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Original Research

Indigenous knowledge of plants in local healthcare management practices by tribal people of Malda district, India

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ABSTRACT

Aim: The present study was aimed at exploring the indigenous knowledge of native tribes on the utilization of wild plant species for local healthcare management in Malda district of West Bengal. **Materials and Methods:** Successive field surveys were carried out from July 2012 to August 2013 in search of traditional healers or practitioners who ceaselessly use their worthy knowledge to treat several ailments for human purposes. The information was collected by means of open-ended conversations, semi-structured questionnaire, group discussion, etc. Information obtained from the informants was also cross verified to check the authenticity. **Results:** The present study revealed that a total of 53 medicinal plants belonging to the 37 families are frequently used to treat 44 types of ailments with 88 herbal preparations. Of 53 plants, herbs possess the highest growth forms (32%) that were used in making traditional preparation, followed by shrubs (24%), trees (23%), climbers (17%), and parasites (4%). Roots comprised the major plant parts used (25%), followed by leaves (21%), seeds (17%), bark (13%), whole plant (8%) and fruits (6%) to prepare the medicinal formulations. The chief ailments treated in this province were azoospermia, diabetes, menstrual disorder, dysentery, rheumatism, etc. **Conclusion:** It can be concluded that the documentation of the ethnobotanical knowledge in management of local healthcare is the first step, which will open new door for the researchers in the field of modern drug development.

KEY WORDS: Ethnobotany, healthcare management, India, Malda district, tribal, West Bengal

INTRODUCTION

The knowledge of medicinal plants in India has been accumulated in course of many centuries based on several ancient medicinal systems, including ayurveda, unani and siddha [1]. According to the survey report of World Health Organization [2], 80% people of the developing world use plant remedies for several therapeutic purposes. India, one of the richest floristic regions of the world has diverse socio-economic, ethnic, linguistic and cultural areas. Therefore, the indigenous knowledge of medicinal plants and their use in treating several ailments might reasonably be expected in this country. Chandel *et al*. [3] have reported that nearly about 70% of tribal and rural inhabitants of India are to a large extent depended on medicinal plants for their primary healthcare management due to either insufficient or inaccessible or less availability of modern healthcare system. The information regarding the medicinal properties of plants came down traditionally generation after generation through traditional healers. Apart from the tribal groups, many other forest dwellers and rural people also possess unique knowledge regarding plant utilization.

Malda district of West Bengal, India [Figure 1] is situated between the latitude and longitude of 24°40′20″N to 25°32′08″N and 88°28′10″E to 87°45′50″E respectively with a total geographical area of 3455.66 sq km [4]. The district is characterised by its great archaeological relics such as Mourya Empire, Gupta Dynasty and Pala Dynasty. The region is covered with plentiful natural vegetation, which makes it verdant. River beds, ponds, marshy land etc. are good habitats for the wetland undergrowth. Most of the remote villages are covered by jungles, which consist chiefly of thorny scrub bush and large trees showing wide distribution of flora. The soil of the western region of the district is particularly suited to the growth of mulberry and mango, for which Malda has become famous. Various ethnic communities, including Santala, Rajbanshi, Namasudre, Polia, Oraon, Mundas, Malpaharias etc. are the inhabitants of this region. Of these Santala, Oraon is different from others due to their unique culture and tradition. They are quite popular to treat several types of local ailments of human and

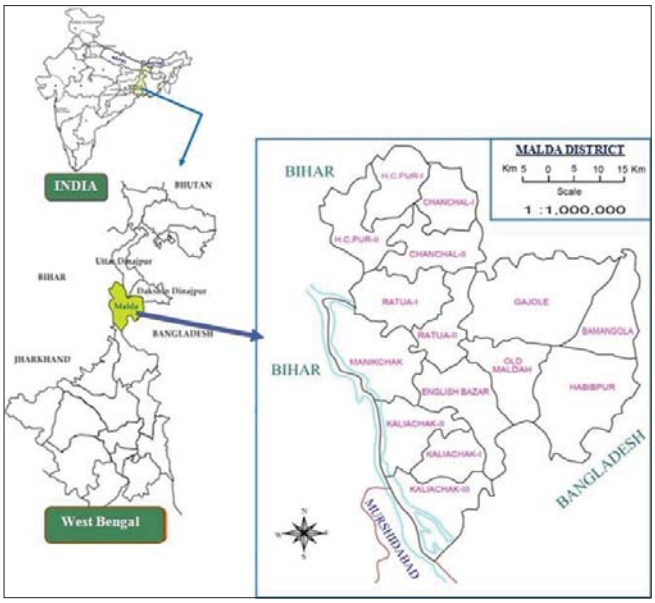

Figure 1: Map of study area (Malda district)

veterinary purposes [4]. Agriculture is the main source of income in the territory. Besides rearing of cattle, sheep, goats, fowls, etc. are the common practices among the tribal communities in this district. They also earn their livelihoods by selling milk, egg, flesh, etc., which plays a significant role in the rural economy of this district.

Preliminary floristic survey and a few numbers of folk usages of local plants had been studied for Malda district by Sur *et al.* [5,6], Pal and Das [7] and Chowdhury and Das [8], whereas Saha *et al.* [4] demonstrated a detailed picture regarding the ethnoveterinarian uses of plants. However, no detailed ethnomedicinal practices by local tribal communities had been done so far for this province. Hence, this is the first hand information on the ethnomedicinal usage by the ethnic people of Malda district as per author's best knowledge.

Now-a-days the traditional knowledge is in the way of erosion due to environmental degradation, deforestation, agricultural expansion and population pressure. Traditional knowledge of medicinal plants and their use by indigenous cultures are not only useful for conservation of cultural traditions and biodiversity but also for community healthcare and drug development at present and in the future. Therefore, recording of indigenous knowledge of medicinal plants is an urgent task. The objective of this study was to interact with local traditional healers and to document their knowledge on utilization of medicinal plants, their usage and the types of diseases treated, etc.

MATERIALS AND METHODS

Ethno Botanical Survey

The practice of medicinal plants is widespread among the tribal people of Malda district, and it is deeply rooted in their socioeconomic culture. However, the documentation of local medicinal practices is distinctly absent for the region. Considering the great cultural and ethnolinguistic diversity of the tribal people of the province, several field interviews were designed to cover as broad an area of the region as possible, in order to maximize the diversity of knowledge and the plant species employed in traditional remedy. The present survey was conducted during July 2012 to August 2013 in the district. Different interviewing procedures, including direct interview, group discussion, open-ended conversations, semi-structured questionnaire etc. were followed to get the information from the local traditional healers, known as Kavirajs, Baidyas or Ojhas and aged knowledgeable persons regarding the use of different medicinal plants curing several ailments. The purpose of this survey was explained to them in details, and prior informed consent was taken as per ethical guidelines of the International Society of Ethnobiology [9]. The villages were visited in different seasons to get the plant in its flowering condition. Plants were pointed out by the informants and their local names, used plant parts, formulation and dosages were also recorded.

Plant Collection and Identification

The plants were properly photographed, and herbarium was prepared for each specimen and deposited at Raiganj University College, Raiganj, India. The collected specimens were identified with the help of Central National Herbarium, Kolkata, India. The survey method followed in this study was that of the guided field-walk method as described by Jain [10] and the collection of voucher specimen, preservation, herbaria technique was followed as per Jain and Rao [11].

Total Key Informants

During the survey, we interacted with more than 100 informants and retained the information only from 74 informants. Among these, 55 were male (74.33%), and 19 were female (25.66%). More emphasis was given to the aged knowledgeable healers due to their vast experience in treating the local diseases and disorders. Kishori Barman (71 years), Uttam Kr. Mandal (53 years), Nargis Bibi (48 years), Farshed Ali (58 years), Fatema Begum (68 years), Basudeb Rajbanshi (55 years) Md. Subed Ali (44 years) etc. were the healers in the study area that we found.

Data Analysis

To analysis the data more clearly, obtaining from the informants, we set up our own database using Microsoft Access version 2007 and the parameters were name of the taxon, family name, voucher number, vernacular names, parts used, diseases treated, mode of administration or medicinal uses. We also analyzed the percentage between the used parts of plant species, growth forms of the species by putting them in the graph.

RESULTS

Plants Used

The present study revealed that a total of 53 medicinal plants belonging to 37 families were frequently used in the treatment

of 44 types of local ailments with 88 phytotherapeutic uses in the territory. The number of species most frequently used in the treatment of several disorders by each family was mentioned as Euphorbiaceae-6 species, Fabaceae-5 species, whereas Acanthaceae, Amaranthaceae, Vitaceae, Malvaceae, Solanaceae, Mimosaceae, and Zingiberaceae contributed 2 species to each family. The rest of 28 families were represented by 1 species in each. The scientific names of recorded species, their families, vernacular names, voucher number, used parts, mode of administration and local ethnic uses were illustrated in Table 1. Our study also exhibited that herbs were the most dominant growth forms with 17 species (32%), followed by 13 shrubs (24%), 12 trees (23%), 9 climbers (17%) and only 2 parasitic species (4%) treating different ailments as shown in Figure 2. *Andrographis paniculata*, *Amaranthus spinosus*, *Alstonia scholaris*, *Cuscuta reflexa*, *Jatropha gossypiifolia*, *Caesalpinia crista*, *Tamarindus indica*, *Sida rhombifolia* etc. were the most important plant used in the treatment of several diseases.

Parts of the Plant Used and Mode of Preparation

Various preparations of roots were used most number of occasions with 18 times (25%), followed by leaves with 15 times (21%), seeds with 12 times (17%), barks with 8 times (13%), whole plants with 6 times (8%), fruits with 4 times (6%), latex and gum with 3 times (4%) etc. as shown in Figure 3 in the treatment of several human disorders. A total of 88 types of formulations was being administrated to heal 44 types of ailments including azoospermia, diabetes, bone crack or ankle sprain, several types of pain, menstrual disorders, rheumatism, dysentery, etc. It had been observed that 20 types of diseases were healed by leaves, whereas 26 types of ailments cured by roots [Table 1]. A single plant part of same plant species was involved in treating different ailments and vice-versa.

The majority of remedies were prepared from fresh plant material in the form of a decoction, infusion or a paste. The most frequently used mode of remedy administration is oral ingestion, followed by external use. Most of the diseases and pains were usually treated either with a single plant or a mixture of plant parts. In some cases, ointments like mustered oil, ghee (a remedy from milk) etc. and other ingredients such as black peeper, ginger, curcuma, milk etc. were also used to make ethnic formulations along with the parts of plant species.

Diseases Treated and Medical Applications

A total of 44 types of diseases were reported to be cured in the present study. Azoospermia with 8 times was mostly healed disease in the study area, followed by different types of pains with 6 times, ankle sprain and diabetes with five occasions each whereas dysentery, inflammation, menstrual disorder, rheumatism, skin disorders, leucorrhea with 4 times each. Further, it can be concluded from Table 1 that the most of the preparations were oral except a few of external use. Various methods of preparation like crushing, grinding, direct use and homogenizing in water or with other plant extracts were used to prepare the traditional remedy. Mustered oil or ghee (a remedy from milk) was being utilized as an ointment at the time of external use such as itching, eczema, inflammation, pus, etc.

DISCUSSION

The prevalent diseases identified in the study area were azoospermia, ankle sprain, pain, diabetes, menstrual disorders, rheumatism, dysentery, skin disorders, etc. To expel ankle sprain or bone crack of local people, different plant parts like whole plant of *Cissus quadrangularis*, roots of *Tragia involucrata*, bark of *Litsea glutinosa*, bark of *Acacia catechu*, rhizome of *Alocasia macrorrhiza*, fruits of *Terminalia chebula* were administrated whereas eight plant species namely roots of *Bombax ceiba*, seeds of *C. reflexa*, *Ocimum kilimandscharicum* and *Abrus precatorius*, roots of *Curculigo orchioides* etc. were administrated to treat azoospermia [Table 1]. Diabetes was cured by means of leaf of *A. paniculata*, seeds of *Trigonella foenum-graecum*, seeds of *Syzygium cumini*, fruit of *Alpinia zerumbet* and whole parts of *Oxalis corniculata*. To treat menstrual disorders several plants had been utilized by the local traditional healers as explained in Table 1. There were few species used more than one occasion to prepare medicinal preparations curing different ailments, viz. *C. quadrangularis* known as harjora was used in bone crack and ankle sprain;

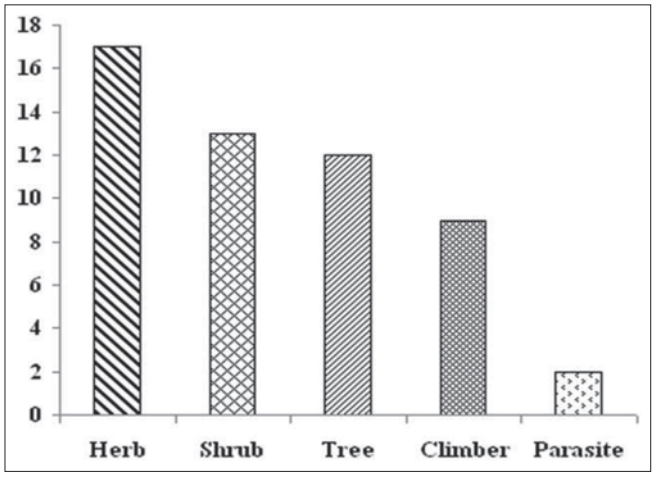

Figure 2: Growth forms of utilized species

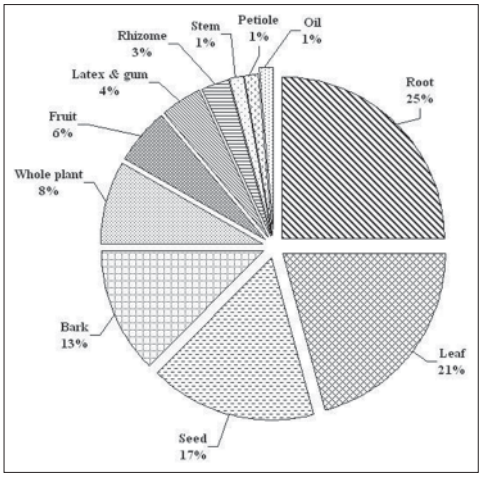

Figure 3: Pie chart of used plant parts

Table 1: List of medicinal plants investigated for local healthcare management with their ethnic use

Name of the plants/ voucher specimen number	Family	Local names	Parts used	Disease/formulation/administration
A. paniculata (Burm. f.) Wall. Ex Nees RUC/MLD-255	Acanthaceae	Kalmegh/ Mahatita/ Iswarnath	Leaf	Fever/Dysentry: The leaf is crushed and the juice is used to treat fever and chronic dysentery at early morning in empty stomach Diabetes: The leaf is grinded along with leaf of *S. chirata* to make a paste against diabetes. The formulation is taken twice a day for 2 months
H. hirta T. Ander. RUC/MLD-294	Acanthaceae	[Not Known]	Root	Bleeding piles: The root is crushed along with *Mentha* leaves and the paste is applied on rectum to stop bleeding piles for 2-3 weeks
A. spinosus L. RUC/MLD-251	Amaranthaceae	Kanta Khuria/ Kanta note	Root	Menstrual problem: The root is grinded and the decoction is mixed with milk and sugar to make a paste and used to treat irregular menstruation. The paste is taken twice in a day for 1 month Rheumatism: The root is grinded with sugar (slight), goat milk and mustered oil to make a paste and applied on affected area to treat rheumatism Cuts and wounds: The grinded root paste is used as an emollient on all types of cuts and wounds
A. aspera L. RUC/MLD-287	Amaranthaceae	Apang/Baro chirchiri	Root	Inflammation: The root is grinded with black pepper and the decoction is taken to treat inflammations in abdominal areas Pain: The roots are chewed with betel and lime to treat liver pain
F. vulgare Mill. RUC/MLD-286	Apiaceae	Mouri	Seed	Menstrual problem: The seeds with roots of *Ageratum conyzoides* and ginger are crushed and the juice is eaten to stop excessive blood discharge during menstruation Inflammation: The seeds along with the roots of *Sida rhombifolia* are crushed and the paste is applied to relief from inflammation of breast
A. scholaris (L.) R. Br. RUC/MLD-275	Apocynaceae	Chatim	Bark, leaf, latex	Anorexia: The bark decoction along with ginger is used to treat anorexia Pregnancy: The leaf decoction is feed to pregnant women to enhance delivery Pain: Latex is externally used in gum pain
A. macrorrhiza Schott. RUC/MLD-310	Araceae	Mankachu	Rhizome	Ankle sprain: The rhizomes are crushed along with ginger and mustered oil and slightly warmed. Finally, the paste is applied externally on ankle pain
C. rotang L. RUC/MLD-330	Aracaceae	Bet	Seed	Bronchitis: The seeds are dusted and mixed with cow-milk to treat bronchitis or cold and cough Skin disorders: Leaf paste along with seeds with *A. maxicana* is used externally in skin disorders
A. indica L. RUC/MLD-288	Aristolochiaceae	Iswarmul	Root	Impotency: The root is washed clearly and burned with the roots of *S. ovalifolia*. The ash is mixed with banana and taken in impotency of female
B. ceiba L. RUC/MLD-283	Bombacaceae	Simul (Beng.)	Root, gum	Azoospermia: The tender root (2-3-years-old tree) is crushed along with the roots of *C. orchioides* and used to induce sex and sperm production Laxative: Gum is used as an ingredient of laxative preparation
H. indicum L. RUC/MLD-277	Boraginaceae	Hatisur	Leaf	Dysentery: Leaf juice is used for curing dysentery and cough. Fresh leaf decoction is applied to wounds, boils and pruritus Conjunctivitis: The leaf juice is applied on eyes to cure eye disorders like inflammation, conjunctivitis etc.
T. chebula Retz. RUC/MLD-341	Combretaceae	Haritaki	Fruit	Bone crack: The *Cissus* stem (Harjora), *Litsea* stem (Daradmayda), *T. bellirica* fruit (Bahera) and an egg (white part) is crushed along with the Haritaki fruit, then the paste is applied externally on bone crack
C. reflexa Roxb. RUC/MLD-296	Convolvulaceae	Swarnalata/ Aloklata	Whole plant, seed	Nervous disorder: The plant is crushed with goat milk and the juice is feed to treat nervous disorder Azoospermia: The seed infusion is used to enhance sperm health and motility. The formulation is taken at night before sleep for 1-2 month
D. bulbifera L. RUC/MLD-411	Dioscoreaceae	Kham alu	Rhizome	Skin disorders: The rhizome is crushed along with leaf of *T. indica* and golmorich and the paste is applied as emollient in herpes, pusses and other skin diseases
D. montana Roxb. RUC/MLD-399	Ebenaceae	Choto gab/Ban gab	Bark, leaf	Leucoderma: The bark and leaves are together crushed and applied externally against leucoderma Diarrhoea: The decoction of bark is used against diarrhoea
J. gossypiifolia L. RUC/MLD-265	Euphorbiaceae	Varenda/ Jamalkota.	Leaf	Toothache: The leaves with salt and golmorich (2-3 pieces of seeds) are crushed and the paste used in toothache Abscesses: Leaf paste and latex are used as emollient on boils and abscesses Vomiting: Leaves juices are used to induce vomiting
P. reticulatus Poir. RUC/MLD-263	Euphorbiaceae	Panichitki	Root	Tumor: The root bark along with fruits of *Tamarindus* and zinger are crushed and slightly wormed then the paste is used as emollient on tumor
T. involucrata L. RUC/MLD-269	Euphorbiaceae	Bichatu/Bichuti	Root	Ankle sprain: The roots are crushed along with stem of harjora, curcuma and ginger to make paste and applied externally on broken leg and ankle sprain
E. tirucalli L. RUC/MLD-318	Euphorbiaceae	Shibjota	Stem	Galatogouge: The stem portion with leaf is crushed and the paste is taken orally to enhance milk production of women Pain: Stem is crushed along with zinger and the paste is applied as emollient on affected area to relief from pain

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Table 1: Contd.

Name of the plants/ voucher specimen number	Family	Local names	Parts used	Disease/formulation/administration
E. neriifolia L. RUC/MLD-305	Euphorbiaceae	Patsaij	Bark	Leucorrhea: Bark is crushed along with *P. betel* (3-5 pieces), lime and khoir (*A. catechu*) then the paste is taken orally to cure from leucorrhea
T. nudiflora L. RUC/MLD-343	Euphorbiaceae	Pithalu	Root	Enlargement of uterus: The roots are crushed and slightly warmed then it is applied externally until it cures
C. sophera L. RUC/MLD-279	Fabaceae	Kalkasunda/ Jhanjhane.	Root	Rheumatism: The root with ginger, garlic and black pepper are crushed and the paste is eaten to treat rheumatism
A. precatorius L. RUC/MLD-304	Fabaceae	Kunch (Beng.)	Seed	Pain: Seeds are crushed and paste is applied in stiffness of shoulder joint pain Azoospermia: Seeds are used to enhance sperm production
C. crista L. RUC/MLD-319	Fabaceae	Nata (Beng.)	Leaf, seed	Hydrocele: 3-4 pieces of apical leaf part are crushed with black pepper and taken to cure from hydrocele for 1 month Inflammation: Seed oil is applied externally against burning sensation of body
T. indica L. RUC/MLD-322	Fabaceae	Tetul (Beng.)	Fruit	Abdominal fat: Fresh fruits (1 kg) are boiled in water along with sugar (michri), and taken the juice twice to minimize abdominal fat Dysentery: Young fresh leaves are crushed along with sugar (michri), and the decoction is taken to treat dysentery
T. foenum-graecum L. RUC/MLD-333	Fabaceae	Methi	Seed	Kidney stone: The seeds are kept in a bowl of water then the decoction (1 glass) is taken at next morning in case of kidney stone for 15-20 days Diabetes: The seed powder is mixed with milk and taken at bed-time for 30 days against diabetes Dandruff: The seed paste is applied on head to prevent dandruff
C. orchioides Gaertn. RUC/MLD-335	Hypoxidaceae	Talmuli	Root	Azoospermia: The root (1-2 pieces) is chewed at every morning for 15-20 days to improve sperm production and motility
O. kilimandscharicum Guerke RUC/MLD-347	Lamiaceae	Dulal babu	Seed	Azoospermia: The seeds are taken in a bowl of water and left for whole night; then next morning it is crushed along with that water and taken to induce sperm production. The formulation is taken for 1 month
L. glutinosa (Lour.) C. B. Rob. RUC/MLD-259	Lauraceae	Daradmoyda	Bark, leaf	Bone crack: The stem bark is crushed along with harjora, curcuma to make a paste and applied as emollient on bone crack, ankle pain etc. Loose motion: Leaves are crushed and the juice is taken in case of loose motion
B. acutangula (L.) Gaertn. RUC/MLD-313	Lecythidaceae	Hizal (Beng.)	Bark, seed	Azoospermia: Bark is taken in a bowl of water and at the next morning the infusion is taken to condense watery semen for 30 days Sinus problem: The seeds are dusted and mixed with warm milk and then eaten at every evening for 1 month which effectively cure sinus problem
D. falcata (L.f.) Etting. RUC/MLD-340	Loranthaceae	Dharua	Bark	Menstrual problem: The bark is crushed along with bark of *S. indica*, fennel seeds and ginger and the juice is taken in case of irregular menstruation
S. rhombifolia L. RUC/MLD-310	Malvaceae	Peet Berala/ Bariala	Root	Abscesses: The roots are crushed with black pepper and areca nut and applied externally to cure from abscesses Inflammation: The roots and fennel seeds are crushed and the paste is used to relief from inflammation of breast
A. moschatus Medik. RUC/MLD-280	Malvaceae	Latakasturi (Beng.)	Seed, whole plant	Sex stimulant: Seeds are kept in a bowl for whole night. On the very next morning seeds are crushed along with roots of *C. orchioides* to make paste which act as sex stimulant and it enhances semen production
C. hirsutus (L.) Diels RUC/MLD-261	Menispermaceae	Jalkasha (Beng.)	Leaf	Azoospermia/late ejaculation: The leaf is crushed with water in a bowl and left for whole night and next morning the decoction is taken to induce semen production. It is also effective against late ejaculation
A. catechu Willd. RUC/MLD-326	Mimosaceae	Khoir	Bark	Ankle sprain: The bark is crushed along with harjora, curcuma, an egg and zinger to make a paste and applied externally on bone crack and ankle sprain Leucorrhea: The bark is crushed along with *P. betel*, lime and bark of *Euphorbia neriifolia* and then the paste is taken orally to cure from leucorrhea for 15-30 days
M. pudica L. RUC/MLD-307	Mimosaceae	Lajjabati (Beng.)	Root, leaf	Leucorrhea: Root decoction is used to treat leucorrhea for 20 days Breast Cancer: Leaves decoction is effectively used in breast cancer
F. benghalensis L. RUC/MLD-257	Moraceae	Bot	Latex, root	Nervous or body weakness: The latex mixed with sugar (batasa) are fed to induce semen production and in nervous or body weakness Rheumatism: The crushed apical prop root mixing with goat milk and sugar (batasa) are used to treat rheumatism
S. cumini (L.) Skeels RUC/MLD-337	Myrtaceae	Jam	Leaf, seed	Dysentery: Leaf is crushed along the leaf of *Tamarindus* sp. (tetul), michri (a type of sugar) and the roots of *Cephalandra* sp. (telakucha) and the paste is taken at empty stomach to prevent dysentery Diabetes: Seed powder is mixed with milk and taken twice a day in diabetes
O. corniculata L. RUC/MLD-320	Oxalidaceae	Amrul	Whole plant, root	Diabetes: The whole plant is crushed and juice is taken at early morning to prevent diabetes for 1-2 months Acidity/vomiting: The roots (3-4 pieces) are crushed with salt and taken to cure from acidity and vomiting

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Table 1: Contd.

Name of the plants/ voucher specimen number	Family	Local names	Parts used	Disease/formulation/administration
A. mexicana L. RUC/MLD-311	Papaveraceae	Siyal kata/ Gandhila	Seed, leaf	Skin disorders: The seeds are fried and crushed and then this seed-dust are mixed with coconut oil and applied on body to prevent skin disorders like eczema, pus etc Conjunctivitis: The leaf juice is applied on eyes to cure eye disorders like inflammation, conjunctivitis etc
P. emblica L. RUC/MLD-270	Phyllanthaceae	Amlaki (Beng.)	Fruit	Late ejaculation: Dried fruits are dusted and eaten at morning and night after meal, which is very useful to prevent late ejaculation. The formulation is taken for 1-2 months Stungury: Boiled fresh fruits with slight salt are taken for 20-25 days to treat stungury
P. betel L. RUC/MLD-317	Piperaceae	Pan	Leaf	Leucorrhea: Leaf is crushed along with stem bark of *E. nerifolia*, lime and fruit of *A. catechu* (khoir), the paste is taken orally to cure from leucorrhea
P. zeylanica L. RUC/MLD-250	Plumbaginaceae	Sadachita/ Agrochita	Root	Appetizer/blood enhancer: The root is crushed and the decoction used as an appetizer and also acts as blood enhancer
S. munja Roxb. RUC/MLD-289	Poaceae	Siki ghas/ Biyana	Root, oil	Allergy/pain: The roots are crushed with curcuma and zinger and the paste is applied externally to cure from allergy and body pain Lumbago: The oil extracted from leaves, are used to treat from lumbago
H. cordata Thunb. RUC/MLD-335	Saururaceae	Anstagach	Leaf	Vomiting: The leaves are crushed along with zinger and golmorich to induce vomiting
S. ovalifolia Roxb. RUC/ MLD-271	Smilaceae	Bagnocha/ Kumarilata	Whole plant, root	Impotency: The root is washed clearly and burned with the roots of *A. indica*. The ash is mixed with banana and taken in impotency of female Rheumatism: The whole plants are crushed with the bark of *C. religiosa* and the juice is taken to treat rheumatism for 2 months
S. xanthocarpum Sch. and Weldl. RUC/MLD-293	Solanaceae	Kantikari (Beng.)	Whole plant, root, seed	Conjunctivitis: Whole plant is burned along with peyaj and used as emollient on eyes to cure from conjunctivitis Pain: Roots and seeds are crushed along with the stem of *E. tirucalli* to make paste and applied externally to treat chest pain
D. metel L. RUC/MLD-328	Solanaceae	Kalo Dhutura	Root, leaf	Paralysis: The roots are crushed along with mustered oil, ghee (a remedy from milk), black pepper, curcuma and sindur, and then used as an emollient on paralyzed area until it cures Hair growth: The leaves are crushed and applied on head for over night, and washed off by tea-liquor to promote new hair growth. It is applied for 10-12 days
A. augusta (L.) L. f RUC/MLD-300	Sterculiaceae	Ulatkambal	Petiole, bark	Azoospermia: The petiole is crushed and kept in a bowl of water for a whole night, then the infusion is taken at early morning at empty stomach as semen and sperm enhancer
C. quadrangularis L. RUC/MLD-312	Vitaceae	Harjora (Beng.)	Whole plant	Bone fracture/ankle sprain: The plant is crushed along with roots of *D. metel* (kalo dhutura), *Glycosmis* sp. (atiswar) leaves of *Tamarindus* sp. (tetul), ginger, salt and the pest is applied as emollient on bone fracture, ankle sprain (5-12 days)
C. trifolia (L.) Domin RUC/MLD-315	Vitaceae	Choto goaliarlata	Leaf	Menstrual disorder: The leaves are crushed along with roots of *A. aspera* (apang) and *Areca* fruit and the juice is taken on empty stomach at early morning to prevent irregular menstruation (20-30 days)
Z. cassumunar Roxb. RUC/MLD-323	Zingiberaceae	Ban ada/Bau ada	Rhizome	Ankle sprain: The rhizome is crushed along with ginger and roots of bichuti (*Tragia* sp.) and a paste is made which is used as emollient on broken bone and ankle sprain
A. zerumbet (Pers.) Burtt & Smith RUC/MLD-314	Zingiberaceae	Elach	Fruit	Diabetes: Fruit (10-12 pieces) is crushed along with *Musa* stem, (3-4 pieces; 10 cm each) *I. aquatica* (kalmi sag), leaf of *N. indicum* and pinch of michri (remedy of sugar) and then the extract juice is taken orally to treat diabetes (30-45 days)

A. paniculata: Andrographis paniculata, H. hirta: Hemigraphis hirta, A. spinosus: Amaranthus spinosus, A. aspera: Achyranthes aspera, F. vulgare: Foeniculum vulgare, A. scholaris: Alstonia scholaris, A. macrorrhiza: Alocasia macrorrhiza, C. rotang: Calamus rotang, A. indica: Aristolochia indica, B. ceiba: Bombax ceiba, H. indicum: Heliotropium indicum, T. chebula: Terminalia chebula, C. reflexa: Cuscuta reflexa, D. bulbifera: Dioscorea bulbifera, D. montana: Diospyros montana, J. gossypiifolia: Jatropha gossypiifolia, P. reticulatus: Phyllanthus reticulatus, T. involucrata: Tragia involucrata, E. tirucalli: Euphorbia tirucalli, E. neriifolia: Euphorbia neriifolia, T. nudiflora: Trewia nudiflora, C. sophera: Cassia sophera, A. precatorius: Abrus precatorius, C. crista: Caesalpinia crista, T. indica: Tamarindus indica, T. foenum-graecum: Trigonella foenum-graecum, C. orchioides: Curculigo orchioides, O. kilimandscharicum: Ocimum kilimandscharicum, L. glutinosa: Litsea glutinosa, B. acutangula: Barringtonia acutangula, D. falcata: Dendrophthoe falcata, S. rhombifolia: Sida rhombifolia, A. moschatus: Abelmoschus moschatus, C. hirsutus: Cocculus hirsutus, A. catechu: Acacia catechu, M. pudica: Mimosa pudica, F. benghalensis: Ficus benghalensis, S. cumini: Syzygium cumini, O. corniculata: Oxalis corniculata, A. mexicana: Argemone mexicana, P. emblica: Phyllanthus emblica, P. betel: Piper betel, P. zeylanica: Plumbago zeylanica, S. munja: Saccharum munja, H. cordata: Houttuynia cordata, S. ovalifolia: Smilax ovalifolia, S. xanthocarpum: Solanum xanthocarpum, D. metel: Datura metel, A. augusta: Abroma augusta, C. quadrangularis: Cissus quadrangularis, C. trifolia: Cayratia trifolia, Z. cassumunar: Zingiber cassumunar, A. zerumbet: Alpinia zerumbet, S. chirata: Swertia chirata, A. conyzoides: Ageratum conyzoides, A. maxicana: Argemone maxicana, T. bellirica: Terminalia bellirica, S. indica: Saraca indica, C. religiosa: Crateva religiosa, A. aspera: Achranthus aspera, I. aquatica: Ipomoea aquatica, N. indicum: Nerium indicum

A. spinosus was used to treat menstrual disorders, rheumatism, cuts and wounds; *T. foenum-graecum* was used against kidney stone, diabetes and dandruff problems.

As the tribal people remain busy throughout the year with their practice of livelihood from the agricultural sector, they rarely visit the hospitals in towns. Simultaneously, they cannot afford the cost of modern medicines. It has also been observed that some of the villages are in such remote areas where transportation facilities are inaccessible or sometimes become detached due to some natural calamities. Hence, the villagers cannot reach the nearby hospital. As a result, the ethnomedicinal practices are popular in the study area as it is more accessible, easy to prepare, low costs, and eco-friendly. Besides, the practice of medicinal plants treating the patients is an alternative source of income for the healers.

CONCLUSION

The present study exhibited that how different interviewing procedures helped to gather the information regarding the name of the diseases treated, plant resources and their usage, including their mode of administration. A total of 44 types of local ailments was treated with 88 phytotherapeutic uses in this district. The making procedure of herbal preparation is yet a secret and passed on generation after generation verbally. Proper analysis of herbal formulations and phytoconstituents of used plants can open new door for the researchers. However, ethnobotanical data is the basis of further validation of practices and plant uses in the context of a professional approach to develop new herbal drug [12].

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REFERENCES

1. Lone PA, Bhardwaj AK. Traditional herbal based disease treatment in some rural areas of Bandipora district of Jammu and Kashmir, India. Asian J Pharm Clin Res 2013;6:162-71.
2. WHO. Traditional Medicine, Growing Needs and Potential. WHO Policy Perspectives on Medicines. Vol. 2. Geneva: WHO; 2002. p. 1-6.
3. Chandel KP, Shukla G, Sharma N. Biodiversity in Medicinal and Aromatic Plants in India, Conservation and Utilization. New Delhi, India: NBPGR; 1996.
4. Saha MR, DeSarker D, Sen A. Ethnoveterinary practices among the tribal community of Malda district of West Bengal, India. Indian J Tradit Knowl 2014;13:359-67.
5. Sur PR, Sen R, Halder AC, Bandyopadhyay S. Observation on the ethnobotany of Malda-West Dinajpur districts, West Bengal-I. J Econ Taxonomic Bot 1987;10:395-401.
6. Sur PR, Sen R, Halder AC, Bandyopadhyay S. Observation on the ethnobotany of Malda-West Dinajpur districts, West Bengal-II. J Econ Taxonomic Bot 1990;14:453-9.
7. Pal BC, Das KK. Usage of mango (*Mangifera indica*) tree-parts as traditional folk medicine in rural Malda, West Bengal, India. Environ Ecol 2008;26:719-21.
8. Chowdhury M, Das AP. Inventory of some ethno-medicinal plants in wetlands areas in Maldah district of West Bengal. Pleione 2009;3:83-8.
9. The International Society of Ethnobiology Code of Ethics. Available from: http://www.ethnobiology.net/code-of-ethics/ [Accessed on 2008 Nov 24].
10. Jain SK. A Manual of Ethno-Botany. 2nd ed. India: Jodhpur Scientific Publishers; 1995.
11. Jain SK, Rao RR. A Handbook of Field and Herbarium Methods. New Delhi, India: Today and Tomorrow Publisher; 1977.
12. Muhammad G, Khan MZ, Hussain MH, Iqbal Z, Iqbal M, Athar M. Ethnoveterinary practices of owners of pneumatic-cart pulling camels in Faisalabad City (Pakistan). J Ethnopharmacol 2005;97:241-6.

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