.31%) and root bark (1.17%). The rest parts were utilized for less than one percent (Fig.2). Leaves were also the most commonly used part for treatment of respiratory disorders in ethnomedicine of Pakistan followed by fruits, roots, seeds, whole plant, stem, flowers, bark etc[18]. Choice of leaves over other plant parts might be due to ease in the collection with less harm to plant which can be more if one collects stem/root/seeds etc.

Anti-asthmatic plants were maximally reported from Madhya Pradesh, Andhra Pradesh and Maharashtra states then from West Bengal, Bihar, Orissa, Sikkim, Chhattisgarh and Jharkhand region, followed by Punjab, Haryana, Rajasthan and Gujarat and South Indian states Karnataka, Tamilnadu, Kerala, Lakshyadweep and Goa then followed by Uttar Pradesh and Uttarakhand; North-eastern states of India *i.e.* Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Arunachal Pradesh. Least reports were observed from Andaman and Nicobar islands. The reason behind the differences in reporting from various states could be due to easy accessibility to tribal regions located in Central and Southern India which have caused frequent field visits and documentation of ethnobotanical knowledge from time to time.

Assessment of conservation status of 465 anti-asthmatic ethnomedicinal plant species of India as per IUCN Red Data List[189] revealed that there are 12 plant species which needs serious attention for their protection and strategies should be prepared for their sustainable use (Table 3).

Ethnobotanical data published up to year 1991 was compiled by Jain[5] which provides information about 122 plants being used for treatment of asthma in India. After 1991, due to rapid spread of Ethnobotany discipline in various parts of the country, documentation and inventorization of folk medicinal claims speeded up and till 2015, a thousand important research papers and books were out; the data of which was compiled in a single voluminous Compendium[6] in 2016. The 25 years period of 1991-2015 has brought attention to a total of 413 plants out of which 343 were unique as reported for the first time for treatment of asthma in the country. Interestingly, 70 plant species were commonly reported in both 1991 and 2016 and 52 were unique plant species reported only before 1991 and have not been again reported from any geographical region of country after 1991. These observations show dynamism as an integral part in evolution of ethnobotany because not only some addition to previous ethnobotanical knowledge but loss of knowledge is also possible[191-192]. And some of the major reasons behind this could be migration, modernization, lack of proper recognition to the traditional healers etc. This further suggests the urgent need for documentation of ethnobotanical knowledge which should be continued at high speed before the loss of plant or informant from that particular region.

India's one of the major traditional medicinal systems is Ayurveda which describes use of plant part/animal part/mineral for treatment of human ailments. Medicinal uses of about 1500-2000 plant species have been mentioned in Ayurveda, out of which mostly 500 plants are utilized on a regular basis[7,192].

Scrutiny of these 500 plants revealed that there are 125 major plants mentioned in Ayurveda that are being used either singly or in combination for the treatment of asthma. Notably, 78 plants are common to both Ethnomedicine and Ayurvedic literature as indicated with an asterisk symbol (*) in Table 1. This further suggests origin of Ayurveda from Ethnomedicine[192]. However, among the 78 common plant species, use of different plant part in Ayurveda other than in Ethnomedicine was also observed for some plants such as use of root of *Acacia catechu*, whole plant of *Argemone Mexicana*, fruit of *Capparis decidua*, leaf of *Echinops echinatus*, latex of *Ficus benghalensis*, flowers of *Opuntia dillenii,* root of *Physalis minima* and others. Moreover, there are 47 unique plant species reported from Ayurvedic literature for treatment of asthma which have yet not been reported in Ethnomedicine for the same purpose (Table 2). Combining these with 465 plants reported in Ethnomedicine gives a figure of 512 plants being utilized for treatment of asthma in Indian traditional medicine.

Assessment of credibility rating of these 465 plants on the criteria of reports of a folk medicinal claim from different locations and different ethnic groups[193], revealed that there are 58 plant species with the highest credibility score of 5 (folk claim reported from more than two different states and ethnic groups). These species have been indicated with a dagger (†) symbol in Table 1. Out of these, 22 plant species have already been included in the traditional Ayurvedic system of medicine for treatment of asthma. Ayurveda could be considered an equivalent to clinical trials as it is an age-old therapeutic system being utilized for well being of humans. Similarly, Ethnomedicine is also result of years of observation and practice of traditional healers and carry equal importance as it has proved to maintain tribal health since ages. Hence, all the 78 common plant species in both Ethnomedicine and Ayurveda could be utilized as efficient herbal drugs for asthma treatment. Moreover, clinical studies on some of these plants have also demonstrated significant anti-asthmatic property for example, *Acorus calamus, Aegle marmelos, Albizia lebbeck, Boswellia serrata, Crocus sativus, Hedychium spicatum, Justicia adhatoda, Lobelia nicotianifolia, Picrorhiza kurroa, Piper longum, Solanum virginianum, Trigonella foenum-graecum, Tylophora indica* etc. These scientific validation studies of traditional medicine through modern methodologies further enhance credibility of our traditional medicine heritage.

However, 14 common plant species to both Ethnomedicine and Ayurveda have still not been scientifically evaluated for their efficacy against asthma and therefore, it is recommended to explore their potential role in asthma. These are, *Abelmoschus moschatus, Aconitum ferox, Amomum subulatum, Commiphora wightii, Datura innoxia, Dioscorea pentaphylla, Echinops echinatus, Euphorbia neriifolia, Hordeum vulgare, Nicotiana tabacum, Pistacia chinensis* subsp. *integerrima, Prunus cerasoides, Solanum ferox* and *Zingiber zerumbet*. Besides, rest of the 373 plant species as reported in Ethnomedicine should also be further screened for their phytochemistry and pharmacology to search for effective phyto-therapeutic molecules for treatment of asthma.

Asthma is mainly of two types, Extrinsic and Intrinsic. Extrinsic asthma is caused by Atopy and Intrinsic asthma is non-atopic, severe and persistent in nature. There are various predisposing risk factors to asthma such as genetic factors, atopy, gender, ethnicity, obesity, early viral infections and there are also triggers such as various environmental factors, allergens, house dust mites, pollen grains, air pollution, cold air, stress, occupational exposure, certain drugs, dampness, and some dietary components which worsen the asthma severity in earlier established cases. The main choice of drug for asthma treatment is a bronchodilator which relaxes the airway smooth muscles and relieves the symptoms and a controller drug which inhibit the underlying inflammatory process[1]. There are various side effects such as palpitation, muscle tremors, poor drug tolerance associated with long term treatment of asthma with modern drugs and also economic burden on patients. In this regard, multi-functional benefits of plant species along with wider safety profile make them potential for development of cost-effective better therapeutic molecules against asthma.

Some of the relevant pharmacological properties for treatment of asthma are Anti-inflammatory, Anti-histaminic, Analgesic, Antiallergic, Antispasmodic, Antitussive, Antisecretory, Bronchodilator, Expectorant, Immunostimulatory, Mast cell stabilizing and Vasodilator[1,10,16] which could be considered as indirect evidences to prove beneficial role of those plant species for management of Asthma.

Among the 465 plants, 196 possess anti-inflammatory, 32 have anti-histaminic and 35 species have demonstrated Mast cell stabilizing action. Recent researches have shown that the main pathophysiology of asthma is chronic inflammation of mucosa of lower airways. In view of this, anti-inflammatory action of 196 Ethnomedicinal plant species is an important observation. There are nine plant species which have shown both anti-inflammatory and bronchodilator activity. These are *Abies pindrow, Achillea millefolium, Albizia lebbeck, Anacardium occidentale, Butea monosperma, Catunaregam spinosa, Drimia indica, Heteropogon contortus* and *Justicia adhatoda*. Antiinflammatory, antihistaminic and antiasthmatic potential together has been demonstrated in plants, *Acorus calamus, Aegle marmelos, Alstonia scholaris, Boerhavia diffusa, Boerhavia procumbens, Boswellia serrata, Calotropis gigantea, Cynodon dactylon, Euphorbia hirta, Fritillaria cirrhosa, Hedychium spicatum, Inula racemosa, Senna sophera* and *Zingiber officinale*. Though indirect, these multifarious activities favorably support scientific validation of folk claims on these medicinal plant species for asthma.

Mast cells also keep a significant role in the acute bronchoconstriction response to allergens and release several bronchoconstriction mediators including histamine, prostaglandin D_2, cytokines, chemokines, growth factors, cysteinyl-leukotrienes and neutrophils. Therefore, antihistaminic and mast cell stabilizing action of these Ethnomedicinal plant species are additional benefits associated with use of these species. However, there are 191 plant species which have yet not been evaluated for their beneficial role in asthma (Table 1)

and their detailed analysis for above-mentioned direct and indirect evidences might lead for development of some novel phyto-pharmaceuticals against asthma with better efficacy and safety profile.

In a nutshell, India has a rich heritage of Traditional medicine in form of Ethnomedicine and Ayurveda and both are time-tested therapies. The present paper describes 512 traditional plant species being utilized for treatment of asthma and indicates those plants whose beneficial role as anti-asthmatic has yet to be scientifically proved so that they can also be utilized by a larger section of society.

REFERENCES

1. Barnes PJ. Asthma. In: Jameson JL, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J, Editors. Harrison's Principles of Internal Medicine. 20th edition, Vol. 2, New York: Mc Graw Hill, 2018 p. 1957.
2. Agarwal R, Dhooria S, Aggarwal AN et al. Guidelines for diagnosis and management of bronchial asthma. Joint ICS/NCCP(1) recommendations. Lung India. 2015; 32(s1): 3-42.
3. Christopher DJ, Balamugesh T. Advances in asthma management. In: Ed. Vander GS, Pareek KK, Progress in Medicine, Medicine update. Vol. 2, New Delhi, India: JP Brothers Medical Publishers Pvt. Ltd., 2016-1.
4. Jain A, Jain SK. Indian Ethnobotany: Bibliography of 21st Century (2001-2015), Jodhpur, India: Scientific Publishers; 2016.
5. Jain SK. Dictionary of Indian folk medicine and Ethnobotany, New Delhi, India: Deep Publications; 1991.
6. Jain V, Jain SK. Compendium of Indian folk medicine and Ethnobotany (1991-2015), New Delhi, India: Deep Publications; 2016.
7. Bhutya RK. Ayurvedic medicinal plants of India (Vol. 1-2), Jodhpur, Rajasthan: Scientific Publishers; 2011.
8. Ekor M. The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety. Front Pharmacol. 2014; 4:177.
9. Jaiswal V, Singh S, Singh A, Maurya S. A critical review on anti-asthmatic Ayurvedic medicinal plants and compound formulations. Int J Pharma Archive. 2014; 3:400-9.
10. Taur DJ, Patil RY. Some medicinal plants with antiasthmatic potential: a current status. Asian Pac J Trop Biomed. 2011; 1(5):413-418.
11. Satyavati GV, Gupta AK, Tandon N. Medicinal Plants of India, Vol. 2, New Delhi: ICMR; 1987.
12. Gupta AK, Tandon N. Reviews on Indian Medicinal Plants, Vol. 1-3, New Delhi; ICMR; 2004.
13. Gupta AK, Sharma M, Tandon N. 2004. Reviews on Indian Medicinal Plants. Vol.4, ICMR, New Delhi.
14. The Wealth of India. A Dictionary of Indian Raw Materials and Industrial Products. Vol.I-XI, New Delhi: PID; 1948-1976.
15. The Wealth of India. First Supplement Series (Raw Materials). Vol. 1-5, New Delhi: NISCAIR,

CSIR; 2000-2004.

16. Kumar D, Bhat ZA, Chashoo IA, Deoda RS, Mudgade SC, Kumar V. Bronchodilator Activity in Traditional Medicines: Gift of God Kingdom. Bronchitis. 2011; 171-190. DOI: 10.13140/2.1.1846.3528
17. Kumar D, Arya V, Kaur R, Bhat ZA, Gupta VK, Kumar V. A review of immunomodulators in the Indian traditional health care system, J Microbiol Immunol Infect. 2012; 45(3):165-184.
18. Alamgeer, Younis W, Asif H, Sharif A, Riaz H, Bukhari IA, et al. Traditional medicinal plants used for respiratory disorders in Pakistan: A review of the ethno-medicinal and pharmacological evidence. Chin Med. 2018; 13:48.
19. Gairola S, Gupta V, Bansal P, Singh R, Maithani M. Herbal antitussives and expectorants–A review. Int J Pharma Sci Rev Res. 2010; 5(2):5-9.
20. Zahidin NS, Saidin S, Zulkifli RM, Muhamad II, Ya'akob H, Nur H. A review of *Acalypha indica* L. (Euphorbiaceae) as traditional medicinal plant and its therapeutic potential. J Ethnopharmacol. 2017; http://dx.doi.org/10.1016/j.jep.2017.06.019
21. Ali SI, Gopalakrishnan B, Venkatesalu V. Pharmacognosy, phytochemistry and pharmacological properties of *Achillea millefolium* L.: A review. Phytother Res. 2017; DOI: 10.1002/ptr.5840
22. Ara A, Arifuzzaman M, Ghosh CK, Hashem MdA, Ahmad MU, Bachar SC, et al. Anti-inflammatory activity of *Adenanthera pavonina* L., Fabaceae, in experimental animals. Revista Brasileira de Farmacognosia, 2010; 20(6), 929-32.
23. Kumar D, Bhat ZA, Singh P, Khatanglakar V, Bhujbal SS. Antiasthmatic and antiallergic potential of methanolic extract of leaves of *Ailanthus excelsa*. Revista Brasileira de Farmacognosia, 2011; 21(1): 139-145.
24. Kalaria P, Gheewala P, Chakraborty M, Karmath J. A phytopharmacological review of *Alstonia scholaris*: A panoramic herbal medicine. Int J Res Ayurveda Pharm, 2012; 3(3):367-71.
25. Dey YN, Ota S, Srikanth N., Jamal M, Wanjari M. A phytopharmacological review on an important medicinal plant - *Amorphophallus paeoniifolius*. AYU. 2012; 33(1): 27-32.
26. Manda RM, Karka SR, Naresh B, Seru G. Analgesic and anti-inflammatory activity of whole plant of *Amorphophyllus sylvaticus* (Roxb). Int J Pharm Phytopharmacol Res. 2015; 4(5): 269-70.
27. Awakan OJ, Malomo SO, Adejare AA, Igunnu A, Atolani O, Adebayo AH, et al. Anti-inflammatory and bronchodilatory constituents of leaf extracts of *Anacardium occidentale* L. in animal models. J Integr Med. 2018; 16(1):62-70.
28. Sharma S, Rasal VP, Patil PA, Joshi RK. Effect of *Angelica glauca* essential oil on allergic airway changes induced by histamine and ovalbumin in experimental animals.

Indian J Pharmacol. 2017; 49(1):55-9.

29. Hemlatha K, Satyanarayana D. Anti-inflammatory activity of *Annona squamosa* Linn. Biomed Pharmacol J. 2009; 2(1). Corpus ID: 53557440. Available from: http://biomedpharmajournal.org/?p=556

30. Agnihotri V, Karchuli MS, Varandani D, Koka S. Anti-inflammatory potential of *Anogeissus latifolia*: assessment through effect on oxidative stress, IL-6 and TNF-? level. Inventi Impact: Ethnopharmacology. 2015; 3:80-4.

31. Anjum B, Kumar R, Kumar R, Prakash O, Srivastava RM, Pant AK. Phytochemical analysis, antioxidant, anti-Inflammatory and insect antifeeding activity of *Ardisia solanacea* Roxb. extracts, J Biologically Active Prod from Nature, 2019; 9(5):372-86.

32. Knipping K, van Esch ECAM, Wijering SC, van der Heide S, Dubois AE, Garssen J. In vitro and in vivo Anti-allergic effects of *Arctium lappa* L. Experimental Biol Med. 2008; 233(11):1469–77.

33. Sánchez-Mendoza M, Castillo-Henkel C, Navarrete A. Relaxant action mechanism of berberine identified as the active principle of *Argemone ochroleuca* Sweet in guinea-pig tracheal smooth muscle. The J Pharmacy Pharmacol. 2008; 60:229-36.

34. Mohanty B, Puri S, Kesavan V. A review on therapeutic potential of *Artemisia nilagirica*. J Plant Biochem Physiol. 2018; 6: 205. Doi: 10.4172/2329-9029.1000205

35. Nisar A, Malik A, Zargar M. *Atropa acuminata* Royle ex Lindl. blunts production of pro-inflammatory mediators eicosanoids.; leukotrienes, cytokines in vitro and in vivo models of acute inflammatory responses. J Ethnopharmacol. 2013; 147. 10.1016/j.jep.2013.03.038.

36. Lal S, Baraik B. Phytochemical and pharmacological profile of *Bacopa monnieri*-An ethnomedicinal plant. Int J Pharm Sci Res. 2019; 10(3): 1001-13.

37. Babu B, Gangarapu K, Thota S, Raja A, Anchuri SS, Ravi P, et al. Preliminary studies on anti-inflammatory and analgesic activities of *Baliospermum montanum*. Pharmacologyonline. 2009; 1:366-72.

38. Manekar SS, Charde MS.Evaluation of anti-asthmatic activity of methanolic extract of *Barleria prionitis* Linn. aerial parts". Int J Curr Pharma Res. 2018; 10(6):30-34.

39. Manisha, Kumar S. *Biophytum sensitivum* DC.: A review. Int J Pharm Sci Res. 2018; 9(1):27-36.

40. Sarkar L, Bhuvaneswari N, Samanta S, Islam N, Sen T, Fukui H, et al. A report on anti-oedemogenic activity of *Byttneria herbacea* roots - Possible involvement of histamine receptor (type I). J Ethnopharmacol. 2012; 140:443-6.

41. Ansari M, Jahan N, Shaikh AAM. A review on phytochemical and biological properties of *Calotropis gigantea* (Linn) R.Br. Phytomed. 2016; DOI: 10.15562/

phytomedicine.2016.32

42. Joseph B, Jini D. A medicinal potency of *Capparis decidua*–A harsh terrain plant. Res J Phytochem. 2011; 5:1-13.
43. Prasanth KG, Anandbabu A, Tom J, Kumar DB, Kumar K, Geetha G, et al. Ethanol extract of *Clerodendrum viscosum* vent Roots: Investigation of analgesic and anti inflammatory effects in male adult Swiss albino mice. Int J Nat Products Res. 2012; 1(4):67-71.
44. Sreejith G, Latha PG, Shine VJ, et al. Anti-allergic, anti-inflammatory and anti-lipidperoxidant effects of *Cassia occidentalis* Linn. Indian J Exp Biol. 2010; 48(5):494-498.
45. Nagore DH, Ghosh VK, Patil MJ. Evaluation of antiasthmatic activity of *Cassia sophera* linn. Phcog Mag. 2009; 5, Suppl S2:109-18.
46. Arya D, Meena M, Grover N, Patni V. In vitro anti-inflammatory and anti-arthritic activity in methanolic extract of *Cocculus hirsutus* (l.) Diels. in vivo and in vitro. Int J Pharmaceut Sci Res. 2014; 5(5):1957-62.
47. Zilaee M, Hosseini SA, Jafarirad S, Abolnezhadian F, Cheraghian B, Namjoyan F, et al. An evaluation of the effects of saffron supplementation on the asthma clinical symptoms and asthma severity in patients with mild and moderate persistent allergic asthma: a double-blind, randomized placebo-controlled trial. Respir Res. 2019; 20(1):39.
48. Gupta DP, Park SH, Yang HJ, Suk K, Song GJ. Neuroprotective and Anti-neuroinflammatory effects of a poisonous plant *Croton tiglium* Linn. extract. Toxins (Basel). 2020; 12(4):261.
49. Gohil KJ, Patel JA, Gajjar AY. Pharmacological review on *Centella asiatica*: A potential herbal Cure-all. Indian J Pharm Sci. 2010; 72(5):546–56.
50. Mohideen V, Hazeena, Sadique J. Antihistaminic activity of *Cissus quadrangularis*. Ancient Sci Life. 1999; 18. 271-4.
51. Srivastava S, Singh P, Mishra G, Jha KK, Khosa RL. *Costus speciosus* (Keukand): A review. Der Pharmacia Sinica. 2011; 2(1):118-128.
52. Wang J-H, Luan F, He X-D, Wang Y, and Li M-X. Traditional uses and pharmacological properties of *Clerodendrum* phytochemicals. J Tradit Complement Med. 2018; 8(1):24–38.
53. Pekamwar SS, Kalyankar TM, Kokate SS. Pharmacological activities of *Coccinia grandis*: Review. J App Pharm Sci. 2013; 3(5):114-9.
54. Shilpa K, Harish CR, Krishnaveni B. Anti-inflammatory activity of *Crinum defixum* ker-gawl. Int J Pharma Sci Drug Res, 2012; 4(2):147-9.
55. Nille GC, Reddy KRC. A phytopharmacological review of plant– *Cassia auriculata*. Int J Pharm Biol Archives. 2015; 6(6):1–9.
56. Shah S, Patel K, Kerai S. Evaluation of Anti-asthmatic activity of *Centratherum anthelminticum* Linn. in experimental animals. J Pharma Res. 2017; DOI: 10.18579/jpcrkc/

2017/16/1/112469

57. Vikhe S, Nirmal S. Antiallergic and antihistaminic actions of *Ceasalpinia bonducella* seeds: Possible role in treatment of asthma. J Ethnopharmacol. 2018; 216:251-8.

58. Singh NK, Garabadu D, Sharma P, Shrivastava SK, Mishra P. Anti-allergy and anti-tussive activity of *Clitoria ternatea* L. in experimental animals. J Ethnopharmacol. 2018; 224:15-26.

59. Genwa C, Gilhotra UK, Varma AK, Rajpurohit B. Evaluation of antiasthmatic activity of *Citrullus colocynthis* fruit. Int J Pharm Sci Res. 2017; 8(2):716-21.

60. Anusha S, Suja SR. Anti-inflammatory, antioxidant and phytochemical properties of *Clematis gouriana* Roxb. ex. DC. leaves. Int J Res Analytical Rev. 2019; 6(1):31-37.

61. Anupama N, Madhumitha G, Rajesh KS. Role of dried fruits of *Carissa carandas* as anti-inflammatory agents and the analysis of phytochemical constituents by GC-MS. BioMed Res Int. 2014: Article ID 512369. https://doi.org/10.1155/2014/512369

62. Kim Y, Kim K, Han C, Park S, Yang H, Lee B, et al. Anti-inflammatory activity of *Crinum asiaticum* Linne var. *japonicum* extract and its application as a cosmeceutical ingredient. J Cosmetic Sci. 2008; 59: 419-30.

63. Yadav DK. Pharmacognostical, phytochemical and pharmacological profile of *Colebrookea oppositifolia* Smith. J Drug Delivery Therap. 2019; 9(6-s):233-7.

64. Gambhire MN, Juvekar A, Wankhede S. Anti-inflammatory activity of aqueous extract of *Cinnamomum tamala* leaves by in vivo and in vitro methods. 2009; 2:1521-24.

65. Pandit P, Singh A, Bafna A, Kadam P, Patil M. Evaluation of antiasthmatic activity of *Curculigo orchioides* Gaertn. Rhizomes. Indian J Pharmaceut Sci. 2008; 70:440-4.

66. Tamhane AS, Mute V, Takawale H, Awari DM. Preclinical evaluation and antiasthmatic activity of *Cassia tora* Linn. leaves. Int J Res Ayurveda Pharm. 2012; 3:273-5.

67. Rajasree RS, Ittiyavirah PS, Harindran J. In vitro studies on methanol extract of whole fruit of *Cucumis melo*. Linn. (F1 hybrid) with a focus on antiinflammatory activity The Pharma Innov J. 2019; 8(6):633-7.

68. Mala F, Sofi M. Evaluation of antihistaminic activity of herbal drug isolated from *Cuscuta reflexa* Roxb. Annals Plant Sci. 2017; 6:1807. 10.21746/aps.2017.6.11.15.

69. Sharma P, Hullatti KK, Kuppasth IJ, Sharma S. Studies on anti-asthmatic property of *Cyamopsis tetragonoloba* (L.) Taub. leaf extracts. J Nat Remedies. 2010; 10(1):81-6.

70. Al-Snafi AE. Medical importance of *Datura fastuosa* (syn: *Datura metel*) and *Datura stramonium*- A review. IOSR J Pharm. 2017; 7(2):43-58.

71. Vipin PS, Johannah NM, Menon S, Lawrence L, Indu MS, Padikkala J. Study of antioxidant and anti-inflammatory activities of methanol extract of *Desmodium gyrans* (DC). J Chem Pharmaceut Res. 2015; 7(9):227-34.

72. Rathi A, Rao ChV, Ravishankar B, De S, Mehrotra S. Anti-inflammatory and anti-nociceptive activity of the water decoction *Desmodium gangeticum*. J Ethnopharmacol. 2004; 95(2-3):259-63.

73. Singh A, Saharan VA, Kumawat I, Veerma R, Bhandari A. Anti-histaminic activity of *Desmostachya bipinnata*. J Biologically Active Products from Nature. 2014; 4(1):7-11.

74. Zakaria ZA, Ghani ZDFA, Nor RNSRM, Gopalan HK, Sulaiman MR, Abdullah FC. Antinociceptive and anti-inflammatory activities of *Dicranopteris linearis* leaves chloroform extract in experimental animals. *Yakugaku Zasshi*. 2006; 126(11): 1197–1203.

75. Mbiantcha M, Kamanyi A, Teponno RB, Tapondjou AL, Watcho P, Nguelefack TB. Analgesic and anti-inflammatory properties of extracts from the bulbils of *Dioscorea bulbifera* L. var *sativa* (Dioscoreaceae) in Mice and Rats. Evid Based Complement Alternat Med. 2011; 2011:912935.

76. Kadam P, Bodhankar S. Analgesic and anti-inflammatory activity of seed extracts of *Diplocyclos palmatus* (L.) C. Jeffrey. Int J Pharma Bio Sci. 2013; 4:P970-P978.

77. Aswal S, Kumar A, Semwal RB, Chauhan A, Kumar A, Lehmann J, et al. *Drimia indica*: A plant used in traditional medicine and its potential for clinical uses. Medicina (Kaunas). 2019; 55(6):255.

78. Jahan R, Al-Nahain A, Majumder S, Rahmatullah M. Ethnopharmacological significance of *Eclipta alba* (L.) Hassk. (Asteraceae). Int Sch Res Notices. 2014; 2014: 385969. doi: 10.1155/2014/385969

79. Kumar S, Malhotra R, Kumar D. *Euphorbia hirta:* Its chemistry, traditional and medicinal uses, and pharmacological activities. Pharmacogn Rev. 2010; 4(7): 58–61.

80. Neelmani C, Sourabh R, Dubey BK. Antiasthmatic effect of leaves of *Evolvulus alsinoides. Int J Pharm Sci Res.* 2012; 3(12); 5125-28.

81. Sermugapandian N, Rubini R, Martina V. Anti-inflammatory effect of *Elettaria cardamomum* oil on carrageenan-induced paw edema using rats based on tumor necrosis factor α, interleukin 6, and interleukin 1 levels in serum. Asian J Pharma Clinical Res. 2018; 11:207. 10.22159/ajpcr.2018.v11i2.20434.

82. Kumar A, Lingadurai S, Jain A, Barman NR. *Erythrina variegata* Linn: A review on morphology, phytochemistry, and pharmacological aspects. Pharmacogn Rev. 2010; 4(8):147-152.

83. Srivastava R, Soni N. An updated review on phytopharmacological profile of *Euphorbia tithymaloides*

(L.) Poit. The Pharma Innovation J. 2019; 8(5):109-115.

84. Palit P, Mukherjee D, Mahanta P, Shadab M, Ali N, Roychoudhury S, et al. Attenuation of nociceptive pain and inflammatory disorders by total steroid and terpenoid fraction of *Euphorbia tirucalli* Linn root in experimental in vitro and in vivo model. Inflammopharmacol. 2017; 26. 10.1007/s10787-017-0403-7.

85. Yeum H-S, Lee Y-C, Kim S-H, Roh S-S, Lee J-C, Seo Y-B. *Fritillaria cirrhosa* , *Anemarrhena asphodeloides* , Lee-Mo-Tang and cyclosporine a Inhibit ovalbumin-induced eosinophil accumulation and th2-mediated bronchial hyperresponsiveness in a murine model of Asthma. Basic Clin Pharmacol Toxicol. 2007; 100: 205-13.

86. Kumar A, Gahlot K, Dora J, Tripathi R. Anti-inflammatory and analgesic activities of *Flemingia strobilifera* (Linn.). Res J Pharmaceut Biol Chem Sci. 2011; 2(3):541-46.

87. Kapoor M, Jasani N, Acharya N, Acharya S, Kumar V. Phytopharmacological evaluation and anti-asthmatic activity of *Ficus religiosa* leaves. Asian Pacific J Trop Med. 2011;642-4.

88. Jadhav RS, Bhambar RS. Evaluation of antiasthmatic activity of *Feronia elephantum* bark linn. European J Biomed Pharmaceut Sci. 2017; 4(2):158-160.

89. Thupurani MK, Reddy PN, Charya MAS, Mittapelli G. In vitro and in vivo determination of anti-inflammatory activities of *Garuga pinnata* Roxb. Int J Pharm Sci Rev Res. 2013; 22(2):310-4.

90. Joshi CS, Sanmuga EP, Mathela CS. Isolation and anti-inflammatory activity of colchicinoids from *Gloriosa superba* seeds, Pharma Biol. 2010; 48(2):206-9.

91. Kulkarni YA, Panjabi R, Patel V, Tawade A, Gokhale A. Effect of *Gmelina arborea* Roxb. in experimentally induced inflammation and nociception. J Ayurveda Integr Med. 2013; 4(3):152-7.

92. Khan F, Sarker MMR, Ming LC, Mohamed IN, Zhao C, Sheikh BY, et al. Comprehensive review on phytochemicals, pharmacological and clinical potentials of *Gymnema sylvestre*. Front Pharmacol. 2019; 10:1223.

93. Ashok KBS, Lakshman K, Jayaveera KN, Murgan VC, Kumar APA, Kumar V, et al. Pain management in mice using methanol extracts of three plants belongs to family Amaranthaceae. Asian Pacific J Trop Med. 2010: 527-30.

94. Pohocha N, Grampurohit N. Antispasmodic activity of the fruits of *Helicteres isora* Linn. Phytother Res. 2001; 15:49-52.

95. Ganapathy PSS, Ramchandra GM, Bhusari KP, Duragkar NJ. Bronchorelaxent and anti-inflammatory effect of *Heteropogon contortus* (l.) Beauv. methanolic extract. Int J PharmTech Res. 2013; 5:99-104.

96. Bhukya B, Anreddy RNR, Gottumukkala KM. Analgesic and anti-inflammatory activities of leaf extract of *Hiptage benghalensis* (L.) Kurz. Biomed. Pharmacol. J. 2009; 2(1). Available from: http://biomedpharmajournal.org/?p=669

97. Ganapathy PSS, Ramachandra YL, Rai SP. Anti-inflammatory and analgesic activities of *Holarrhena antidysenterica* Wall. leaf extract in experimental animal models. Int J Biomed Pharmaceut Sci. 2010; 4(2):101-3.

98. Pradhan D. Preliminary investigation of the anti-inflammatory properties of *Hybanthus enneaspermus*. Int J Universal Pharmacy Life Sci. 2011; 1:239-45.

99. Das N, Bhattacharya A, Mandal S, Debnath U, Dinda B, Mandal S, et al. *Ichnocarpus frutescens* root derived phyto-steroids defends inflammation and algesia by pulling down the pro-inflammatory and nociceptive pain mediators: An in-vitro and in-vivo appraisal. Steroids. 2018; 139. 10.1016/j.steroids.2018.09.005.

100. Saraswathi MN, Karthikeyan M, Rajasekar S, Gopal V. *Indigofera tinctoria* Linn.- A phytopharmacological review. Int J Res Pharma Biomed Sci. 2012; 3(1):164-9.

101. Hamsa TP, Kuttan G. Evaluation of the anti-inflammatory and anti-tumor effect of *Ipomoea obscura* (l) and its mode of action through the inhibition of pro inflammatory cytokines, nitric oxide and COX-2. Inflamm. 2011; 34:171–183.

102. Fierascu I, Ungureanu C, Avramescu SM, Cimpeanu C, Georgescu MI, Fierascu RC, et al. Genoprotective, antioxidant, antifungal and anti-inflammatory evaluation of hydroalcoholic extract of wild-growing *Juniperus communis* L. (Cupressaceae) native to Romanian southern sub-Carpathian hills. BMC Complement Altern Med. 2018; 18(1):3.

103. Fernandes JM, Cunha LM, Azevedo EP, Lourenço EMG, Fernandes-Pedrosa MF, Zucolotto SM. *Kalanchoe laciniata* and *Bryophyllum pinnatum*: An updated review about ethnopharmacology, phytochemistry, pharmacology and toxicology, Revista Brasileira de Farmacognosia, 2019; 29(4): 529-58.

104. Jagadeeswari M, Hemashenpagam N. In vitro antioxidant and anti-inflammatory potential of *Kedrostis foetidissima* (Jacq.) Cogn. leaf extracts. J Pharm Res. 2019; 8(5):360-5.

105. Acharya N, Acharya S, Kumar V, Kapoor M, Tripathi N. Anti-asthmatic and Anti-allergic activity of *Lagenaria siceraria* Mol. Standley. J Nat Remedies. 2012; 12:72-6.

106. Deb D, Dev S, Das A, Khanam D, Banu H, Shahriar M, et al. Anti-inflammatory and anti-diarrheal activities of the hydroalcoholic extract of *Lasia spinosa* Linn. (Araceae) roots. Latin Am J Pharma. 2010; 29:1269-76.

107. Kumar VG, Devanna N. An update of *Leucas aspera* – A medicinal plant. Int J Sci Res Methodol. 2016; 5(1):485-503.

108. Baburao B, Reddy ARN, Kiran G, Reddy YN, Mohan GK. Antioxidant, analgesic and anti-inflammatory activities of *Leucas cephalotes* (Roxb.ex Roth) Spreng. Brazilian J Pharma Sci. 2010; 46(3):525-29.

109. Yu S-Y, Wang S-W, Hwang TL,Wei B-L, Su C-J, Chang F-R, et al. Components from the leaves and twigs of mangrove *Lumnitzera racemosa* with anti-angiogenic and anti-inflammatory effects. Mar. Drugs. 2018; 16(11):404.

110. Baheti J, Awati S. Antiasthmatic activity of *Leptadenia reticulata* (Retz.) Wt. & Arn. leaves. 2013; 3rd International Conference on Applied Mathematics and Pharmaceutical Sciences (ICAMPS-2013), Singapore.

111. Shekhawat N, Vijayvergia R. Investigation of anti-inflammatory, analgesic and antipyretic properties of *Madhuca indica* Gmel. European J Inflamm. 2010; 8:165-171.

112. Zakaria ZA, Nor RNRM, Kumar HG, Sulaiman MR, Devi GR, et al. Antinociceptive, anti-inflammatory and antipyretic properties of *Melastoma malabathricum* leaves aqueous extract in experimental animals. Can J Physiol Pharmacol. 2006; 84(12):1291-99.

113. Sridevi H, Jayaraman P, Pachaiyappan P. Anti-inflammatory and antioxidant activities of *Memecylon umbellatum* Burm.f leaf extract under invitro. IOSR J Pharma Biol Sci. 2014; 9(5):61-8.

114. Malik F, Hussain S, Sadiq A, Parveen G, Wajid A, Shafat S, et al. Phyto-chemical analysis, anti-allergic and anti-inflammatory activity of *Mentha arvensis* in animals. African J Pharmacy Pharmacol. 2003; 6(9):613-19.

115. Suralkar AA, Patil DY. *Michelia champaca*: a useful remedy for mast cell stabilization, antiallergic and anaphylactic activity in management of asthma. 2015; Corpus ID: 98224763

116. Chandran R, Thangaraj P, Saravanan S, Thankarajan S, Arunachalam K. Antioxidant and anti-inflammatory potential of *Monochoria vaginalis* (Burm. F.) C. Presl.: A wild edible plant. J Food Biochem. 2012; 36. 10.1111/j.1745-4514.2011.00560.x.

117. Patro G, Panda M, Das P, Bhaiji A, Panda A, Sahoo HB. Pharmacological evaluation of *Musa paradisiaca* (Linn.) on bronchial asthma. Egypt Pharmaceut J. 2016; 15:25-30.

118. Mallikadevi T, Paulsamy S Karthika K, Jamuna S. In vitro and in vivo anti-inflammatory activity of whole plant methanolic extract of *Mukia maderaspatana* (L.) M.Roem. (Cucurbitaceae). Int J Pharmacy Pharmaceut Sci. 2012; 4:435-9.

119. Dangar D, Patel N. Evaluation of anti-asthmatic activity of *Neuracanthus sphaerostachyus* Dalz. leaves extract. Asian J Pharmacy Pharmacol. 2019; 5:744-9.

120. Sivaprakasam P, Viswanathan S, Thirugnanasambantham P, Reddy

MK, Vijayasekaran V. Pharmacological screening of *Ochna obtusata*. Fitoterapia. 1996; 67:117-20.

121. Ozolua RI, Umuso DI, Uwaya DO, Modugu AA, Oghuvwu SO, et al. Evaluation of the anti-asthmatic and antitussive effects of aqueous leaf extract of *Ocimum gratissimum* in Rodents. Med Aromat Plants. 2016; 5: 235. doi:10.4172/2167-0412.1000235
122. Lee A-Y, Kang S, Park S-J, Huang J, Im D-S. Anti-allergic effect of Oroxylin A from *Oroxylum indicum* using *in vivo* and *in vitro* experiments. Biomol Ther (Seoul). 2016; 24(3):283-90.
123. Sasikala, V, Shanmugam S, Parimelazhagan T. Analgesic and anti-inflammatory activities of *Passiflora foetida* L. Asian Pacific J Trop Med. 2011; 4:600-3.
124. Pathan A. *Peganum harmala* seeds: Evaluation of antiasthmatic effect by using clonidine induced mast cell degranulation. Neuropharmac J. 2016; 1:18-21.
125. Chandak RR, Dighe NS. A review on phytochemical & pharmacological profile of *Pergularia daemia* linn. J Drug Delivery Therapeutics. 2019; 9(4-s):809-14.
126. Adedapo AA, Ofuegbe SO. Anti-inflammatory and antinociceptive activities of the aqueous leaf extract of *Phyllanthus amarus* Schum (Euphorbiaceae) in some laboratory animals. J Basic Clin Physiol Pharmacol. 2015; 26(1):89-94.
127. Saha A, Masud MA, Bachar SC, Kundu JK, Datta BK, Nahar L, et al. The analgesic and anti-inflammatory activities of the extracts of *Phyllanthus reticulatus* in mice model. Pharmaceut Biol. 2007; 45(5):355-9.
128. Kajaria D, Tripathi JS, Tiwari SK, Pandey BL. Anti-histaminic, mast cell stabilizing and bronchodilator effect of hydroalcoholic extract of polyherbal compound-Bharangyadi. Anc Sci Life. 2012; 31(3):95-100.
129. Khan MA, Khan H, Khan S, Mahmood T, Khan PM, Jabar A. Anti-inflammatory, analgesic and antipyretic activities of *Physalis minima* Linn. J Enzyme Inhibition Med Chem. 2009; 24:3: 632-7.
130. Bui TT, Piao CH, Hyeon E, Fan Y, Nguyen TY, Jung SY, et al. The protective role of *Piper nigrum* fruit extract in an ovalbumin-induced allergic rhinitis by targeting of NFκBp65 and STAT3 signalings. Biomed Pharmacother. 2019; 109:1915-23.
131. Gupta S, Duraiswamy B, Satishkumar MN. Peritoneal mast cell stabilization potential of *Pothos scandens* L. Indian J Pharmacol. 2013; 45(1):83-6.
132. Kehili HE, Zerizer S, Beladjila KA, Kabouche Z. Anti-inflammatory effect of Algerian date fruit (*Phoenix dactylifera*). Food Agri Immunol. 2016; 27:6, 820-9.
133. Abokyi S, Koffuor GA, Kyei S, Asiamah EA, Atobiga CN, Awuah A. Antiallergic effect of an aqueous leaf extract of *Pistia stratiotes* in murine model of ovalbumin-induced allergic conjunctivitis. Pharmacognosy Res.

2014; 6(4):274-9.

134. Farokhi F, Khaneshi F. Histophatologic changes of lung in asthmatic male rats treated with hydro-alcoholic extract of *Plantago major* and theophylline. Avicenna J Phytomed. 2013; 3(2):143-151.

135. Sammaiah G, Thirupathi K, Srivastava RS. Anti-inflammatory and antinociceptive effects of the alcoholic extract of Indian *Polygala arvensis* in experimental animals. East and Central African J Pharmaceut Sci. 2007; 10(2):39-44.

136. Alagammal, Almeida DD, Mohan V. Anti-inflammatory activity of *Polygala chinensis* L whole plant (Polygalaceae). Int J Chem Pharmac Sci. 2012; 3:1-3.

137. Sivasamy V, Ekambaram M, Ramalingam K, Balasubramanian A. Anti-inflammatory activity of *Portulaca quadrifida* Linn. Intercontinent J Pharmaceut Investigat Res. 2016; 3(4):160-4.

138. Mohammed R, Mohammed U, Pathan EK, Jain B, Pawar V, Sandeep R. In-vitro anti-inflammatory activity of *Pterocarpus marsupium* Roxb. stem bark on albino rats. J Pharm Scien Innov. 2012; 1(2):21-5.

139. Pandey N, Yadav D, Pandey V, Tripathi YB. Anti-inflammatory effect of *Pueraria tuberosa* extracts through improvement in activity of red blood cell anti-oxidant enzymes. Ayu. 2013; 34:297-301.

140. Pinheiro AJMC, Gonçalves JS, Dourado AWA, de Sousa EM, Brito NM, Silva LK, et al. *Punica granatum* L. leaf extract attenuates lung inflammation in mice with acute lung injury. J Immunol Res. 2018; Article ID 6879183.

https://doi.org/10.1155/2018/6879183

141. Chandra S, Saklani S, Agrawal RK. Isolation and identification of pharmacologically active compounds in fruit of *Pyrus pashia*. Int J Med Res Health Sci. 2016; 5(8):30-4.

142. Ghante MH, Bhusari KP, Duragkar NJ, Jain NS, Warokar AS. Bronchorelaxant, mast cell stabilizing, anti-inflammatory and antioxidant activity of *Randia dumetorum* (Retz.) Lamk. extracts. Acta Poloniae Pharmaceutica - Drug Res. 2012; 69(3):465-74.

143. Prieto JM, Recio MC, Giner RM, Máñez S, Ríos JL. Pharmacological approach to the pro- and anti-inflammatory effects of *Ranunculus sceleratus* L. J Ethnopharmacol. 2003; 89(1):131-7.

144. Alamgeer, Nasreen P, Uttra AM, Asif H, Younis W, Hasan UH, et al. Evaluation of anti-inflammatory and analgesic activities of aqueous methanolic extract of *Ranunculus muricatus* in albino mice. Pak J Pharm Sci. 2020; 33(3):1121-26.

145. Pandith SA, Dar RA, Lattoo SK, Shah MA, Reshi ZA. *Rheum australe*, an endangered high-value medicinal herb of North Western Himalayas: a review of its botany, ethnomedical uses, phytochemistry and pharmacology. Phytochemistry Reviews: Proceedings of the Phytochemical Society of Europe. 2018; 17(3):573-609.

146. Joharapurkar A, Deode NM, Zambad, S, Umathe SN. Immunomodulatory activity of alcoholic extract of *Rubia cordifolia* Linn. Indian Drugs. 2003; 40:179-81.

147. Arora M, Siddiqui A, Paliwal S, Sood P. A phyto-pharmacological overview on *Salvadora oleoides* Decne. Indian J Nat Prod Resources. 2014; 5:209-14.

148. Chopra RN. The treatment of bronchial asthma with *Saussurea lappa* (Kuth Root). The Indian Medical Gazette. 1928; 63(4):186-190.

149. Akhtar J, Siddique KM, Salma Bi, Mujeeb M. A review on phytochemical and pharmacological investigations of miswak (*Salvadora persica* Linn). J Pharm Bioallied Sci. 2011; 3(1):113–7.

150. Lapuz AMR, Arabiran RDA, Sembrano TM, Albaniel JR, Paet JC, Maini HA. Preformulation and Evaluation of antibacterial and anti-Inflammatory activities of *Saccharum spontaneum* Linne root extract cream. Int J Chem Engineering Appl. 2016; 7(3):204-8.

151. Suralkar AA, Gaikwad KK, Jadhav AS, Vaidya GS. Evaluation of antihistaminic activity of *Sida rhombifolia* linn in management of allergic asthma. Int J Instit Pharm Life Sci. 2014; 4(2):322-32.

152. Kumar R, Singh R. Acute-toxicity, anti-inflammatory and bronchial smooth muscles investigation of *Sisymbrium irio* Linn (seeds) in experimental animal models. Int J Res Studies in Biosci. 2015; 1:48-53.

153. Ndebia E, Kamgang R, Nkeh-ChungagAnye B. Analgesic and anti-inflammatory properties of aqueous extract from leaves of *Solanum torvum* (Solanaceae). African J Tradit Complement Altern Med. 2006; 4:240-4.

154. Govindan S, Viswanathan S, Vijayasekaran V, Alagappan R. Further studies on the clinical efficacy of Solanum xanthocarpum and Solanum trilobatum in bronchial asthma. Phytother Res. 2004; 18(10):805-9.

155. Deb P, Ghosh R, Chakraverty R, Debnath R, Das L, Bhakta T. Phytochemical and pharmacological evaluation of fruits of *Solanum indicum* linn. Int J Pharma Sci Rev Res. 2014; 25:28.

156. Prachayasittikul V, Prachayasittikul S, Ruchirawat S, Prachayasittikul V. High therapeutic potential of *Spilanthes acmella*: A review. EXCLI J. 2013; 12:291-312.

157. Ismail H, Rasheed A, Ihsan-ul Haq, Jafri L, Ullah N, Dilshad E, et al. Five indigenous plants of Pakistan with antinociceptive, anti-inflammatory, antidepressant, and anticoagulant properties in Sprague dawley rats. Evidence-Based Complement Altern Med. 2017; Article ID 7849501. https://doi.org/10.1155/2017/7849501

158. Clarke R, Lundy FT, McGarvey L. Herbal treatment in asthma and COPD – Current evidence. Clin Phytosci. 2015; 1:4.

159. Chaudhary S, Hisham H, Mohamed D. A review on phytochemical and

pharmacological potential of watercress plant. Asian J Pharm Clin Res. 2018; 11(12):102-7.

160. Balasubramanian T, Chatterjee TK, Sarkar M, Meena SL. Anti-inflammatory effect of *Stereospermum suaveolens* ethanol extract in rats, Pharm Biol. 2010; 48:318-23.

161. Riaz M, Zia-Ul-Haq M, Jaafar HZE. Common mullein, pharmacological and chemical aspects. Revista Brasileira de Farmacognosia. 2013; 23(6):948-59.

162. Enoc WN, Daisy MGN, Wilbroda OA, Alphonse WW, Joseph NJN, Maina MJK. Antinociceptive and anti-inflammatory effects of flavonoids rich fraction of *Solanum incanum* (Lin) root extracts in mice. J Phytopharmacol. 2018; 7(4):399-403.

163. Patel P, Patel K, Gandhi T. Evaluation of effect of *Taxus baccata* leaves extract on bronchoconstriction and bronchial hyperreactivity in experimental animals. J Young Pharm. 2011; 3(1):41-7.

164. Palbag S, Dey B, Singh N. Ethnopharmacology, phytochemistry and pharmacology of *Tephrosia purpurea*. Chinese J Nat Med. 2014; 12:1-7.

165. Kariuki HN, Kanui TI, Yenesew A, Patel N, Mbugua PM. Antinocieptive and anti-inflammatory effects of *Toddalia asiatica* (L) Lam. (Rutaceae) root extract in Swiss albino mice. Pan Afr Med J. 2013; 14:133.

166. Alagar YS, Ramalingam S, Jabamalai RA, Subban R. Antihistamine from *Tragia involucrata* L. leaves. J Complement Integr Med. 2015; 12(3):217-26.

167. Kumar R, Perumal P, Shankar BR. Antinociceptive and anti-inflammatory activity of alkaloid fraction of *Trichopus zeylanicus* Gaertn. Int J Pharm Pharmaceut Sci. 2012; 4:632-35.

168. Emtiazy M, Oveidzadeh L, Habibi M, Molaeipour L, Talei D, Jafari Z, et al. Investigating the effectiveness of the *Trigonella foenum-graecum* L. (fenugreek) seeds in mild asthma: a randomized controlled trial. Allergy Asthma Clin Immunol. 2018; 14:19.

169. Kumeshini S, Kumar G, Baojun X. *Trianthema portulacastrum* L. (Giant pigweed): Phytochemistry and pharmacological properties. Phytochem Rev. 2017; 16:461-78.

170. Baburao B, Rajyalakshmi G, Allenki V, Gangarapu K, Anchuri SS Rao B, et al. Anti-inflammatory and antimicrobial activities of methanolic extract of *Tribulus terrestris* Linn. plant. Int J Chem Sci. 2009; 7:1867-72.

171. Ahuja A, Jeong D, Kim M-Y, Cho JY. *Trichosanthes tricuspidata* Lour. Methanol extract exhibits anti-inflammatory activity by targeting Syk, Src, and Irak1 kinase activity. Evidence-Based Complement Altern Med. 2019; Article ID 6879346, https://doi.org/10.1155/2019/6879346

172. Arawwawala M, Thabrew I, Arambewela L, Handunnetti S. Anti-inflammatory activity of

Trichosanthes cucumerina Linn. in rats. J Ethnopharmacol. 2010; 131(3):538-43.

173. Wee HN, Neo SY, Singh D, Yew HC, Qiu ZY, Tsai XC, et al. Effects of *Vitex trifolia* L. leaf extracts and phytoconstituents on cytokine production in human U937 macrophages. BMC Complement Med Ther. 2020; 20(1):91.
174. Hiralal GM, Bhusari KP, Duragkar NJ, Ghiware NB. Pharmacological evaluation for anti-asthmatic and anti-inflammatory potential of *Woodfordia fruticosa* flower extracts. Pharm Biol. 2014; 52(7):804-13.
175. Srivastava R. A review on phytochemical, pharmacological, and pharmacognostical profile of *Wrightia tinctoria*: Adulterant of kurchi. Pharmacogn Rev. 2014; 8(15):36-44.
176. Sharma S, Rasal VP, Joshi RK, Patil PA. In vivoevaluation of antiasthmatic activity of the essential oil ofZanthoxylum armatum. Indian J Pharm Sci. 2018; 80(2):383-90.
177. Okokon J, Koofreh D, Bassey A. Analgesic and anti-inflammatory activities of *Zea mays* leaves. J Herbal Drugs. 2016; 7:73-82.
178. Parveen S, Ramesh CK, Mahmood R, Pallavi M. Anti-inflammatory and antinociceptive activity of some orchids. 2018: 4(4):502.
179. Modi A, Jain S, Kumar V. *Zizyphus xylopyrus* (Retz.) Willd: A review of its folkloric, phytochemical and pharmacological perspectives. Asian Pac J Trop Dis. 2014; 4: S1–S6. Doi: 10.1016/S2222-1808(14)60408-4.
180. Adeyemi O, Akindele A, Nwaubani N. Anti-Inflammatory activity of *Drymaria cordata* extract. J Nat Remedies. 2008; 8:93-100.
181. Muko KN, Ohiri FC. A preliminary study on the anti-inflammatory properties of *Emilia sonchifolia* leaf extracts. Fitoterapia. 2000; 71(1):65-8.
182. Loro JF, del Rio I, Pérez-Santana L. Preliminary studies of analgesic and anti-inflammatory properties of *Opuntia dillenii* aqueous extract. J Ethnopharmacol. 1999; 67(2):213-18.
183. Manju V, Revathi R, Murugesan M. In vitro antioxidant, antimicrobial, anti-inflammatory, anthelmintic activity and phytochemical analysis of Indian medicinal spices. Research J Pharm and Tech. 2011; 4(4):596-99.
184. Saneja A, Kaushik P, Kaushik D, Kumar S, Kumar D. Antioxidant, analgesic and anti-inflammatory activities of *Santalum album* Linn. Planta Med. 2009; 75. 10.1055/s-2009-1216540.
185. Ferdous N, Hridi SU. Studies on the anti-inflammatory and analgesic efficacy of *Scindapsus officinalis* (Roxb.) Schott in laboratory animals. Int J Pharm Sci Res. 2013; 4(4):1434-41.
186. Singh B, Nadkarni J, Vishwakarma R, Bharate S, Nivsarkar M, Anandjiwala S. The hydroalcoholic extract of *Cassia alata* (Linn.) leaves and its major compound rhein exhibits antiallergic activity via mast

cell stabilization and lipoxygenase inhibition. J Ethnopharmacol. 2012; 141: 469-73.

187. Singh SK, Patel J, Dubey PK, Thakur S. A review on antiasthmatic activity of traditional medicinal plants. International J Pharmaceut Sci Review Res. 2014; 5:1000-7.

188. Gupta S, George P, Gupta V, Tandon VR, Sundaram KR. *Tylophora indica* in bronchial asthma-a double blind study. Indian J Med Res. 1979; 69:981-89.

189. The IUCN Red List of Threatened Species. Available from: https://www.iucnredlist.org/

190. The Plant List. A working list of all plant species. Available from: www.theplantlist.org

191. Jain SK. Dynamism in ethnobotany. Ethnobot. 2005; 17:3–13.

192. Jain SK, Jain V. Evolution of ethnobotany in last six decades in India: An overview. Ethnobot. 2015; 27:1–6.

193. Jain SK. Credibility of traditional knowledge: The criteria of multilocational and multiethnic use. Indian J Tradit Knowl. 2004; 3(2):137–153.

Bringing together tribal traditional healers and public health functionaries on the occasion of International Day of the World's Indigenous Peoples, 2019

Nishant Saxena[1]*, Dinesh Kumar[1], Aparup Das[2]

Abstract: *Vivid description, background, outcome and future directions which emerged from the one-day interactive workshop on traditional healing practices organized amidst the adivasis on the occasion of International Day of the World's Indigenous Peoples, 2019 is brought to light. This was a unique attempt by ICMR-NIRTH, Jabalpur to disseminate awareness about tribal traditional medicine system.*

BACKGROUND

Every year on 9 August the International Day of the World's Indigenous Peoples is commemorated to mark the date of inaugural session of the Working Group on Indigenous Populations at the United Nations in 1982 (UN Dept. of Economic and Social Affairs, 2019). In 2019, this auspicious day was celebrated in an unusual way by the National Institute of Research in Tribal Health (NIRTH), Jabalpur which is the only permanent institute of ICMR solely dedicated to research on health of tribes of India. An interactive workshop on '*Current Practices and Access to Healthcare in Indian Tribes*' was organized in the District Hospital at Dindori, Madhya Pradesh by outreaching to the tribal community in their own backyard.

In line with this year's theme of the International Day on *Indigenous Languages*, with focus that "when a language disappears the world loses a wealth of traditional knowledge" (UN Press, 2019), the idea was to have an open interactive discussion with the *Gunia* or tribal traditional healers (TTHs) who are considered as the living repository of age-old system of healing and curing. The event was successful in bringing together TTHs, patients of TTHs who availed treatment from them, frontline health workers (like ASHA, ANM) from tribal villages, village level functionaries like the Sarpanch, school

[1]Department of Botany, Government Meera Girls' College, Udaipur-313001, Rajasthan, India

[2]Department of Medicine, Pacific Medical College and Hospitals, Udaipur-313001, Rajasthan, India, Email: skvermaster@gmail.com; vartikajain31@gmail.com

*Corresponding address: 28, Shivaji Nagar, Udaipur-313001, Rajasthan, India; Ph: 9414168910

teachers, Anganwadi workers, members of civil society active in this area and public health functionaries from the block and district level along with team of researchers from NIRTH.

The seeds of this interactive workshop were sown about a year ago when community based and field oriented empirical research was taken up in the domain of "ethnomedicine" by NIRTH. There was a concerted effort to reach out to the TTHs, their patients and to the community whose survival and existence has been contingent on forest for a long time. The Dindori district in Madhya Pradesh is tribal dominated (65% population is ST as per Census 2011) and considered to be the abode of Baiga tribe – one of three PVTGs (Particularly Vulnerable Tribal Group) in the state. According to some, the term 'Baiga' itself refers to 'sorcerers' and are revered for their extensive knowledge of folk-medicine (MoTA& UNDP).

THE EVENT

Different sessions were organized in the interactive workshop to discuss and bring out voices of all sections about tribal traditional healing practices. The central theme was to learn about and address questions concerning efficacy of the traditional tribal medicines by hearing different perspectives. The highlights which emerged were - *Adivasi* lifestyle has always been sustainable with deep-rooted understanding of the give-and-take phenomenon with mother nature which has been key to their survival.Infectious diseases like dengue, chikungunya, malaria pose a threat in tribal areas which are experiencing seasonal migrations much more than ever before. Similarly, non-communicable diseases are also rising in tribal populations which need special attention. Both public health functionaries and TTHs acknowledged that traditional tribal medicines have been there for time immemorial, but there is no dialogue between the two. All expressed that this workshop will go a long way in melting the ice.

Further, TTHs claimed to be providing *jadi-booti* (herbal medicine) for a range of health issues like fever, malaria, jaundice (*moti-jheera*), snake bite, dog bite, kidney stones, TB, worm infestations in children, back pain, migraine (*adhkapari*), arthritis, anaemia, diabetes and others like *badi-dawa* for females just after delivery of the child. They also stressed on the usage of traditional food like *kodo* and *kutki* in their daily lives.TTHs elaborated their diagnostic methods by touching the forehead, hands, by feeling the pulse or *naadi*. Sometimes the problem is other worldly and then *jhaad-phonk* or faith healing is also performed. One of the healers even demonstrated diagnosis by feeling the pulse (Picture 1).Table 1 below depicts the range of health issues which are dealt with by the *Gunia* or tribal traditional healers (TTHs). This amply shows the contribution they are making in providing primary health care to the community and this thought was backed by patients who availed treatment from them.

Table 1: Specialization of tribal traditional healers*who attended the workshop

Healer	Village	Specialization as claimed by TTH	Naadivaidya (Y/N)
Gunia 1	Chanda	Diabetes, heart diseases, cancer, TB, post-delivery herbal combination for mother (*badi-dawa*), anaemia, sickle cell disease, jaundice, kidney stones	Y
Gunia 2		Fever, diarrhoea	N
Gunia 3	Kandawani	Joint pain	Y
Gunia 4		Fever	Y
Gunia 5		Faith and herbal healing	Y
Gunia 6		Joint pain, body pain	Y
Gunia 7		Faith & herbal healing, psychological issues, migraine	N
Gunia 8	Tantar	Muscular swelling	N
Gunia 9	Jampaani	Faith and herbal healing (conducts *chaukia*lso)	Y
Gunia 10	Kamko	Bone setting, fracture, muscular spasms	N
Gunia 11		Weakness, infertility	N
Gunia 12		Malaria, fever	N
Gunia 13		*Badi-dawa* (post-delivery herbal combination for mother)	Y
Gunia 14	Devalpur	Fever, cold	N
Gunia 15		Fever, cold, cough, diarrhoea	Y
Gunia 16	Bauna	Faith and herbal healing	N
Gunia 17		Stomach problems in adults and children	N
Gunia 18		Leucorrhoea, diabetes, hypertension, TB, epilepsy	Y
Gunia 19		Snake bite, scorpion bite, other venomous bite	Y
Gunia 20 *female*)		*Badi-dawa*, gynaecological problems, fever, parturition,infertility, family planning	N
Gunia 21 *female*)		parturition, *badi-dawa*	N
Gunia 22	Chapwar	Cough-cold, nausea	N
Gunia 23		Stomach related disorders, fever	N
Gunia 24	Bamhani	TB, cancer, weakness, fever, infertility, parturition, jaundice	Y

*Names of the healers have not been declared for anonymity.

On decision making and the all-important question "To whom does the person suffering with health issue in tribal areas approaches first for remedy?", differing perspectives were observed from frontline health workers vs. TTHs, their patients and village functionaries.TTHs and their patients pointed that different people respond differently to the treatment which is often taken wrongly and people feel that it is not working. Sometimes, patients do not follow completely healer's instructions and that may lead to differences.

It was revealed that many of the TTHs have a substantial clientele. The remuneration in lieu of their services depends upon the capacity of the patients and most often treatment is for free as it is considered sacred service to the community. TTHs expressed in unison the desire to "share" their knowledge when asked if they are willing to share their wisdom with the government and other agencies.

FUTURE DIRECTIONS

The interactive workshop culminated with consensus that usage of medicinal plants and its related traditional knowledge base holds the key to tribal

health. The traditional healers were urged to share their age-old traditional knowledge, which has been transferred from one generation to the next, before it's too late as this trait in tribes is a losing art. All felt that the need of the hour is to continue the dialogue which has been established between the bio-medical system and traditional tribal medicine system vis-à-vis the tribal community through the event.



Picture 1: A Gunia performing the *naadi-parikshan* i.e. feeling the pulse



Picture 2: Gunia and bio-medical researcher together

Authors declare no competing interests.

ACKNOWLEDGEMENT

Authors are thankful to the Director, ICMR-NIRTH Jabalpur for providing the motivation and institutional support to organise this all-important event. Special mention must be made of CMHO, Dindori who provided logistic support for organizing the event and also graced the occasion.

REFERENCES

Census, 2011. *Office of the Registrar General and Census Commissioner, Ministry of Home Affairs, Government of India*. accessed from https://censusindia.gov.in

Tribal Faces in India. Ministry of Tribal Affairs, Govt. of India, New Delhi & United Nations Development Programme, New Delhi. Accessed from https://tribal.nic.in/DivisionsFiles/tribalFaces.pdf

UN Dept. of Economic and Social Affairs, 2019. *International Day of the World's Indigenous Peoples 2019*. accessed from https://www.un.org/development/desa/indigenouspeoples/international-day-of-the-worlds-indigenous-peoples/international-day-2019.html

UN Press, 2019. *World Loses Wealth of Traditional Knowledge as Each Language Disappears, Warns Secretary-General, in Message on International Day of Indigenous Peoples*. accessed from https://www.un.org/press/en/2019/sgsm19694

Living Style of People in A Malaria Endemic Village: A Study Among Binjhal Tribe of Odisha, India

Mahendra Panda[1], K.C. Satapathy[2] and Amarendra Mahapatra[3]

Abstract: Villages of KBK (Kalahandi-Balangir-Koraput) districts in the state of Odisha, India have been categorized as highly malaria endemic. In spite of various time bound intervention strategies by government to control malaria, people are still suffering from the disease years together. The habitual behaviour of people living in a malaria endemic tribal dominated village of Balangir district under KBK district was taken for study. Data collected through qualitative research techniques and quantitative questionnaire methods. In the village information on people's daily activities, their sleeping habits, knowledge on the cause, transmission and survival strategies were collected. The findings revealed that though disease was familiar among people as *Palli Jwaroo* but its treatment practices passes through steps which were found greatly influenced by decisions of the elder members of the family. Factors associated with Socio-cultural activities especially keeping country fowl inside sleeping room, sleeping places, use of herbal medicines were found influential factors.

Keywords: Malaria *(Palli Jwaroo* Key Informants (KIs). Focus Group Discussions (FGDs). Kalahandi-Balangir-Koraput (KBK).*)*. Traditional Healer *(Baidya,* Country Fowl.

INTRODUCTION

Among vector borne diseases, Malaria causes more morbidity and mortality as it is transmitted through bites of female anopheles mosquito between dusk and dawn. Malaria existing as a major public health problem of human being since time immemorial in different places namely high altitude to sea level areas because of its transmission dynamics differs from place to place. It has been reported that South Africa and South East Asian countries are mostly affected due to malaria as compared to

Department of Anthropology, Utkal University, Vani Vihar, Bhubaneswar, Odisha, India

**Mobile No.: +91-6371441821, E-mail:* mahendra74iips98@gmail.com

Associate Professor, Department of Anthropology, Utkal University, Vani Vihar, Bhubaneswar, Odisha, India, Mobile No.: +91-9437984045, E-mail: kanhu_c@yahoo.com

Scientist-F, Epidemiology Division, ICMR-Regional Medical Research Center, Department of Health Research, Ministry of Health & Family Welfare, Govt. of India, Bhubaneswar 751 023, Odisha, India, Mobile No.: +91-9437694368, Office: 0674-2305661 Fax: 91-674-2301351

other parts of the World. It was estimated that a total of 1.4 billions of people are at risk of malaria and out of this 1.2 billion people reside in malaria endemic countries of Africa, South-East Asian Countries. Around 65 percent of total malaria cases of South-East Asian countries are from India . The World Malaria Report-2017, reveals that fifteen countries in Sub-Saharan Africa and India carried about 80 percent of the Global Malaria burden. India alone contributes four percent of total malaria cases, six percent of *Pf cases* and six percent of *Pv* cases and six percent of deaths. The State of Odisha in India, located on the east coast of India constitute four percent of total population of India, contributes about 44 percent of *Plasmodium falciparum (Pf)* & *Plasmodium vivax (Pv*) category of malaria cases, out of which 49 percent malaria cases are found *pf* category with 25.5 percent of total malaria deaths. In the year 2011 it has been reported that Odisha contributed 24.4% of the total malaria cases, 40 percent of *Plasmodium falciparum* infections and 17.3 percent of malaria deaths of the country in the year 2009. Tribal settlements are the most malaria endemic areas in the state of Odisha and are also economically underdeveloped, having difficult terrain, poor communication facilities and inadequate health infrastructure. Despite a good distribution of health facilities, family members are depending on self-treatment, private clinics, quakes and private medicine shops because of their easy and familial accessible in the locality and because of the this, young children suffered towards Malaria complicacy. The control strategy will be fruitful and it can achieve the goal when people understand the problem of disease spread and its management and can realize the seriousness of the disease, along with the Health workers . Malaria burden and transmission also vary from region to region in Odisha. It has been reported that the tribal dominated districts of Odisha namely- Koraput, Rayagada, Nowarangpur, Malkangiri Balangir, Sonepur , Kalahandi & Nuapada named as undivided KBK districts have shown high malaria prevalence followed by northern and western districts. In contrast, eight coastal districts showed very low incidence of malaria over the years except few pockets in these districts. Malaria incidence is thus multifarious in KBK regions because of its vast territory of forest with only 27 percent of state population and 50 percent tribal population, contributed 70 percent of total malaria positive cases and 64 percent of total malarial deaths case of Odisha up to 2018. Hence, the present study was conducted to know the factors influential for survival of people living in Malaria endemic village in terms of their prevention and cure strategies being adopted by them for cure of malaria. This study was concentrated to highlight the indigenous methods of prevention and cure practices adopted by the people before, during and after appearance of feverish symptoms of disease malaria popularly known by Tribe Binjhal people as "*Palli Jworaoo"*. The study was done with an objective to understand the cause, transmission and control practices of people in a malaria endemic tribal village in KBK districts of Odisha.

METHODS

Study Setting and Population

The study was conducted in the village Chabripalli in Khaparakhol Block in the district of Balangir under KBK district of Odisha and lies between latitude 20^0 52'41" North and Longitude 82^0 56' 41" East having the unique features of varying topography such as; hills and rolling uplands covered with forests (Gandhamardan mountain part of Eastern Ghats), water courses and plain agricultural land; as there was highest incidence of malaria cases under KBK district can be a better representative village for the whole KBK due to its backwardness and highest incidence of malaria cases with four reported deaths cases in the year 1998, 1999, 2000, 2001 respectively; and more than 90 percent fever cases in the village were reported due to *Plasmodium. falciparum (Pf)* category in the year 2016 to 2018 without any death case because of Government intervention; which can represent better for the KBK district for its backwardness as well as uniqueness of the tribe namely "Binjhal tribe".

Survey methods

For the whole village study, two fold research techniques were used for collection of empirical data. In first phase a field survey was undertaken by employing anthropological research methods with the following steps namely, identification of community gate keepers according to their role and responsibility in the village. Community Gate Keepers (GKs) were identified purposively from among villagers having their social responsibility in the village and their broader understanding on causes, transmission, prevention and control aspect of malaria. Information like daily habits, economic condition, exposure towards outside people, knowledge on Government sponsored schemes and treatment process were also collected from them. The selection of Gate Keeper (GK)/ Key Informants (KIs) for in-depth interview and participants for Focus Group Discussions (FGDs) were done purposively. The GKs/KIs in the present study included Village Jati Panchayat head/, traditional healers (*Baidya*) / Private Practioner (*Kabiraj*), local leaders (Panchayati Raj Institution (PRI) members)/ medical officers, female health workers, Anganwadi Worker (AWW), Auxiliary Nurse Mid-wives(ANM), Accredited Social Health Activists (ASHA) working in the village. The FGDs with a group of seven to eight villagers included adult men, adult women (including Pregnant & Lactating women) and health service providers available in the village. FGDs were organized at house of Village Head (Gatekeeper), at village common places such as village middle point, school campus as per availability of space in the village. A total number of five GKs/KI interviews and fourteen FGDs were undertaken in the present study for collection of qualitative primary data. A total six leading questions were asked to each KIs and during FGDs in order to have a broader understanding on causes, transmission, prevention and control aspect of disease malaria in the study village.

1. Is the disease malaria known to villagers and they are aware of it?
2. Do the people in the village have any idea about the Causes, Transmission and Control practices of malaria?
3. Do the villagers start the Malaria treatment immediately after occurrence of disease?
4. Do the people have any financial hardships causes delay in treatment?
5. How people do manage the Economic issues at the timing of disease burden?
6. What are the different methods adopted by people for malaria prevention practices?

Due to the remoteness of the village, the voluntarily expression of the members of the FGDs and KIs were recorded manually. On the basis of above findings a Structured Questionnaire was developed and door to door survey of all 167 Households' Heads/Members as per availability were conducted for collection of data from people in the village.

Ethical considerations:

The community members in the study village were informed well in advance about the study and the aim of the research work before visiting the study area before seven days. The key informants such as local PRI (*Panchayatiraj* Member (*Sarpanch/Ward Member/Samiti Member*) as well as Village head, health workers and school teacher were contacted individually. For the Focus Group Discussion the women and Men of the village were interacted separately after obtaining due consent along with permission from family heads. Further, individual members of different age-groups were duly informed and explained about the study and oral consents were taken before collection of data.

RESULTS

A. QUALITATIVE RESEARCH FINDINGS:

The disease Malaria was familiar among people as "*Pali Jwaroo* (intermittent fever) having the symptoms of high temperature, fever, severe convulsion and periodic shivering along with body ache. The findings revealed that symptoms and causes of *Palli Jwaroo* (malaria) not only caused by mosquito bite but also by other agents like flies, forest water and forest fruits. During interviews with the KIs and discussion in the FGDs it was perceived that the villagers have their own concept to distinguish Malaria (*Palli Jwaroo*) from other fever type illness. Analyzing the details of the Key Informant Interviews, it was observed that, though majority of people in the village were aware about Malaria (*Palli Jwaroo*) but still a sizeable portion of the population need to be aware about the causes, transmission, prevention and control of malaria; as they have different perceptions on the disease Malaria. The villagers still have possessed confusion and altogether wrong knowledge about occurrence of malaria namely by bathing/drinking of forest stream water. Further, it was also expressed that exposure to too much to outside village areas in bare body, over

work/fatigue and sleeping outside house are also attributed towards the causes Malaria (*Palli Jwaroo*). Observations of KIs information on the issues like causes, transmission, prevention and control of malaria in the study area are mentioned as follows:-

Perception of People about Causes of Disease Malaria:

Key informants during discussion informed "Now a days people specially the women are believing that malaria is a dangerous disease but sizable portion still believe that malaria is not caused only by mosquito bite but for other reasons. Regular opening of Anganwadi Centre and periodical joint visit of Anganwadi Worker and ANM to door to door of each household has created awareness among people but still it is in dormant stage. The KIs during discussion informed that if there is delay in treatment, it will affect brain (*Munnd*) which may cause death of the patient or patient may suffer from lunatic condition". It has also been observed that due to ignorance and economic hardship the people who are working in jungle area for plucking *kendu leaf* or collecting fire-wood or similar activities in jungle area hardly takes care of their health. It has also been suggested for prompt action on treatment of disease; Further, it has been expressed that exposure too much to outside village areas in bare body and over work/fatigue and sleeping outside house are the causes of malaria".

Participants opined that "biting of small flies" as the main cause and responsible for occurrence of disease. *Palli Jwaroo* is occurring in the area because of small flies locally called (*Gunddi pookk*) and forest based big mosquitoes only.

On the issue of non-biting of mosquito in the night, all respondents agreed to inform that "country fowls are rejecting flies to enter into their living room" and because of this their family members are sleeping comfortably inside house and one could not heard flies croon because of Country Fowl available inside the living room". The female members of this Group opined that *Palli Jwaroo* occurs due to biting of small flies during day time and we do not experience any night bite of flies/ mosquito and hardly suffers from *Palli Jwaroo* (malaria) as we sleep inside the houses at night along with Country Fowls inside the living room at their coop.

Cause of Malaria as Perceived by People:

It has been expressed by members in FGD that if someone works in the dirty/dark place and comes in contact with any stagnant water in the working place has the possibility of malaria. Further, it has also been opined by members of the group that consumption of any forest fruits or plum, roots or even drinking of stream water from forest area have chances of suffering from *Palli Jwaroo*". Again, it has also been opined by members of the group that consumption of any forest fruits or plum, roots or even drinking of stream water from forest area have chances of suffering from *Palli Jwaroo*".

The participants during FGD opined that "in the locality majority of male members, who are working and habit of taking fermented watered rice, raw onion,

curry/dry fish along with Country Liquor (*Mahuli*) for relaxation of their body after long hours of day long hard labour suffer from different diseases including Malaria (*Palli Jwaroo*). Further, this also causes economic hardship as well as depletes the earning capacity of their sustenance as they are unable to perform hard work. Those elders who are sleeping outside sleeping rooms are falling sick of *Palli Jwaroo* frequently and our ladies and children sleeping inside house are not falling sick of any fever. The aspect of dirty and unhygienic environment because of keeping of Fowl inside living room was also discussed among villagers. Participant mentioned that Country Fowls are being treated as Sacred Bird in the area as their egg and meat are being used in all important rituals (birth, marriage ceremony and useful as gift to be given to others) and ceremonial occasion and festivals where Sacrifice Offering are being done before Local Goddess.

Malaria treatment practices:

The participants in FGDs opined that the medicines available for malaria treatment such as Chloroquine (White Tablets) and Quinine (Small Brown Tablets) were supplied by the Anganwadi worker/ ASHA Worker/ ANM worker to get cured from the malaria (*Palli Jwaroo*) in the ANM/AWW Centres. This facility was not available previously and people were to travel a long distance to get medicines for treatment; by sacrificing a part of the daily earning.

The participants expressed that previously our village did not have health personnel except Anganwadi Worker without any medicine. For seeking any treatment, one has to walk kilometers as there was no transport as well as pucca road in the area. Further, if someone in the family falls sick we are trying to get him/her cure in our village itself; and if he/she is not cured and fell sick for long then we are carrying the sick person to PHC Khaprakhol or to private practitioner (*Kabiraj*) at Paikamal (Bargarh district, Odisha) and waited two to three days for the treatment and the treatment continues for a week or more. Because of above types of difficulties people preferred to seek treatment from the Traditional healer (Local Herbal Men called *Baidya*) first who is a respected person of our village provides us herbal medicines not for immediate cure but also for future prevention of the disease. Participant also informed about the mobile private practioner locally familiarly known as *Village Kabiraj* also available while visiting this area

Village Traditional Healer (*Baidya*) Allow the sick person to consume local herbal mix a paste made from (plant leave Gangaseuli (*Nyctanthes arbor-tristis* i.e., Night-flowering Jasmine) (10gm) +Zinger (5gm)+black pepper (1.0gm)+Water (100ml)+Honey (10gm) and equivalent amount of country liquor (Mahuli) to the patient for immediate cure and prevention."

"Further in the study area it was seen that people who are well versed with the village health staff or hospital staffs are seeking allopathic malaria treatment immediately rather others".

Lack of awareness for the proper use of mosquito net is also expressed as one of the cause in malaria transmission as many a times mosquito enters to the

nets and bite the members who sleep inside the mosquito net.

Malaria Prevention Practices:

On the aspect of Malaria prevention practices it was mentioned by GKs and highlighted by KIs that in their village Women and young children are preferring to sleep inside their house where country fowls were kept. It was told that due to presence of country fowls inside sleeping room the flies, mosquitoes or other small insects do not enter into their sleeping room. The practices of rearing of country fowls are being done by people years long not only for the fulfillment of cultural practices (used eggs& live bird in different rituals) but also for the economic sustenance of the family.

On the issues of use of mosquito net, KIs opined that people are unable to use mosquito net because of unavailability of adequate number of nets to all adult family members. Only the women and elderly members given preference to use the same. It has also been reported by the participant that the small sleeping room size, difficulties in hanging mosquito Net, inappropriate mosquito net size and experience of uncomfortability in breathing inside the mosquito net resist them to use mosquito net. It has been observed that people who are going to the forest area for collection of firewood and forest produce includes collection of leaf, fruits, plums, sleeping or staying more time inside forest area or taking bath or drinking forest rivulets water are considered as major cause of occurrence of disease. The KIs also opined that non-consumption of forest spring water, avoiding contact with small forest flies, non consuming forest fruits/plum unwashed and avoiding bathing in spring water reduces the malaria cases .

It was also reported that any illness due to fever, experienced by the villagers, most of the people in the village prefer to take home remedy first for two to three days for its easy availability and economic viability; then consult traditional healers (*Baidya*) in the next phase and finally preference was given for Government health facility-Primary Health Centre (PHC), if it lingers for more than seven days. At times the villagers prefer not to go to PHCs as there was presumption that no guarantee of availability of urgent medical facilities in PHC and also lack of transport facility available in the village as they have to cover almost 30 kilometers on foot to reach at PHC. The importance of Country Fowls among villagers emerged as one of the most important aspect in prevention of mosquito bite in the study area; as the smell of Country Fowls act as a repellent against the mosquito bite. During the summer season majority male members sleep in open space of outside house or at portico of house are more affected by malaria as compared to women and children who sleep inside the living room by opening all door and windows.

B. QUANTITATIVE RESEARCH FINDINGS

In the study village Chabripalli a total one hundred sixty-seven (167) nos of respondents representing all families residing in the village has been taken for quantitative research. The respondents in the age-group ranging from 18years

above up-to above 60 years were interviewed. The study respondents consisting of 75 (44.9%) Binjhal tribe men, 58 (34.7%) Binjhal tribal women, 17(10.17%) other caste women and 17(10.17%) other caste men of different age groups. The respondents were categorized into different age-category namely Young-Age (18 to 40Yrs), Matured Middle-Age (41yrs to 60yrs) and Old -Age (61 years and above) category residing in the study village Chabripalli. The total distribution of tribal and non-tribal people in the study area is as follows:

Table 1. Total number of respondents in the study village.(N =167)

Binjhal Tribe = 133 Nos (79.6%)		**Other Caste = 34 Nos (20.4%)**	
Women	**Men**	**Women**	**Men**
58 (34.7%)	75(44.9%)	17(10.17%)	17(10.17%)

Table 2. Category of study population

Age Group			**Binjhal Tribe & Others**		**Total**
			Tribe Binjhal	**Others**	
Women	Age Group	Young (18 years to 40years)	28(16.76%)	9(5.39%)	37(22.15%)
		Middle Age (41yrs to 60yrs)	17(10.17%)	4(2.40%)	21(12.57%)
		Matured (Above 61yrs)	13(7.78%)	4(2.40%)	17(10.18%)
	Total		58	17	75
Men	Age Group	Young (18 years to 40years)	42(25.15%)	7(4.19%)	49(29.34%)
		Middle Age (41yrs to 60yrs)	30(17.96%)	8(4.79%)	38(22.75%)
		Matured (Above 61yrs)	3(1.79%)	2(1.20%)	5(2.99%)
	Total		75	17	92
Education			**Binjhal Tribe &Others**		**Total**
			Tribe Binjhal	**Others**	
Women	Education	Illiterate	32(42.7%)	7(9.3%)	39(52.0%)
		Literate up to Primary schooling	16(21.3%)	5(6.7%)	21(28.0%)
		Literate above Primary School	10(13.3%)	5(6.7%)	15(20.0%)
	Total		58	17	75
Men	Education	Illiterate	23(25.0%)	12(13.0%)	35(38.0%)
		Literate up to Primary schooling	28(30.4%)	4(4.3%)	32(34.8%)
		Literate above Primary School	24(26.1%)	1(1.1%)	25(27.2%)
	Total		75	17	92

Identification of Different Problematic Disease by People in the Study Village:

Malaria is familiar as '*Palli Jwaroo'*, among the people in the study area. The local people used Malaria illness as "*Palli Jwaroo"* in the study village as described by villagers in the Village Chabripalli (Buromal). From the study it was found that the Binjhal tribal women are more concerned about disease Malaria than the tribal male in the village. The results of the finding show that 64 % of Binjhal tribal women termed '*Palli Jwaroo'* as a frequently occurring problematic disease in the area in comparison with the 53% non-tribal women. The male Binjhal tribe people, on the other hand, are considering "*Palli Jwaroo"* as a disease (39 %) and took it casual and informed the same even at the time of discussion. Among the non-tribal men 65 % ranked Malaria as the frequently occurring disease in the Village. Other diseases like Tuberculosis (TB), Diarrhea /Dysentery, skin also prevail in the village as informed by the villagers. The details of the same is recorded in Table below:

Table 3. Identification of different problematic diseases in the village

Gender Group	Type of disease people know in the village	N (=133)	N (=34)
		Binjhal Tribe	Others
Women	Malaria (*'Palli Jwaroo')*	63.8%	52.9%
	TB	12.1%	23.5%
	Diarrhea/Dysentery	5.2%	0
	Skin diseases	10.3%	23.5%
	Any Other	8.6%	0
Men	Malaria(*'Palli Jwaroo')*	38.7%	64.7%
	TB	18.7%	11.8%
	Diarrhea/Dysentery	20.0%	17.6%
	Skin diseases	12.0%	0.0%
	Anyother	10.7%	5.9%

Disease malaria and its perception by people in the study area:

In order to analyze the malaria disease perception of people as per their demographic characteristics namely Age category (namely Young population (18 years to 40 years), Middle Age population (41 years to 60 years) and Old age population (Above 61 years), Community (Scheduled Tribe-Binjhal& Others) and Education.

Table 4. Disease malaria and its perception by people in the study area:

Malaria disease perception as per demographic characteristics of people in the study area		Malaria can kill a person	Not a dangerous disease	Total
Young=(18 years to 40years)	Observed	56	12	68
	Expected	54.4	13.6	68.0
	%	82.4%	17.6%	100.0%
Middle Age (41yrs-60yrs)	Observed	38	11	49
	Expect	39.2	9.8	49.0
	%	77.6%	22.4%	100.0%
Older (Above 61yrs)	Observed	14	4	18
	Expected	14.4	3.6	18.0
	%	77.8%	22.2%	100.0%
Chi Square($\chi 2$) Test Result	**($\chi 2$) = (DF-2, N=135*), 0.475; P=0.78(P>.05)**			
Malaria Knowledge by community members in the study village				
ST- Binjhal	Observed	84	22	106
	Expected	84.8	21.2	106.0
	%	79.2%	20.8%	100.0%
Others	Observed	24	5	29
	Expected	23.2	5.8	29.0
	%	82.8%	17.2%	100.0%
Chi Square Test Result	**($\chi 2$) = (DF-1, N=135*),0.176; P=0.67 (P>.05)**			
Malaria Knowledge of people as per their education				
Illiterate	Observed	45	16	61
	Expected	48.8	12.2	61.0
	%	73.8%	26.2%	100.0%
Literate up-to Primary schooling	Observed	29	4	33
	Expected	26.4	6.6	33.0
	%	87.9%	12.1%	100.0%
Literate above Primary Schooling	Observed	34	7	41
	Expected	32.8	8.2	41.0
	%	82.9%	17.1%	100.0%
Chi Square Test Result	**($\chi 2$) $_{0.05}$ = (DF-2, N=135*); 2.979 P=0.22(P>.05)**			

*= 32 non-response cases not considered

The detail was discussed with the Focus Group discussion in order to find out the knowledge on malaria in relation to education, age and community level. In the findings it was shown that there was no significant difference in different age group population about Malaria as a killer disease perception (P=0.78). Further there was no statistically significant association found on the matter of

perception of Tribal-Binjhal people and other community members living in the study area about their perception of disease Malaria as a killer disease (P=0.67).

The level of education and perception of the people as disease malaria a killer disease in the study area it was also not noticed that there was no significant difference (P=0.22) in disease perception among youth population (18 to 40 years age), middle aged population (41 to 60 years age) and old aged population (above 61 years age) in the study area. From this analysis it may be perceived that the community members as a whole are playing a very important role in transmission, treatment and prevention knowledge irrespective of their age and education level.

DISCUSSION

The health seeking behaviour of the tribe Binjhals in the study area as observed could be the results of their strong cultural belief as more respondents attributed bite of flies of small size responsible for Malaria (*Palli Jwaroo*). Perceptions of Binjhal tribe on usefulness of mosquito Nets alone with a believe that it do not help much in controlling the incidence of *Palli Jwaroo* as they believe mosquito alone are not responsible for occurrence of this disease but there are other factors namely drinking of stream water etc are also responsible. This type of perception of people may be attributed towards their irregular use of the mosquito net and adoption of other methods including consumption of herbal juice from local traditional healer (*Baidya)*. As an immediate measure for prevention of disease the traditional healer provides local herbal mix a paste made from (plant leave Gangaseuli (*Nyctanthes arbor-tristis* i.e., Night-flowering Jasmine) (10gm) + Zinger (5gm) + black pepper (1.0gm) + Water (100ml) + Honey (10gm) and equivalent amount of country liquor (*Mahuli*) to people and the patient for prevention and immediate cure and prevention." This medication has become very easily available and accessible to villagers.

Habits of villagers do have their perception that keeping country fowls inside their living room reduces the occurrence of *Palli jwaroo*. This was further observed from the observations of the respondents that sleeping inside the house where country fowls are kept; reduces the occurrence of malaria. This perception on other prevention methods of malaria in the village as found in the present study may not be in the line of observations of other studies. Hence besides people's habit of keeping country fowl inside their living room, need-based adequate supply of bed-net to each households, focusing awareness campaign by involving Women Self Help Group (SHGs) with clear message in local language/local dialect on regular use of bed-nets by all family members should be done as one of the personal protection measures to prevent mosquito bite and prevention of malaria. The local knowledge of people and the biomedical knowledge if synchronized properly could lead to adoption of appropriate health practices. In a study by Vijayakumar, et al. (2009) in a tribal belt of Odisha, the author highlighted that tribal people have their own way of treatment of disease and it embedded mostly with their socio-cultural

and belief systems. In this connection the participatory role as played by the traditional healer in treating malaria was highlighted by them in their study. So involving traditional healer in promoting different preventive measures namely use of bed-net, use of mosquito repellent and herbal medication practices for malaria prevention and control measures in endemic areas may be considered as very useful strategies. Comoro et al. (2003) in a Tanzanian village highlighted that villagers did not consider malaria as a serious health problem besides sufferings, unless they incurred huge expenses towards treatment. The observations of their study indicated that majority of people are well aware about mosquito net prevents mosquito bite but few believe that it will prevent malaria. In the present study, participant reported the culturally appropriate and environmental hygiene namely keeping country fowl inside their sleeping room to prevent croon sound and night bite of mosquitoes since long. Hence, though the cause of malaria among the respondents in the study area was not only due to mosquito bite but also for other reasons as believed by people.

In the study area it was found that women were more aware of the symptoms of *Palli Jwaroo* than the male because of their role as care taker in the house and their personal rapport with the village level health worker or their interaction with ASHA or Anganwadi Worker of ANM in the village. Further it was found that Binjhal tribal families irrespective of their economic condition are keeping country fowls inside their living room. This practice of people may be termed as unique habit as almost all participants in FGDs reported this method of driving the croon sound of mosquitoes or files during night time from their living room due to pungent odour. This present study revealed all activities of people living in malaria endemic village and how they should manage disease prevention and cure aspect at village level. Singh et al.(1999) in their study had reported that the people's habitual activities plays important role towards the interventions. Dowler et al. (2006) in their study highlighted utilization of health intervention strategies, easy availability of services are influenced by perception of people towards the same and perception of people from the basis of their use and non-use of available health services in the area. Similarly, in the present study, wearing full body covered clothes, sleeping inside room by women and children are perceived as safe though inside their sleeping room they are keeping country fowl not because of scarcity of space but it was a habit of people and their perception that croons of flies/mosquitoes are not noticed inside sleeping room. This type of observation shows how people perceived prevention of disease. A study by Njama et al. (2003) in Kampala city in Niagiria, Africa showed that 90 percent of care giver in the study area knew that mosquito causes malaria but they also indicated that drinking of un-boiled water and respiratory illness are also the reason of the cause of Malaria .

Since people in the study village are habit of keeping country fowl inside their living room and believe that fowls are not allowing mosquito to bite them inside living room at night so use of mosquito net inside living room was not popular among people. Further people are not in favour of

use of any insecticide spray inside living room or use of insecticide treated bed-net as supplied by Government. So, use of insecticide treated bed-nets in the study village was found not popular among people.

CONCLUSION

The observations of the present study revealed that the sleeping habits of people and practices prescribed by elders in the village emerged as an important preventive measure of malaria. The practice of sleeping inside room and allowing Fowls to stay inside their living room without any complaint of hygienic aspect in the study area plays significant role of Fowls as a Mosquito repellent inside living room. This was because of zoophillic nature of mosquitoes. As per villagers opinion those who are sleeping outside are more prone to malaria fever than those who are sleeping inside living room. By seeing age old practice of people, one can conclude that malaria preventive measures are being adopted by people years together might have prevented them from sufferings of malaria. Further the role of Traditional Healers in treatment decision was found crucial as elder members of family have always preferred to recommend advice from Healers at beginning. The roles of Traditional Healers are crucial in remote villages for their easy access and cheap treatment of malaria. Further, they are respected by villagers and they play a very important role in the socio-cultural belief of people. Further, the community may be sensitized regarding availability of malaria diagnosis and treatment facility services with the ASHA, Anganwadi Worker in village level. Similarly, the village level health worker should ensure availability of diagnostics kits and medicines at their disposal each moment so that the community members do not lose their faith on them. These important practices may be disseminated as a knowledge bank for repelling the malaria vector in an epidemiological prospective to protect public health, explore a range of habitual behaviour and perceptions of people that would form a sound healthy environment for malaria disease prevention and control strategies.

RECOMMENDATIONS

Malaria is considered as a poor man's disease and no vaccine for prevention except available of effective medicines for cure only after detection of disease through biological test is available. The health care practices of people in terms of their daily habits as well as use of traditional knowledge for treatment of malaria is no doubt an effective tool which not only bring success in Malaria prevention but also effective in successful curb of disease in remote areas.

LIMITATION

This study was undertaken in a tribal dominated village in Balangir in KBK district of Odisha keeping in view of malaria cases, deaths, backwardness, varying topography and other unique socio-cultural practices of people, it cannot be a final representative of all the areas having high dominance of tribal population, higher education level, daily hygiene and unique socio-cultural behavior and practices of other tribes.

CONFLICT OF INTEREST STATEMENT

We declare that we have no conflict of interest.

AUTHORS' CONTRIBUTIONS

Epidemiology Division, ICMR (RMRC), Bhubaneswar, Odisha was designed the study. The first author was conducted data gathering work and all authors cross verified, analyzed and interpreted data and results. All authors have contributed to the manuscript.

REFERENCES

1. Hussain MA, Dandona L, Schellenberg D. 2013. Public health system readiness to treat malaria in Odisha State of India. *Malaria Journal*, 12: 351.
2. World Malaria Report 2017. WHO Geneva.
3. Kumar A, Valecha N, Jain T, Dash AP 2007. Burden of Malaria in India: Retrospective and Prospective View. *Am. J. Trop. Med. Hyg. (Suppl 6)*: 69–78.
4. Das A, Ravindran T.K.S. 2011. Community knowledge on malaria among febrile patients in an endemic distict of Orissa, India. Journal of Vector Borne Disease, Vol-48, 46-51.
5. Panda Mahendra, Mahapatra A, Satapathy KC 2018. "Health Seeking Behaviour of People in a Malaria Endemic Village of Odisha, India: An In-Depth Study", *The Oriental Anthropologist: A Bi-annual International Journal of the Science of Man,* 18(2): 341-360.
6. Panda M, Mohapatra A.(2004):" Malaria control- An over view in India". J. Hum. Ecol., 2004;15(2):101-4.
7. Pradhan,M.M, Meherda,P.K 2019. "Malaria elimination drive in Odisha-Hope for halting the transmission". *Journal of Vector Borne Disease*, 56:53-56.
8. Vijayakumar KN, Gunasekaran K, Sahu SS, Jambulingam P 2009. Knowledge, attitude and practice on malaria: a study in a tribal belt of Orissa state, India with reference to use of long lasting treated mosquito nets. *Acta Tropica*, 112(2):137-142.
9. Comoro, C., Nsimba, S.E.D., Warsame, M., Tomson, G 2003. Local understanding, perceptions and reported practices of mothers/ guardians and health workers on childhood malaria in a Tanzanian district—implications for malaria control. *Acta Tropica,* 87, 305–313.
10. Singh H, Haqq ED, Nustapha N 1999. Patients' perception and satisfaction with health care professional at primary care facilities in Trinidad and Tobago. *Bull World Health Organization*, 77(4):356–360.
11. Dowler E, Green J, Bauer M, Gasperoni G. 2006. Assessing public perception: Issues and methods. In: *Carlos D, editor. Health, hazards and public debate: lessons for risk communication from BSE/CJD Saga. Geneva: WHO*: 40–60.
12. Njama D, Dorsey G, Guwatudde D, Kigonya K, Greenhouse B, Musisi S 2003.Urban malaria: primary caregivers' knowledge, attitudes, practices and predictors of malaria incidence in a cohort of Ugandan children. *Trop Med Int. Health.* 8(8):685–92.

Lifestyle and cultural correlates of the Baiga tribe depicted through their traditional hut model established in ICMR-NIRTH, Jabalpur, India

Nishant Saxena[1], Poonam Vaiyam[1], Suyesh Srivastava[2], Manjunathachar HV[3], Vijay Kachhi[1], A.K. Goel[1], Ravikanta S. Thakur[1], Manish Adey[1], Jagat L. Prajapati[3], Dinesh Kumar[1], Aparup Das[4]*

Abstract:

Background: Baigas are a very ancient and primitive tribe. Aboriginal culture reflects the correlation between customs, lifestyles and their shelter. The aim of article is to understand the correlation between life style and cultural aspects through established outline techniques of traditional hut in the ICMR-NIRTH, Jabalpur campus. At the same time the model hut is also open for further in-depth research in future.

Methodology: Traditional primitive hut model was selected from Khamhera village in Dindori district by the research team. The hut was constructed in the campus by Baiga artisans who had prior experience of hut construction in traditional way and agreed to build exact simulation model of their dwellings. The artisans were provided with necessary wages as per the government norms with free lodging and fooding. Other hut related items were procured locally.

Results: The Baiga hut constructed in the campus serves as a visual simulation model of the way of living in the community. The hut is rectangular in shape with walls made with small stones, waste materials of wheat, kodo stalk and slimy blackish soil specially selected by the artisans. The wall has been plastered by mud and coated with cow dung paste and later white washed with white clay and further for decoration black clay is used. Roof of the hut is slanted at about 30 degrees to combat the long rainy season. The availability of materials for the construction of hut was managed by the Baiga artisans like wood, bamboo, wooden poles.

Conclusion: The established Baiga hut model gave strong correlation of the life style of

Affiliations:

[1]Division of Social Science & Ethnomedicine, ICMR- NIRTH, Jabalpur, India

[2]Division of Non-communicable Diseases, ICMR- NIRTH, Jabalpur, India

[3]Division of In-vivo Research, ICMR- NIRTH, Jabalpur, India

[4]Division of Vector Borne Diseases, ICMR- NIRTH, Jabalpur, India

***Corresponding author:** Dr Dinesh Kumar, Division of Social Science & Ethnomedicine, ICMR-National Institute of Research in Tribal Health (NIRTH), Nagpur Road, Jabalpur - 482003, India*
Email Id: drdkumar1970@gmail.com, Phone: +91-7612370800 (office), Fax: +91-761-2672835

the Baiga with their cultures. Further, it is found that the traditional aspects of this tribe have been preserved. The hut model, exactly depicting the way of living in this primitive and vulnerable tribe, is now open for visit by national/international researchers, scholars, scientists, policy makers, and to general public for getting a sense and feel of the tribal culture which is on the verge of becoming obsolete.

Keywords: *Baiga, culture, lifestyle, traditional hut, tribal artisans*

INTRODUCTION

In India, tribes constitute a significant proportion of the population. The 705 groups categorized as Schedule Tribes account for 8.6% of the total country's population. In-state of Madhya Pradesh, about 21.1% population is of the Scheduled Tribes [1]. In MP, the Dindori district is considered backward due to inadequate facilities and infrastructure, with about 7,04,218 individuals in which about 64% of the total population belongs to the Scheduled Tribes category. The majority of the Baiga tribe inhabits this district, who themselves as *Bhoomiraja*, an ancient tribe practicing Bewar agriculture and knowing medicine. They treat people with natural herbs, available in a local forest, so they are sometimes referred to as"*Ojha*" [3]. Some studies suggest that genetically Baigas are directly linked to Australian aboriginal groups, wherein anthropologists' research has found mitochondrial DNA shared only between tribes like Baiga, Birhor, and the Australian Aborigines[2]. The basic physical appearance of the Baiga tribe is medium height, compact body, dark color, black straight hair, broad nose, and thick lips. Previously the hanging bow and arrow on the shoulders of Baiga was a mark of their identity, but nowadays, they can be spotted with axes (*Kulhadi*). Baiga men wear white breech cloth and round white towel on his head, whereas women wear saree up to the knee length with ornaments and tattoos on their body [4,5,6]. When asked, the Baiga defines themselves as having a very jolly nature and conspicuous to some extent. Women in the Baiga tribe love to get tattoos on their body. They do not like to do *bindi* on their forehead or piercing their nose for decoration as generally, we see in Hindu tradition. The Baiga men typically have long hairs and tie the bun of hairs on the left side of the shoulder with tattoos on their forehead, hand, and chest only[7].

Moreover, the staple food for Baigas is Maize Pej, Kodo, Kutki, they collect sweet roots, honey, Mahua, Harra from the local forest, and sometimes engage in fishing and hunting. They are skilled in making handcrafts of bamboo. This tribe is firmly attached to nature. Their main God is Budha Dev; they worship the Saal tree (locally known as *Sarai*) and worship of Thakur God for the protection of their village from evil forces, and for their better health, they worship Dulhi-Dulha dev. Mainly in the Baiga tribe, Udhariya,Chor, Uthawa, Mangni/Chadh, and Lamsena, marriage is prevalent[8]. People of this tribe mainly like to live in the grey area of a very dense forest. They used to live in mud made houses, the roof made up of grass and leaves. The Baiga house may be conical, cylindrical, square, or L-shaped. The primitive form of Baiga huts were made of mud, wood, and

bamboo. One corner in the room is used as a kitchen and another as a worshipping place in dwellings with a single room. Domestic animals are an essential part of their economy, so their sheds are also an integral part of the dwellings. The restroom is used for sleeping and guest seating. The tribal traditional hut mainly builds surrounded by forest area, rectangular shaped house, thoroughly applied on the wall of interior and exterior part from Mud soil, and coated cow dung, Thatched roof, and low height door. They believe that this type of house directly connected to nature automatically regulates the temperature and helps avoid diseases[9]. Especially its primitive identity, history, dialects or language, and traditions may be extinct. Few open-air museums have tried to preserve the way of living of the Baiga tribe like Mahant Gasidas Memorial Museum (Raipur, Chhattisgarh), PurkhoutiMuktangan (New Raipur, Chhattisgarh), Zonal Anthropological Museum (Jagdalpur, Chhattisgarh), Zonal Anthropological Museum (Nagpur, Maharashtra), Tribal Museum (Bhopal, Madhya Pradesh), Indira Gandhi Rashtriya Manav Sangrahala (Bhopal, M.P)[10] with well-preserved artifacts, but none have tried to correlate with health practices and outcomes for this ethnic group which is the specialty of the one in ICMR-NIRTH, Jabalpur campus.

METHODOLOGY

Interaction and collaboration were developed with Baiga artisans during the fieldwork in the community. As per project protocol, the research team visited the study area district Dindori to select five villages for the survey with research components. We contacted local authorities and bodies associated with Baiga tribe's development and collected villages block-wise list. The five villages were selected by adopting the probability proportional to the size (PPS) sampling technique. The five selected villages were Khamhera, Bouna, Chanda (all from Bajag block), Jaampani village from Karanjia block, and GaouraKanhari from Samnapur block. The research team closely examined several huts in the selected villages. The ideal hut model of a primitive hut is built traditionally, and most availability focuses on their lifestyle. So, the ideal hut model was selected from Khamhera village. The team's second important task was to search skilled Baiga artisan based on his experience and verified by three villagers andSarpanch's village. For this, the team selected, convinced, and motivated five artisans, namely Raiytu, Dhaniram, Laxman, Nanguru, and Manik Lal, for constructing the hut in the institute. Their daily remuneration for tribal artisans was fixed as per the guidelines of the Ministry of Culture, Government of India. This order was collected from IGRMS (Indira Gandhi Rashtriya Manav Sansgrahalay), Bhopal. The payment of Rs. 837.50 per day, excluding the expenditures for travel, lodging, and fooding extended by the institute. With these terms and conditions, the tribal artisans constructed the traditional tribal hut model in the Institute in two spells: firstly, between 23 January to 6 March 2019, the minor remaining part was completed between 4 April to 19 April 2019.

RESULTS

1. The Layout of Baiga primitive hut model in the NIRTH campus

(a) Framing the traditional tribal hut

A Baiga tribal hut with three L-

shaped rooms constructed at the selected location. Before construction *Bhumi pujan* performed as per Baiga-artisan customs by offering coconut, joss stick, and dry fruit (*Chironji*) to the Goddess of land (*Bhumi Devi*). Land demarcation was done by forming four corners of wooden logs tied with a rope. Afterward, the land was dug to obtain the preferred soil type for the foundation of the dwelling.

(b) Foundation work

After digging up the land, water was filled at the site. Foundation is laid by adding up the soil and *Kodopaira*. This entire process of the foundation laying was completed by repeating it for 2-3 times so as to provide strength to the structure.

(c) Preparation of the building material (Mud/Leva)

A semi-fluid mixture was prepared by combining soil, *pairakodo, and water,* then mixed with feet' help. This mixture is called as *Leva/Lonnda.* This mixture has the special binding property which prevents cracks and ensures that the wall is slit free.



Figure 1: Foundation works started by Baiga artisans in the presence of research team members

2. Wall construction

Wall construction started after finishing the foundation of the building. The length and breadth of the room were 15 and 7 feet, respectively. However, the other two rooms were about 16 feet in length and 10 feet in breadth. Wall construction was initiated with small stones, mixed with materials, then the wall was constructed till 1.5 feet and was left to dry so that it will gain strength. After that, every 1.5 feet of the wall was constructed by repeating the same procedure mentioned above.

(a) Set the door frame

After constructing 1.5 feet of wall, the wooden door frame made of Dhavawood was set with Leva's help. These items were bought from other regional distributors and artisans to support the door frame. The door frame is fixed by lifting the wall to 3.5 feet; then remaining walls were built ½ feet in length and 1 foot in width. Walls were left to dry in the presence of sunlight and air. According to the marked region, a flat thick wood Mayar is placed on top of the door so that the two walls can be joined together. After this, the length and width of the four walls were equally built. Triangular shaped shelves known as Ariya /Phundka are made within the wall itself at a height of about 3-4 feet from the floor of the room. These shelves are usually made diagonally opposite to the door of the room and used to keep daily use items especially the chimni or lanterns for illumination in the dwelling.

(b) Wall Plastering

Wall is dabbed by hands while using a mixture of mud and water to fill the

cracks and give a smooth texture to the wall. After that, Coaris prepared for the decoration of the wall. This adds aesthetic value to the entire structure and makes it attractive.

(c) Wall painting

Tribal people believe in keeping their houses clean for their mental well-being. For painting walls, they use cow dung, mixed with water, and applied over the floor is called Dung sarodhini. They use chuhi (calcium carbonate) to paint their houses' walls, which gives white color to the walls. It is called as Chuhisarodhini in the Baigani dialect. On the exterior walls of the rooms, usually under the porch shade, for about 1.5 feet from the ground coating with black colored mud/clay is done known as dhig. This patch of dark coloured coating on the walls provides aesthetic value to the walls and also prevents it from water stains while cleaning.



Figure 2: Wall constructions and fitting the Chanukah by Baiga artisans

3. Construction of the roof

(a) *Mayar:* *Mayar* is the thick and straight wooden log used in the hut construction to support the roof. *Mayar* is kept on the walls, which are across the breadth of the hut. Holes are made at the center of *mayar* so that *chiraiya* can be fixed over it. *Mayar* is mounted over 7 feet above the ground.

(b) *Chiraiya:* *Chiraiya* is a wooden log bent at both of the ends. It is fixed in the holes of the *mayar* to build strong support for the thatch. The upper part of *Chiariya* and the *Mayar* is painted with asphalt. So that it can be protected from external damage, the structure of *Mayar* and *Chiraiya* will provide support to the Baredi.

(c) *Baredi:* It is also made up of a thick, strong, and straight wooden log applied to the length of the room above *Chiraiya*. A straight wooden log of 8 to 10 feet in length is used to make thatch known as *Balli* or Malaga. One part of *Balli* is fixed with *Balli* with the help of a nail. This structure is mounted by 2-3 feet over the wall.

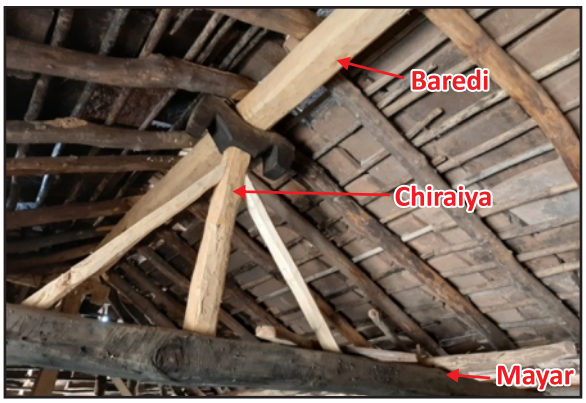


Figure 3: Inside of the hut showing Mayar, Chiraiya and Baredi

(d) Roofing over thatch: In Baiga tribal houses, the roofing over thatch is done by hand-made tiles using mud called *Khapra/Ghariya*. The roofing starts from the end of *Uryati* to *Mangre*. In the beginning mud,the dough is placed over

Uryati, protects tiles from falling. *Khapra*/*Ghariya* is placed so that no gap is left, which will cause water leakage. *Khapra*/*Ghariya*is rectangular, which is applied in a row on the thatch. On the external corners of the roof tiles are in the shape of the thin and hollow tube. After that, a tin sheet is placed at the corner to facilitate water's downward flow during the rainy season.



Figure 4: Roofing work by Baiga artisans

4. Construction of a porch

In Baiga tribals*Uryati* (front of the house) is an extended structure from the rooms towards outside the hut. *Uryati*is supported by vertical wooden logs known as*Thuniya*.*Uryati*is used for sitting with guests. The 'L' shaped structure is also made along with a wall to sit under it.*Thuniya* also provides vertical support to the *Balli* under *Uryati* in front of the room with its base under the ground.

5. *Najardheettotka*: the magico-religious cultural belief

The Baiga tribe has strong belief in *Najardheettotka,*a significant part of their culture. It is used to protect the house from black magic and the evil eye. Baiga tribal hang a black colored mud pot painted with white color chalk (*Chuhi*) to draw oval and round shapes. This pot is hung on the long vertical wood tied with*Thuniya* in front of the house. According to Baiga artisans, it is placed in such a position to attract the outsiders passing by the hut. Henceforth, it will neutralize the effect of the evil eye, and *najardheet* can also be seen in this traditional hut model constructed inside the campus.



Figure 5: Najardheet to top of the Baiga hut

6. Courtyard and *Bada* construction

A courtyard is built in front of the hut. Medium-sized stones were interlocked on the ground by pouring water with soil over them and used *dhammas* to uniform surface level. Baiga tribe builds a large fence outside their homes; it is used for keeping their

livestock, bullock cart, ploughs (*hul/nagar*), and crops. Baiga tribe often builds a boundary using firewood, as per their ancestor's beliefs and culture. The main entrance of the hut is made up of wood gate known as *Fadka. Fadka* has two components; *Bandheri* and *Bendhi. Bandheri* is two long wooden logs that are placed vertically. *Bendhi* is made up of three slender wooden logs placed horizontally to build the gate.

7. Construction of animal shed

The animals in Baiga household hold an integral part of their life and sustenance. In Baigani dialect, the animal shed inside the dwelling premises is called *Saar*. An open and free space attached to the courtyard is called as *Dand* in Baigani. The wooden blocks are used to dig the ground in the rectangular area. The wooden frame is built with the help of *Barendi*. A thatch is prepared by using *Barendi,* bamboo sticks, nails, and wooden logs. Roofing has to be done by mud *tiles/khapra,* as mentioned earlier. The dimensions of the courtyard were kept standard for the domestication of animals.

8. Bridge construction

A bridge was also constructed in front of the Baiga hut. In the field trips we could find such wooden bridges built by the community people to ensure free movement of human and animals over the streams. First of all, two thick planks of wood have been used to support the bridge; two big thick woods were used, called '*Baithaki'*in the Baigani language. Then six holes have been made with the help of *Vindhani* for vertical wooden logs in the '*Baithaki,'* and the '*Vedang'* was installed to connect the pole. The '*devan*' was laid in the base of the '*Baithaki*', after that barrage was fixed in the middle of the '*Aadiya*' to strengthen the bridge, which is called '*Lakad'*in the Baigani language.

9. Plantation in the courtyard area

The entire research team along with the tribal artisans planted the Satparniand Mulberry plants in the courtyard area of the model hut premises to emulate the traditionalBaigaculture and their habitat. These two plants were specially sown as they have medicinal, as well as sacred values in the Baiga tribe culture.

10. Stuffs used by the Baiga tribe in daily life

Household stuff like stove, plough, stool (*Machia*), cot, *etc.* made by the Baiga artisans was also kept in the hut. Hence, this hut is the representation of Baiga culture by portraying chunks of their household, livelihood, habitat, tools, techniques, and traditional knowledge. The constructed hut model as a visual outcome shown in Figure 4.



Figure 6: Baigaprimitive hut model established in the ICMR-NIRTH, Jabalpur campus

DISCUSSION

Tribes dwell in the lap of nature having a close day-to-day interaction with forest and the flora - fauna. Their sustenance is dependent on natural products as they share a sacred bond with nature. Through generations of observation, practice and usage tribes have developed and preserved their traditional knowledge-base and this is reflected in the habitats they build for their family. The Baiga of Madhya Pradesh are no different.Their family structure is pre-dominantly of joint family type and usually their ideal hut consists of three rooms. The first room is the main one which consists of a fireplace where *Dulha-Dulhi, Narayan dev,* and other deities live. Other rooms are used for living purposes. The second is called *Kuria* in the Baigani dialect, where the other family members live. The third room is called the *Pohda* and used as a guest room. The animal shed is called *Saar* which is used for keeping domestic animals. Every Baiga house has an animal courtyard which holds an essential place for their livelihood. Besides, some houses also domesticate pig (*Sura*) called as *Gudha*.

The Baiga traditional habitat (hut) model has been established in the ICMR-NIRTH, Jabalpur campus after careful observation of the everyday lifestyle of the community with the aim to depict it as scientifically as possible. For researchers and the masses in general, the tribal way-of-life has always been of interest and curiosity, and thus as per the mandate of the present project this tribal habitat model will help disseminate the correct information and knowledge about tribal lifestyle. Apart from the Baiga hut model, similar structures for other tribal groups like Bharia and Saharia of MP, Hill Korwa of Chhattisgarh and Bhil of Rajasthan is also planned under this project funded by the Ministry of Tribal Affairs, Government of India. Construction of Bharia and Saharia hut models has been completed and are open for public view. All these together will prove to be unique features of the research institute situated in Jabalpur.

It is not so that depiction of tribal lifestyle and culture is not found anywhere else, rather there are few institutes, mainly museums, funded by government, whose mandate is dedicated to documentation and dissemination of the tribal lifestyle. Notable are Indira Gandhi Rashtriya Manav Sangrahala (IGRMS), Bhopal, Madhya Pradesh Tribal Museum, Bhopal, Zonal Anthropological Museum (Jagdalpur, Chhattisgarh), Zonal Anthropological Museum (Nagpur, Maharashtra), Mahant Gasidas Memorial Museum (Raipur, Chhattisgarh), Purkhouti Muktangan (New Raipur, Chhattisgarh), *etc*. These museums and institutes have helped to preserve the tribal cultural identity and provided a vibrant flavour to it by making it popular. Some like the IGRMS, Bhopal have open-air galleries and thematic galleries on tribes of India. Nevertheless, our work at ICMR-NIRTH, Jabalpur is unique as the institute is solely dedicated to working on the health of the tribal communities. Publicized by their health scenario women of this Baiga tribe have low awareness and underutilization of MCH services due to wrong perception in relation to the pregnancy and safe delivery[11]. Further the traditional culture

norms and ceremonies at the time of just after birth are an emerging factor for newborn morbidities among Baiga[12]. Indigenous herbal remedies articulating with faith healing therapy shows a greater impact in diagnosis of postpartum disease and treating due to geo cultural factors and empirical knowledge of natural herbs and traditional medicine[13]. Henceforth, this demonstration sheds light on the health aspect and living conditions of the tribal communities. For instance, Saharia of MP live in congested houses with no ventilation facility, which has emerged as a potent reason for abnormally high incidence of tuberculosis in this. Similarly, Baiga domesticate livestock in their house and maintain very close interaction with animals which may open up possibility of transfer of zoonotic diseases. These hut models in an institute dedicated exclusively to studying health of tribes will help formulate such hypothesis and open up new vistas of future researches and could be of assistance for the policy makers on tribal welfare and wellbeing.

ACKNOWLEDGMENT

The authors are grateful to the Ministry of Tribal Affairs, Government of India, New Delhi for providing the funds to this project. Authors are thankful to Director, ICMR-NIRTH, Jabalpur for providing institutional support and encouragement to carry out this research. Most importantly the authors are indebted to the Baiga community members and tribal artisans for their cooperation. The manuscript has been approved by the Publication Screening Committee of ICMR–NIRTH Jabalpur and assigned with the number ICMR-NIRTH/PSC /…/ 2020.

Conflicts of interest: None declared

AUTHOR CONTRIBUTION

NS (Contributed to hut construction, manuscript editing and finalization), PV (documentation and preparing initial drafts,literature search), SS (conception of study, contributed to hut construction), MHV (conception of study, contributed to hut construction), VK (data collection, contributed to hut construction), AKG (data collection, contributed to hut construction), RST (data collection, documentation), MA & JLP (data collection, contributed to hut construction), DK (conception of study,design, analysis, extensive contribution to hut construction, final editing of manuscript), AD (mentored the whole project from inception to execution, manuscript finalization).

REFERENCES

1. Ministry of Tribal Affairs (2013). *Statistical Profile of Scheduled Tribes in India*. 1–448. Accessed on August 22, 2020 from https://tribal.nic.in/ST/StatisticalProfileofSTs2013.pdf
2. Direct Genetic Link between Australia and India Provides New Insight into the Origins of Australian Aborigines. Accessed from https://blog.23andme.com/news/direct-genetic-link-between-australia-and-india-provides-new-insight-into-the-origins-of-australian-aborigines/ on August 21, 2020
3. Babu, R., & Panda, A. (2016). Socio-

Economic status of the Baiga tribe of Chhattisgarh in India. *International Journal of Multidisciplinary Research and Development*; 3(10):182–186.

4. Madhya Pradesh in Baiga tribe. Available from: https://samanyagyanedu.in/accessed on July 13, 2020
5. Mohanta, B. K. (2015). Tattoo and tribal identity: A case of the Baiga tribe of Central India *International Journal Of Research*; 2(2).
6. Available from: http://www.peoplesoftheworld.org/hosted/baiga/) Accessed on July 13,2020
7. Gautam,R. (2011). Baiga-The hunter gatherers of central India. New Delhi: Readworthy Publications.
8. Kumar, G. (2018). Historical analysis of the concept of origins of Baiga tribe, *Int. J. Ad. Social Sciences,* 6(1): 25-29.
9. *Baigas in exile.* Accessed from https://www.downtoearth.org.in/coverage/baigas-in-exile-38674 on Augut 23, 2020.
10. Soni, A. (2019). Representation of Baiga Tribe in the Museums of Central India. *Journal of Indian Museums, 72*, 88–96.
11. Kumar, D. Goel, A.K., Ghanghoria, V., Ghanghoria, P.(2016). A qualitative study on maternal and child health practices among Baiga tribe of Madhya Pradesh in Central India. *The journal of Community Health Management*,3(1):23-27.
12. Kumar, D., Vishwakarma, A., Goel, A.K. (2015). Tribal newborn culture: An observation, *Indian Journal of maternal and child health*, 17(2):1-4.
13. Vishwakarma, Goel, A.K., Kumar, D.(2016). Indigenous knowledge of postnatal care practices: An evidence from primitive Baiga tribe in Madhya Pradesh. *Swadeshi Research Foundation- A quarterly journal of multidisciplinary research*, 3(1):78-79.

Health Status and Practices of Munda Tribe on the Margins of Traditionality & Modernity

Poly Varghese[1], Dr. Joseph Xavier[2], Dr. Melville Pereira[3]

Abstract: *The tribal population in the country faces a triple disease burden of communicable diseases, non-communicable diseases and that of malnutrition. This has been the health landscape of Munda population in the state of Jharkhand. The socio-economic and religious influences and conditions have swayed on their poor health status and practices. Lack of proper means of income, poor awareness and education on health and health and protection systems, inadequate mechanisms for culturally appropriate health care services have perpetuated the condition of poor health of the Munda tribe. The ambitious health coverage scheme RSBY (Rashtriya Swasthya Bima Yojana), now the revised Ayushman Bharat have made some impact, though the services remain fragmented. Access to affordable and quality health care is going to be the determinant elements in the tribal health ecosystem today. Coupled with that, proper implementation of National Health Schemes, revival of alternate health systems like Ayurveda and Naturopathy will reduce the health burden of the tribal community. Measures of health protection through community health insurance will mitigate the vulnerabilities of the tribal population. Community participation and ownership should be the new normal in the health care ecosystem of the tribal community. This article paints the picture of health status and practices of Munda tribes and the impact of the health protection scheme that bent-on health landscape of Munda community in the state of Jharkhand.*

Keywords: Health Status, Health Practices, RSBY, Ayushman Bharat Munda Tribe

INTRODUCTION

Health signifies much more than an absence of physical disease. It is a composite of health behaviors, practices and perceptions linked with the cultural environs. It reflects the consequent behavior of community in response to health problems which is generated as a result of interaction of cultural perceptions and meanings of health problems. A cursory look into the origin of the life of Munda tribe will help us to build a better viewpoint into our understanding of their health status and practices.

The Munda people are an ethnic group of India. They speak the Mundari language as their native language, which belongs to the Munda subgroup of

[1]*PhD Scholar of Assam Don Bosco University, Assam*
[2]*Director, Indian Social Institute, Bangalore, India*
[3]*Associate Professor, Assam Don Bosco University, Assam*

Austroasiatic languages. The Munda are found in the northern areas of east India concentrated in the states of Jharkhand, Odisha and West Bengal. Munda tribe callthemselves Hodo meaning people. Munda was name given by the Aryans and some say Munda comes from the word muhunda 5which means native people. (Toppo, L., 2018) In the late 1800s, during the British Raj, the Munda had to pay leases and work as bonded laborers. As migrant trackers in the India tribal belt, they became farmers who were utilized in basket work and weaving. Munda religion is a mix of Sarnaism and Hinduism. Although Munda have saved quite a bit of their culture, they have consumed various Hindu conventions. The supreme deity of Munda is Singbonga, which means, 'sun god', who as indicated spare them from inconveniences and illnesses.

METHODOLOGY

The objective of the study was to understand the Improved Health Security of Munda Tribe in Jharkhand A Mixed Methodology was used to collect, analyse, interpret and integrate the data.The study was located in the state of Jharkhand, more focussing the Munda tribal settlement districts of Gumla West Singbhum, with 21 selected villages from three blocks of the above mentioned two districts. . A sample size of 450 was selected for the study, using multistage sampling along with lottery method. For the qualitative method, Systematic random sampling was used to identify the groups of FGD (Focus Group Discussion), and the purposive convenient sampling was used to identify the members keeping the variability of members into consideration. Data collection was done through interview schedule with reliability validated and using other methods like FGD, In depth interviews and Case Narratives. The collected data was coded, measured, processed and analysed using statistical tools and methods. Qualitative data was analysed by triangulation of the data to understand the emergence of the theme and ascertain the qualitative parameters.

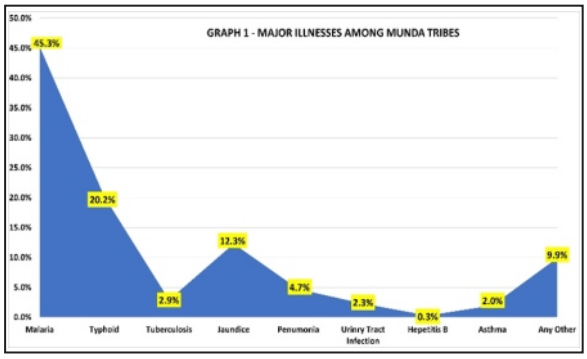
Health Status of Munda Tribe in Jharkhand

The scenario of health does not present a promising picture for the Munda tribe. Out of the population studied almost 58.9 percent of them are contracted with major illnesses at various stages. The disease burden of the community will really make the life miserable and affects the health and wellbeing of the people. Though the 41.1 percent of the community responded that there were no major illnesses, agreed to the fact that they go through several episodes of minor illnesses which can affect their work life and income levels. This also shows the reality as to how multiple illnesses can really be a health shock to the families.

Morbidity

The tribal population in the country faces a triple burden of disease. The morbidity landscape is also equally worrying as there are major non communicable diseases which add to a large burden to the families.

Malnutrition and communicable disease (Graph-1) like malaria and Typhoid continues as unabated. 45.3 percent of cases have reported Malaria as the major illness and followed with



Typhoid by 20.2 percent of cases among the Munda Tribe in Jharkhand. Cerebral Malaria can even result in the loss of life. People go through difficult episodes of malaria cases which could totally affect their health system and security. All these diseases are caused by poor water quality, sanitation and hygiene. Malnutrition is also another factor contributing to their health problems. Common illnesses found in the villages of the Munda tribe were classified according to the season they occur. As stated by Gigoo, "Malaria, Typhoid and Jaundice are the most common illnesses among the Munda tribe, which occurs specifically during the rainy and winter season. Malaria and diarrhea are usual causes of child mortality and it is common among Munda tribe"(Gigoo, A. P., 2009).

The Tribal Health Report (2018), reiterate that, the tribal population bears a lop-sided burden of communicable disease, primarily those referred to as disease of poverty and under development. Dengue is widely prevalent in several tribal areas in Jharkhand. Almost 80 per cent of malaria reported in India is from the areas where 20 percent of country's population resides in tribal, hilly, hard-to reach or inaccessible areas. Moreover, although tribal communities constitute only 8.6 per cent of the national population according to census 2011, they account for 30 per cent of all the cases of malaria, more than 60 per cent of Falciparum and as much as 50 per cent of the mortality associated with malaria (Tribal Health Report in India, 2018).

Malnutrition

Inadequate nutrition is a country wide problem. The National Family Health Survey (NFHS) 2015-16, finds that every second child in India suffers from at least one form of nutrition failure (i.e., stunting, underweight, or wasting). Given the large child population base (about 140 million in 2016), these figures translate into huge numbers of about 77 million undernourished children in India. The situation in the state of Jharkhand is corroborating the findings in NFHS - 4. Malnutrition and the impact on the children by underweight and stunting is a great health issue among the Munda tribe. Malnutrition seems to be an alien concept to them. "Nearly 67 percent children in WestSinghbhum are underweight, the highest in India. More than half are stunted and a third suffer from wasting" (Masoodi, A., 2019). A vast majority of West Singhbhum's children are more likely to die younger and even if they somehow manage to survive, as adults, they may suffer disability, have impaired physical and cognitive development, and reduced performance levels at school and work. "Earlier, people here were convinced that malnutrition was an incurable illness. The parents couldn't imagine that the kid would recover only by eating right. Even now, they keep saying 'the kid is fine, he just looks weak', or devi ka prokoaphai (evil

eye)," says Dr Jagannath Hembrom, who runs the Malnutrition Treatment Centre at Chaibasa(Masoodi, A., 2019). Such was the belief of the people in the community. In the villages, malnutrition is not a concern because people don't really know why the kids are growing weak. To add to it, the word Kuposhan (malnutrition in Hindi) is still an alien concept among villagers, who only know of it as a word outsider use when talking to them.

According to Jharkhand Economic Survey (2015-16) 47 percent and 27 percent children, respectively under age five (0-59 months) were stunted and severely stunted in Jharkhand in the year 2013-14. Stunted growth among children in the rural areas (stunted 50.2% and severely stunted 25.9%) of Jharkhand was higher among the children in the urban areas (stunted 37.2% and severely stunted 16%) of the state. The children of the Munda Tribe, who also suffer from malnutrition and anemia in different age groups. The level of underweight (low weight for age) stunting (low weight for age) and wasting (low weight for height) is high among the age group from 0 to 5 years. This adds to the increased rate of morbidity as well as mortality of the tribal children (Jharkhand Economic Survey, 2015-16). The current infant mortality rate for India in 2020 is 29.848 deaths per 1000 live births, a 3.48 per cent decline from 2019 (Macrotrends, 2020). The Sample Registration Survey (SRS) of 2017 has put Jharkhand's IMR at 29 deaths per 1,000 live births (TNN, 2019).

The food and nutrition have been the critical factor influencing the health scenario of the tribal. The food intake by many tribal mothers is inadequate not only in terms of protein and calories, but in iron, calcium and vitamins. Only 20 per cent of pregnant and lactating women had adequate intakes of both protein and calories. This leads to undernourished mothers and children risking their health. Sheeth Toppo, in his comparative study on the health status of Oraon and Munda in the Gumla block of Jharkhand showed that, "malnutrition is still a leading problem and it is very much influenced by income of the family, education level, family size and certain beliefs and traditions of the society. Promoting healthy lifestyle and diets to reduce the burden of malnutrition and non-communicable diseases requires a multisectoral approach (Toppo, S., 2016).

Maternal and Child Health

High incidence of anemia, low Body Mass Index (BMI), early marriage and early childbirth are the critical reasons for high maternal mortality. According to NFHS 3, 21.1 per cent teenage tribal girls had begun childbearing the highest among all social groups. The rapid survey on children 2013-14 reveals that more than 30 per cent of ST women in the 20-24 years of age groups are married before they turn 18. Alarmingly almost 50 per cent of adolescent ST girls between the age of 15 to 19 years are underweight or have a BMI of less than 18.5(Dutta, S., and Lahiri, K., 2019).The proportion is higher than all other population groups. Studies on maternal health show poorer nutritional status, higher levels of morbidity and mortality, and lower utilization of antenatal and postnatal

services among the tribal.

According to Tribal Health Report (2018), the child health indicators for the scheduled tribes are poor and worse than the general population. The tribal IMR was 74 as against 62 for the rest of the population in India, an excess of about 20%. It is based on the whole population data (104 million ST) hence the whole estimate is precise. The estimated IMR for ST Population in 2004 was 44,4 percent and under - five MR was 57.2 percent to1000 live births. In the same way, the under-five child deaths in tribal population can be estimated from U5MR-ST of 96 in 2004(NFHS-3) and 57 in 2014 (NFHS-4). The annual rate of reduction was 3.9. When applied to the estimated live births in ST (2,114,739) in 2011, the estimated number of tribal under five child deaths in the country in 2011 was 1,45,917 (Tribal Health Report in India', 2018).

Sanitation

The provision of safe drinking water supply and sanitation facilities are necessity of life and a crucial input in achieving the goal of "health for all" (Dr. Khobragade, G.M., 2019). The issues of health and well-being are closely related to that of an adequate water supply and functional sanitation system. Tribal communities face several problems related to health and sanitation.One of the key problems was the facility for clean drinking water. The tribal live in specific territories and hard to reach places. Government of India's flagship scheme, the Swachh Bharat Abhiyan (Clean India Mission), has constructed more than 12 million toilets in rural areas. SDG goal 3, of "attaining the highest possible level of health and well-being for all at all ages through a preventive and promotive health care and universal access to good quality health" (Kumar, S. S., 2017) would be a reality only when the poor people are able to access facilities for sanitation and health.

Socio-economic Situation contributing to the poor health of Munda Tribe

The primary occupation is Agriculture 53.6 percent followed by daily wage laborers 33.1 percent (Table - 1).

A good number of the Munda tribe live in poverty. The average monthly income of the respondent family is Rs. 1500 - Rs. 2000. A large portion of them live under abject poverty and are in debt in the hand of local money lenders.

Table 1: Occupational Status

Occupation	Responses	
	N	%
Agriculture	388	53.6%
Artisan	11	1.5%
NTFP Collection	25	3.5%
Private Service	2	.3%
Daily wage laborer	240	33.1%
Govt Service	1	.1%
Self Employed	14	1.9%
Unemployed	12	1.7%
Any other	31	4.3%
Total	724	100.0%

Table-2: Income Status

Monthly Income	N	%
Up to 1500	152	33.8
1501 – 2000	204	45.3
2001 – 2500	50	11.1
Above 2500	44	9.8
Total	450	100.0

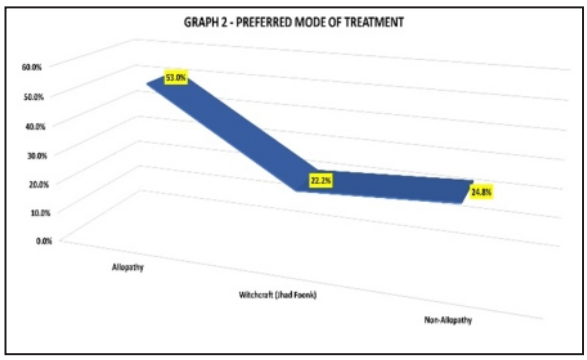
The liability ispractically inescapable since heavy interest is to be paid to these money lenders. "Once self-sufficient, the Munda farming community in Jharkhand has accepted changes in governance that promises social and economic development. But inclusive development has eluded them" (Sharma, T., 2018). Munda are socially excluded. The identity and rights of the tribes is a question in the country that believes in inclusion and progress of all communities. Poverty and exclusion have impacted much on the health status of the Munda Community.

Health Practices of Munda Tribe

R.S. Balgir (2006) states that, "the primitive tribes in India have distinct health problems mainly governed by multidimensional factors such as habitat, difficult terrains, varied ecological niches, illiteracy, poverty, isolation, superstitions and deforestation" (Balgir, R. S., 2006)

The social fabric of the Munda community is very much linked with their religious beliefs and practices. Most of the Munda are animists, i.e., nature worshippers. Their religion is Sarna. Most villages have a sacred grove, where the people believe the souls of their ancestors live this has some telling on their health practices as well. The tribe primarily depends on traditional healers/ojhas.

Though 53 percent (Graph - 2) of cases go for allopathic of treatment, a good number of 22.2 percent of cases still opt for witchcraft. The practice of health seems to be a matter of serious concern as people don't have faith in any single stream of medicine. This itself can be detrimental to the health security of the community. This also can drain the economic sources of the community drastically as the episodes of treatment can be prolonged and even detrimental to the life of the people.



The influence of tribal traditions and practices have a great say in the health system of the community. Tribal health system has been influenced vigorously by their belief in extraordinary powers, for example, protective spirits, benevolent spirits, malevolent spirits and the ancestral spirits whom they accepted to have caused their wellbeing or ill health and controlled their prosperity. Among these tribal communities, the religious specialists act as priests for conducting

spiritual functions to suppress the evil spirits by offering different religious methods. Mostly the male religious leaders practice this kind of healing method, which is largely accepted among the tribal communities like Santal, Kharia, Munda, Oraon. "Many of the cases have been reported and recorded that witchcraft has its feminine affiliation. The alleged women are trailed, branded as witches and after that raped, burnt alive and in many cases ruthlessly murdered." (Malik, B., 2019)

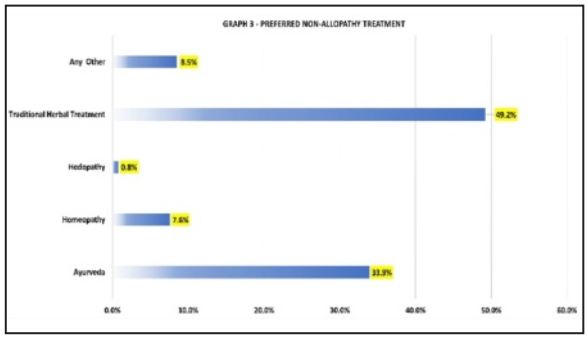
Then again, the involvement of ojhas including practices of black magic and divination for healing from different illnesses make them vulnerable. Tribal otherwise known as Adivasis regarded the occurrence of deadly disease, death in the family, epidemics or calamities not as a natural phenomenon, but as the influence of malevolent spirits or by the mischievous activities of a witch. Any kind of illness was attributed to the attack of an evil spirit and depended on witchcraft for the treatment. Lack of education, extreme poverty, the cultural upbringing and the influence of the worship of natural and celestial forces, influence their health system and practises.The case story narrated below is an example of the influence of witchcraft on the health.

Case Narrative

A mentally ill women (name changed) aged 38 living in Koinardan village of Gumla district with her two children (Son 12years and daughter 9years). The villagers believed that she was possessed by the bad spirit (Demon/ Daien). The society isolated and distanced her. She was not taken to the hospital nor her relatives came to her support, but she was considered as a problem to the family. Her children were helpless. Due to the stigma attached with the illness, the children were distanced, and their education also suffered. The family was in extreme poverty and due to socio-cultural barriers, she could not get proper guidance and treatment. Lack of proper treatment, proper food intake, proper hygiene and nutrition resulted in multiple complications and even developed paralysis. Such was the sad plight of this women.This is a sad story of a woman who was victim of belief in evil spirits and alienation from the mainstream resulted because of the failure of social support system.

Although, The Indian Psychiatric Society stresses the lack of data on mental health of tribal populations and the need for conducting more research to bridge the gaps in knowledge,Mental illness is still considered as the influence of evil spirit in their life. For this reason, they are rather reluctant to go to hospital and take the appropriate treatment.

In the non-allopathic stream, 49.2 percent of cases (Graph-3) have responded favoring ayurvedic practice, which is a healthy system that needs to be encouraged. This can contribute to healthy living and can even save the income on healthcare needs. Ayurveda and traditional treatment practices are accepted treatment practice and more sustainable stream. The health protection mechanism does not provide options for such treatment options. This also can



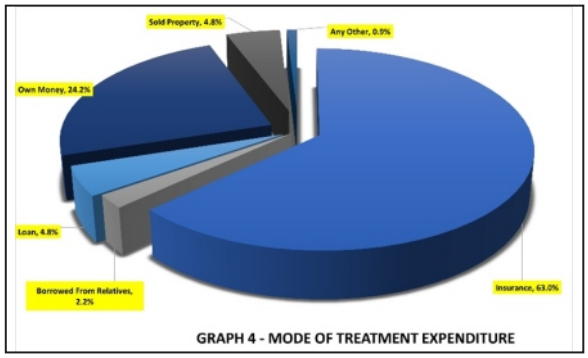
lead to heavy out of pocket expenditures causing poverty situation. Traditional herbal treatment is a popular practice among the Munda tribe and for this reason they go for such an option in large numbers.

Linking with modernity, the perception of the villagers about the health system vary based on the availability of health systems and the capacity to access them. The Primary Health Centres (PHC) are situated far in almost all the villages and therefore it is very difficult to reach them. The presence of private health providers (traditional/tribal healers) are located within the village itself. Most people in villages prefer modern methods of treatment, but due to financial problems, long hours of travel and lack of availability and accessibility, either they access private providers, whether traditional or tribal healers.

In case of minor morbidity like swelling of feet, vomiting or weakness, the people first consult a traditional healer, then an Auxiliary Nurse and Midwife (ANM) and lastly, doctors. In case of a normal delivery, they mostly prefer a dai (midwife), and only in critical cases, do they visit a hospital. For diseases like malaria, diarrhea and white discharge, the villagers first try to get medicine from ASHA workers, and if they cannot get the medicine or cure, they visit the doctor. In critical health situations, the patients are referred to the hospital/doctor at the district hospitals in Gumla and Chaibasa. However, in many cases, due to unavailability of doctors in the hospitals, the patients are left unattended and untreated.

The interview and the focus group discussions prove that the tribal families, despite having major sicknesses, were rather hesitant to get hospitalized for cultural and occupational reasons and therefore either they went for outpatient treatment with some health clinic in the vicinity or empaneled hospital or resorted to alternate medicine and stayed back at home. In this scenario they were not able to access the services of the health protection schemes.

Out-of-pocket expenditure to meet the expenses can take them to poverty, seriously affecting their health security. Borrowing and mortgaging can again lead the poor people to economic liabilities and can even result in the loss of assets. This again is a serious threat to the security and wellbeing of the Munda community. Interviews and focused group discussions have validated this reality. Analyzing the mode of meeting the treatment expenses (Graph-4) 63 percent of cases have used insurance as the mode of payment. But at the same time, we see that another 24.2 percent of the cases using their own money, and other means to meet the expenses. This indicates that the insurance amount is not enough to meet the expense. This results in out-of-pocket expenditure.



GRAPH 4 - MODE OF TREATMENT EXPENDITURE

Awareness leads to phenomenal change through the access and utilization of the scheme. Awareness about the health protection program in general seems to be a gap both at the conceptual level and levels of utilization of the scheme. Literatures in some sense justify this position that despite the presence of the scheme for many years the level of awareness is considerably low.The knowledge about the scheme was intended to be disseminated through lots of formal communication channels. The last level of communication channel is Gram Sabha. But the analysis evidenced that only 29 percent of the cases received the information from Gram Sabha. Gram Sabha being the grass root planning body, should be the vehicle of information sharing which has failed to a large extent. (Table-3).The group discussion highlighted the fact that participation in such platforms were not at the ideal levels. Village leaders have played their role within the limited knowledge about the scheme.

Table-3: Source of Information for RSBY

Source of Information	Responses	
	N	%
Gram Sabha	128	22.3%
Village Leaders	99	17.2%
Neighbors	58	10.1%
Relatives	14	2.4%
Any Other	275	47.9%
Total	574	100.0%

It is interesting to note that the major role played in sharing the knowledge about the scheme was the RSBY Mithras, who contribute significantly to the account of information as per 62 percent of cases. This social capital should be harnessed and put in the right use for effective knowledge sharing and participation of the community. And it was found that this channel was functioning quite effectively in some villages where they had better information and support services in enrolment and availing the RSBY cards.

As per the present study, physical access and distance impact on the health practises of the Munda people. 76.9 percent of the respondents had to pay for the transportation of the patients, though it is covered as per the provisions of the scheme, which is a limitation of the program. In the interview process it was reported that this facility for free transportation was non-existent and majority of them could not avail the transport facilities, even if it was available. This was due to the lack of adequate knowledge about such a provision embedded in the scheme and lack of facility to provide the free transport. RSBY card is the instrument to access and avail the insurance benefits. More than 64.2 per cent of cases look RSBY card advantageous for Insurance coverage, which is the prime focus of the RSBY scheme. But unfortunately, the data clearly indicates that almost 50 per cent of the people

enrolled have not received the RSBY smart card. This could be one of the major lacunae in the implementation of the program.

The support mechanism of the tribal family system is very low in times of health emergencies. The quality of life of the community and the social support systems have a significant relationship. The analysis indicates the poor social support system, which needs to be improved. The neighborhood systems need to be fostered and strengthened for quality and sustainable development.

Recommendations

- Heath coverage and protection mechanisms need to be refurbished for the health protection of tribal communities, and to address the Universal health coverage. More focus should be on preventive aspects of health and thereby arrest morbidities in the community. It is imperative that the method must be a multisectoral and multidimensional that accounts for various social determinants of health in the tribal context. The agenda must be an inclusive one and the answer may lie in the government and the tribal communities mutually co-creating spaces. The schemes, policies and the very definition of development need to be redefined and redesigned as per the aspirations of the Munda.
- In the study we have seen that Malaria is one of the major health issues among the Munda tribe. The target of malaria elimination from the country by 2030, remains an unfinished agenda if the services are not provided upto the last mile. Measures should be intensified for the tribal communities in the country and more specifically among the primitive tribes.
- Traditional herbal treatment and Ayurveda are the popular practices, among the Munda tribe as 61.7 per cent and 42.6 per cent of the respondents stated respectively in the non-allopathy stream. Ayurveda and traditional treatment practices are accepted treatment practice and more sustainable stream. RSBY considers only allopathy method and does not cover other streams of medicine such as; naturopathy, homeopathy, siddha etc. RSBY should accommodate wholistic and multidimensional health care practices. This could be the correct approach for tribal system from an economic and tribal ecosystem perspective.
- Insurance is one of the key health protection mechanism widely accepted by all the societies. Measures must be taken for universal coverage to achieve the aspirational goal of 'health for all'. Since people do not have the income even for their subsistence, they would even sacrifice their health needs, which would make them even more vulnerable to health events. Outpatient coverage is essential to meet the health needs of the communities. Insurance should cover the complete cost of the treatment, when it comes to the economically poor sections tribal. Creating opportunity to access the benefits of the scheme with provisions covering

the complete cost of the treatment, cost of transportation to make more effective for the community.

- Community participation and ownership should be the new paradigm of health planning and implementation in the context of tribal health. Participation of the community for need based and evidence-based policy making, and program planning will help in addressing the issues of the people and they become channels of communication and people led development. The formation of village level committees and village information centres are the channels of communication and information sharing. Community health volunteers can contribute significantly in the effective functioning of this program is the learning from this scenario.
- Well-functioning health systems are the bedrock of improved health security. The government should ensure that the health systems at the various levels are functioning well catering to the targeted communities. The health system of the state of Kerala is a model par in excellence, where there is a good synchronization of primary, secondary and tertiary levels. The participation of the community is another hallmark of Kerala model.
- Affirmative steps for policy changes, policy implementations under the Tribal Sub Plan, effective monitoring and evaluation of functioning of health systems will bring the required changes in this direction.

CONCLUSION

In a context of myriad challenges shrouding the health status and practices of the Munda tribe, the above-mentioned propositions would help in addressing the challenges and create a conducive environment for improved health security of the tribal population. Health and wellbeing are intimately connected to these basics of living. Addressing the Thirteenth Global Healthcare Summit 2019, Honorable Vice President of India, Sri M Venkaiah Naidu said, "We must move away from a treatment approach to a wellness-based approach, a goal that has been enunciated in the National Health Policy, 2017. (PIB, D., 2019).

The wellbeing status of India's tribal community needs uncommon consideration. Being among the least fortunate and most marginalized in India, tribal experience severe levels of deprivation. The tribal community falls behind the national average on several vital public health indicators, with women and children being the most vulnerable. The pertinent health related issues are of worth consideration to understand the tribal health scenario of the country. Without an extensive and comprehensive picture of tribal health in the nation, policy measures and government programs will not be complete and sustainable.

REFERENCES

- Balgir, R. S. (2006, October). Tribal health problems, disease burden and ameliorative challenges in tribal communities with special emphasis on tribes of Orissa. In Proceedings of National Symposium on "Tribal

Health" 19th-20th October (pp. 161-176).

- Dr. Khobragade, G.M. (Last updated 2019) 'Health Status of Tribal Women in Rural India and Health Consciousness: Present Perspectives' <https://velivada.com/2017/04/09/health-status-tribal-women-rural-india-healt-consciousness-present-perspectives/>.
- Dutta, S., & Lahiri, K. (2015). Is provision of healthcare sufficient to ensure better access? An exploration of the scope for public-private partnership in India. International journal of health policy and management, 4(7), 467.DOI: 10.15171/IJHPM.2015.77
- Gigoo, A. P. (2009). Health Issues and Health Seeking Behaviour of Tribal Population. Jharkhand, MHFW, Govt of Jharkhand.
- Jharkhand Economic Survey 2015-16'(2016). India: Planning Cum Finance Department & Finance Division Government of Jharkhand.
- Kumar Singh Shantesh (2017) 'India's National Health Policy 2017 and 2030 Agenda for Sustainable Development' <https://iigh.unu.edu/publications/blog/indias-national-health-policy-2017-and-2030-agenda-for-sustainable-development.html>.
- Macrotrends (Last updated 2020) 'India Infant Mortality Rate 1950-2020' <https://www.macrotrends.net/countries/IND/india/infant-mortality-rate#:~:text=The%20current%20infant%20mortality%20rate,a%203.36%25%20decline%20from%202018.
- Malik, B. Witchcraft in Tribal Society: Historical Analysis of Origin and Practice.
- Masoodi, A. (2019) 'Inside Jharkhand's Singhbhum, the Worst Constituency in India' LiveMint.
- PIB, D. (Last updated 2019) 'Addresses 13th Global Healthcare Summit 2019' <https://pib.gov.in/PressReleseDetailm.aspx?PRID=1579680>
- Sharma, T. (2018). Munda Tribes of Jharkhand Desire Inclusive Development. Retrieved June 10, 2020, from https://www.villagesquare.in/2018/08/27/munda-tribes-of-jharkhand-desire-inclusive-development/
- Toppo, L. (2018) 'History of Munda Tribe'.
- TRIBAL HEALTH REPORT in India' (2018). India: Government of India. (Report)

