



Ethno-medicine of Toto tribe of Alipurduar District, West Bengal, India: An Quantitative Approach

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Abstract: The concept of health and illness has been playing a very important role in existence of any civilization. Since time immemorial, all societies pursue their own disease theory systems for identification, explanation and cure of illness. Depending on deep observation and understanding of nature various techniques have been formulated to get rid of from ailments. These easy accessible indigenous medical system or ethnomedical procedures have been helping numerous marginalized societies to sustain their livelihood. The present paper will try to explore various ethno medicinal uses of numerous plant species by the Particularly Vulnerable Tribal Group (PVTG) Toto population of Alipurduar district, West Bengal. Attempts have also been made to quantify various medicinal parts using suitable statistical tools. Data were collected by interviewing Toto traditional medicine men and knowledgeable persons of the Toto society. Altogether 32 plant species were identified for the study to cure at least 21 types of misfortunes. The study has also been formulated for documentation and preservation of indigenous remedies of Toto society.

Keywords: Ethnomedicine, Toto, Consensus Value, Fidelity Level, Importance Value, Fic

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Introduction

In the map of tribal world, India has been prominent by hosting/ nurturing the largest tribal population of the world. The United Nations has estimated that there are over 370 million indigenous people in the world living across 90 countries (UN 2009) while in India they actually constitute about 8.6% of the India's total population (Census 2011) and cover about 15% of the country's area. They are known by many names like *Adivashi*, *Banabashi*, Native people, Indigenous people and so on. The maximum tribal population concentrated

in North East India followed by Central India and lowest proportion in South India.

There are nearly 2000 ethnic groups in the world and almost every group have their own traditional knowledge and experience in connection with medicinal practices (Liu et. al. 2009). WHO declared, about 80% of the world's rural population relies predominantly on plants and plant extracts for their primary health care (WHO 2005). According to Foster and Anderson (1978), all societies have disease theory systems to identify, classify and explain illness. Some rudimentary health practices are very common among the tribals living in villages, remote hills, forest regions. They have developed unique pharmacopoeia and some exceptional knowledge of medical techniques at individual level depending on specific ecology and habitation although medicine in tribal societies does not exclude supernatural means. Their deep observation and understanding of nature and ecology helps them to develop various techniques of herbalism, easy accessible home remedies of cure and even various surgical methods to relief the sick either separately or together. Even till date, tribals of India combat their illness and life crisis with their indigenous knowledge of using natural products available in nearer ecology, supernatural faith, and worship of deities (Chaudhuri, 1986).

The practice and cultivation of indigenous knowledge including the ethno-medical domain has been an age old process. Particularly ethno-medicine is an embedded knowledge of any community which is distributed among the members of the community people. This practice of health care is based on belief and experiences which is also an inevitable part of their age old tradition and culture. This traditional medicine culture has also been defined by WHO (2019) as "the sum total of knowledge and practices, whether explicable or not, used in diagnosing, preventing or eliminating physical, mental and social diseases. This knowledge or practice may rely exclusively on past experience or observation handed down orally or in writing from generation to generation. These practices are native to the country in which they are practiced. The majority of indigenous traditional medicine has been practiced at the primary health care level."

After knowing about the rich traditional medical knowledge of indigenous cultures, there has been an increasing demand to pay more attention to this hitherto silent aspect in the literature on ethno-medicine as these herbal drugs are cheap, effective, easy available and more importantly supposed to have no side effects. To strengthen the knowledge of pharmacognosy it is essential to acquire some basic information regarding medicinal plants, their various

traditional usage, way of preparation, doses, mode of administration of crude drugs for documentation, conservation and preparation of database for further research.

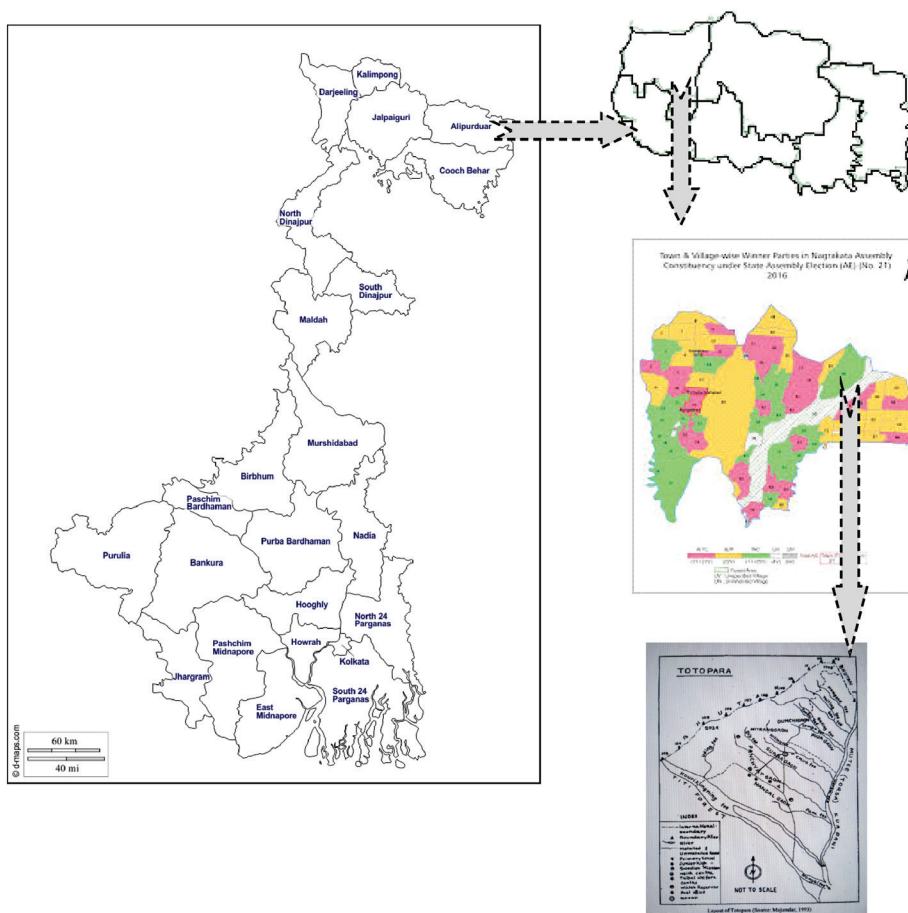
It has been found that the age-old tradition regarding information about attitude towards disease, diagnosis, prevention as well as prescription and pharmacology are still lying unclaimed/ unnoticed among different tribes in our state also. A perusal of literature shows that very little documentation of ethnobotanical works including quantitative analysis of specific indigenous group has been commenced in different parts in our country.

In this context, present study has been designed to document and conserve the traditional herbal knowledge of Toto tribe living in Totopara village, Alipurduar District. Alipurduar is one of the newly formed districts of West Bengal. It lies between 26°29'N 89°34'E. The district has an area of 3,010 sq. km. and total forest area of sq.km. Geographically, the village of Totopara is located within latitude 89° 20' and longitude 26°50'. For a pretty longtime, a number of tribal communities have been found to migrate to this area and became the autochthones of this area. The Sub-division has high percentage of migrated populations of different cultural groups (Rajbanshis, Rabhas, Totos, Mech, Santhals, Oraons) which have created a unique cultural harmony. The village Totopara, the only settlement of the Toto population, has a total area of 1996.76 acre (3.12 sq. miles) of land. The northern end of the village touches Bhutan (on the south); the Torsha flows on the eastern side of the village. The village is bounded in the north by the Teding hills; Titi Reserve forest is situated at the West. The altitude of the village varies from 500ft to 2024ft from the south to north up-to the Indo- Bhutan Border. The Bhutan Himalayas plays an important role in the climatic condition of Totopara. The average temperature of that area was 30.9 degree Celsius 32.5 degree Celsius maximum in the summer and in the winter 8 degree Celsius minimum. The humidity of the village varies from 100-50%. Relative humidity 82% and average annual rainfall 3160mm. maximum rainfall occurs from June to September. In comparison to the surrounding places Totopara experiences much higher rainfall due to the presence of Titi forest, Torsha-river and Bhutan Himalayas.

Materials and Methods

Data Collection

Exposure on huge traditional medical knowledge of the Particularly Vulnerable Tribal Group (PVTG) was first happened during the PhD field survey during



2011 to 2013. Specific ethnomedical data were collected between January 2016 to March 2017 following the standard methods from Totopara village with the help of village headman and traditional medicine men. On the basis of availability of traditional medicine men as well as aged persons of the village various medicinal plants were collected and herbarium was prepared. Village was visited in different season's viz. summer, monsoon and winter to access maximum number of seasonal medicinal plants. As the village Totopara is segmented into six sectors key informants and knowledgeable persons were selected from every sector. Before interview consent was taken from the interviewee. Interviews were mostly conducted in Toto and Nepali language with the help of the interpreter. Those who knew Bengali language particularly the school going pupil helped the researcher to conduct smooth interview. The data have been collected through semi structured and open ended schedule

format. The local name of the plants, parts used, mode of administration, doses, preservation procedure were recorded. As per requirement, photography method was also followed for better understanding as well for future reference.

Quantitative ethno-medicinal data analysis

Here in this study, different quantitative tools like Consensus value for Plant Part [CPP](Monteiro *et al.*, 2006), Informant Consensus Factor [Fic](Trotter and Logan, 1986), Fidelity Level [FL%](Friedman *et al.*, 1986), Preference ranking exercise (Martin, 1995), and importance value [IVs] (Byg and Balsev, (2001) were employed to analyze the collected data.

Consensus value for Plant Part (CPP) measures the degree of agreement among informants concerning the plant part used and is calculated as $CPP = P_x / P_t$, where P_x = number of times a given plant part was cited; P_t = total number of citation of all parts.

Fic has been determined to identify the most potential medicinal plant species used in the culture of Santal people of the study area. It is expressed by a formula: $Fic = Nur - N_t / Nur - 1$, where Nur is the number of use reports from informants for a particular disease category, N_t is the number of taxa that are used for that disease category. Fic value ranges between 0-1, where a high value indicates the greater informant consensus and a lower value signifies disagreement among the informants.

The Fidelity Level (FL%) is used to quantify the percentage of informants claiming the use of a certain plant for the same major purpose and is calculated as: $FL = N_p / N \times 100$, where N_p = number of informants who cited the species for a particular disease; N = total number of informants that cited the species to treat any given disease.

The Importance Value (IVs) measures the proportion of informants who regard a species as most important and is calculated as follows: $IVs = n_{is} / n$, where n_{is} = number of informants who consider the species s most important; n = total number of informants.

Result and Discussion

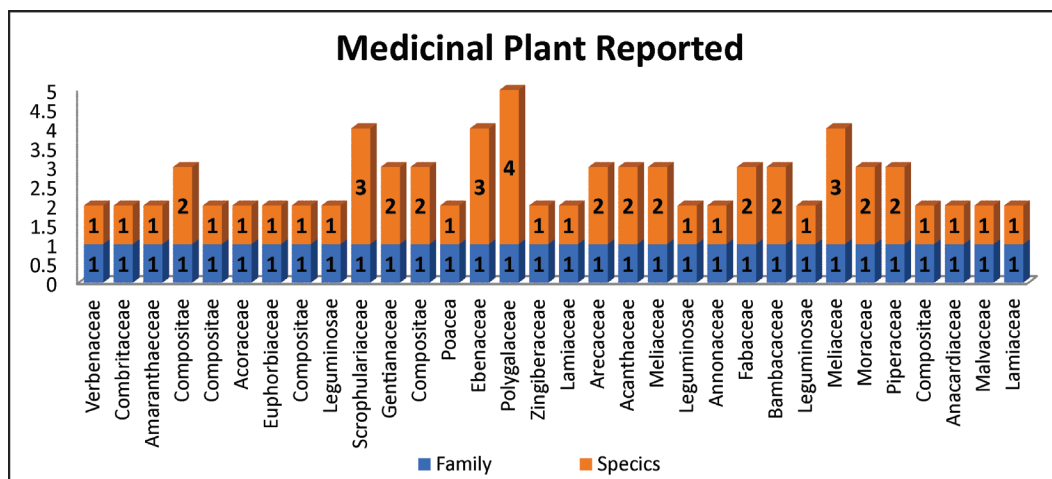
The result has been presented in tabular form showing graphs and charts with scientific as well as local name.

Medicinal Plant Reported

Altogether 32 plants have been identified which according to the studied population carries medicinal values from the village Totopara and surrounding

locality. These 32 recorded plants spread over 24 different families. Except Compositae, Leguminosae, Lamiaceae, Maliaceae, all the remaining families represent only one species. The family Compositae was represented by highest number of species (5 species), followed by Leguminosae (3 species), Lamiaceae and Maliaceae (each family by 2 species). Considering the medicinal use, it was also the family Compositae which attributed the maximum use in comparison to the others i.e. 30.4%. This was followed by Meliaceae (21.7%), Polygalaceae (17.4%), Leguminosae (13.0%), Scrophulariaceae (13.0%), Acoraceae (13.0%). Families viz. Fabaceae, Bambiaceae, Moraceae, Piperaceae, Gentianaceae, Lamiaceae, Acanthaceae contributed some 8.7% in the herbal medicinal plant diversity. Remaining 10 families have contributed about 4.3% representation.

Habitually the investigated Taxa fall under four groups like Trees, Shrubs, Herbs and climbers. The numbers of species in each group and their representative percentage have been defined as tree (49%, 25), shrubs (25%, 13), herbs (24%, 12), and climbers (2%, 1) (fig.). The most dominant form used by the Toto includes trees (25%). This indicates that these vegetation are easily available and as these grow around the tribal village they could be easily accessible by the community people.



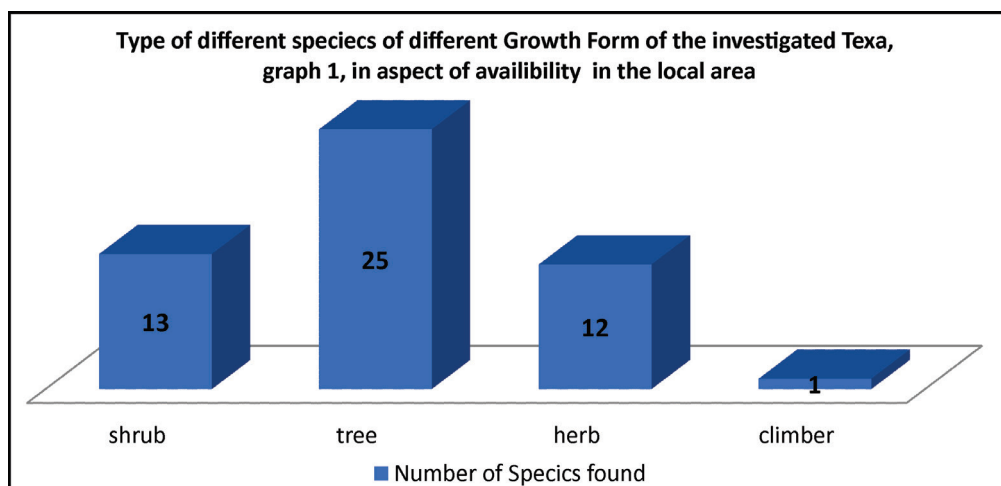
Diseases Treated

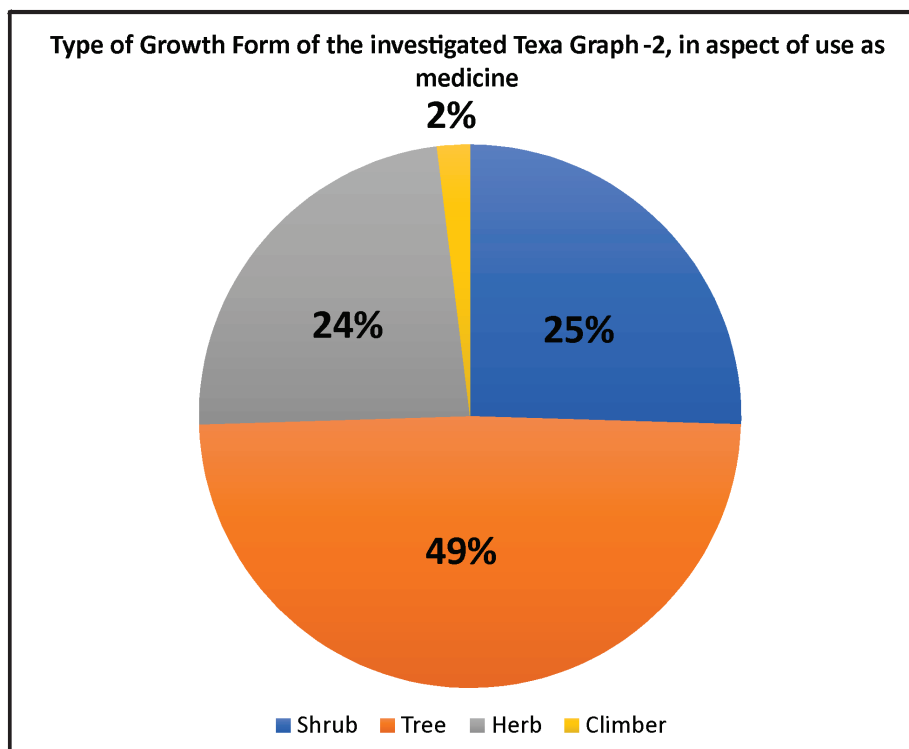
The recorded 32 plant species are used in formulation of 45 types of ethnomedical preparations (either exclusively or as a part/ingredient) that can cure at least 26 types of various misfortunes. The diseases that are frequently found among the studied population include malaria, fever, cough and cold, diarrhea, dysentery,

jaundice, skin disease, stomach ache, gastroenteritis, asthma and also snake bite as well as scorpion bite. Skin disease and various other dermatological disorders were frequently found among the studied population. Revealed traditional treatment regime of concerned population also supported the fact. It has been found that five (5) types of plant species have been mentioned by the traditional healers as well as common people which could suggest the possible heal of skin ailments.

It has been reported that the Totopara is a declared endemic zone of malaria and high fever. Numerous cases of both malaria and high fever have been reported in the local Primary Health Centre (PHC). Against malaria and high fever four (4) different types of plant species were prescribed by the traditional healers. For pneumonia and cough cold four (4) types of plant species were reported. To check bleeding and curing wound four (4) species were reported. Another common disease found among the population was jaundice. Three (3) different plant species have been mentioned to cure the ailment. During the field survey all the species were found within or surrounding of the village.

For dysentery and diarrhea 2 species, scorpion bite 2 species, gastroenteritis and stomach ache 2 species were reported. Diseases like heart problem, tooth cavity, urinary problem, paralysis, psychological disorder, mumps were treated by single plant species. They also reported about one plant species which they consider as a good mosquito repellent. They preferred to treat dandruff problem with herbal solution made from the tree *Buddhi*. Treatment of bone fracture was also suggested in their traditional treatment with only the help of some specific plant species. Remedy of some minute skin problem like sty and pierce was also available in Toto traditional medicine.





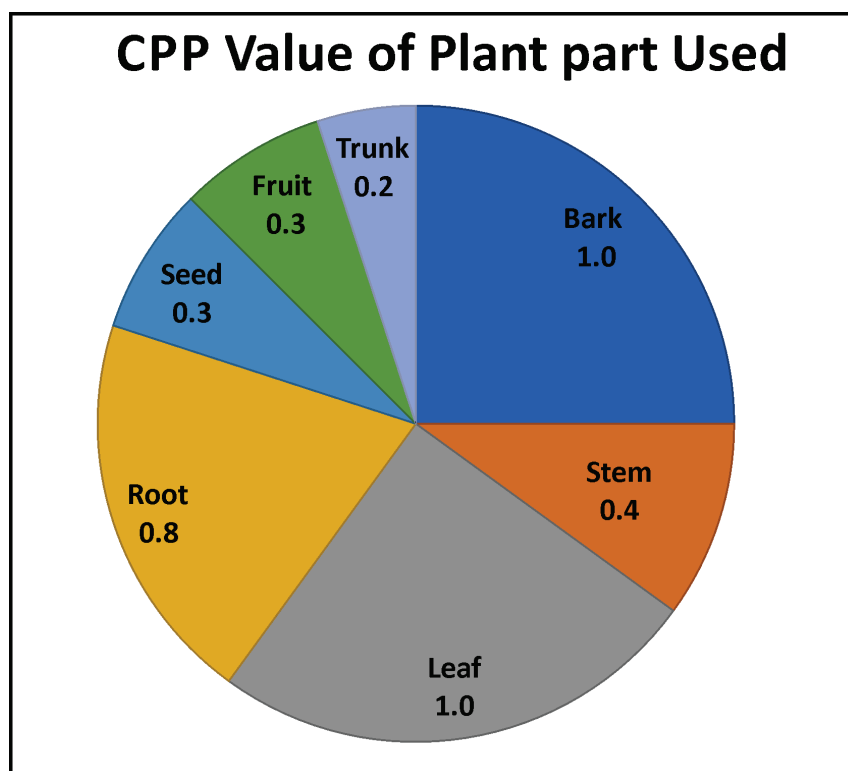
Plant Parts Used

Study indicated that traditional medicine men in the studied area used leaves, stem, bark, root, seed, fruits, flower, young bud, young twig etc. The most used part for many medicinal preparations was leaves as reported by most of the medicine men. Easy accessibility was said to be the prime cause. Collection of leaves by the traditional healers seems to support the sustainable method of harvestmen because unplucked leaves allow the plant to survive naturally/ normally. Harvesting roots, rhizome, seeds actually extend threat to the survival of plants than collecting other plant parts.

The leaf (CPP 1.0) and bark (CPP 1.0) of the identified plant species were used most frequently by the concerned population in formulation of various remedies as compared to the other. Root and Rhizome (CPP 0.8) was found to be the next important part used in various remedial measures.

Use of drugs in various forms-

It has been observed that Toto medicine men in the Totopara village follow various ways of remedial preparation which depend on type of disease treated.

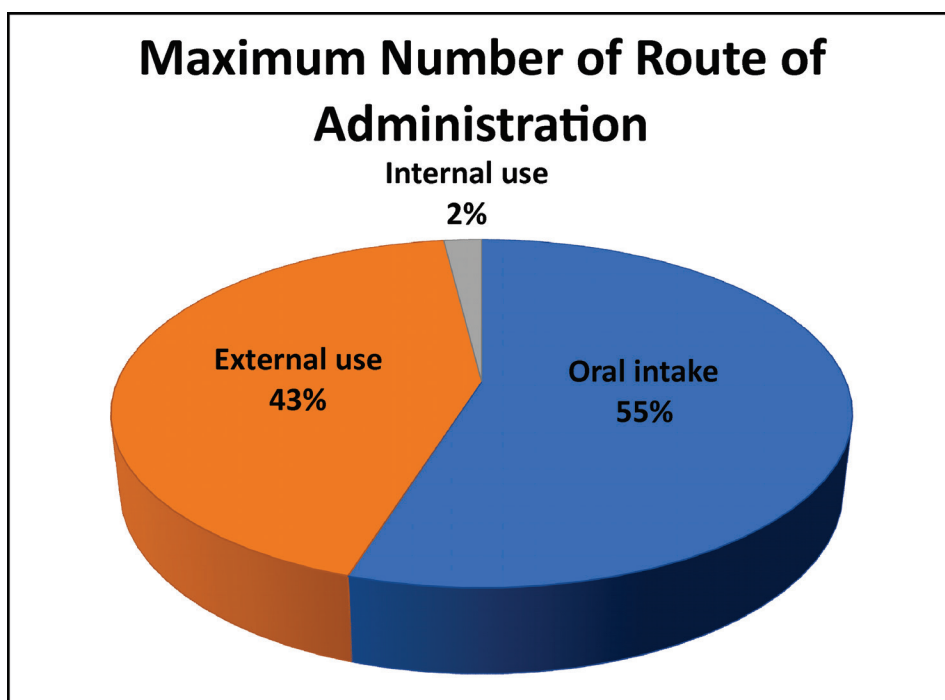
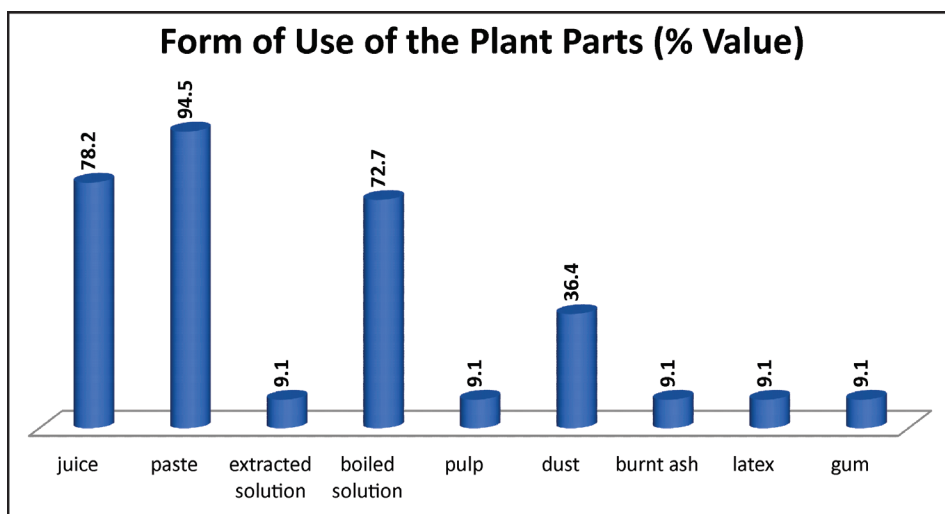


The major modes of remedial preparations were paste (94.5%), followed by juice (78.2%), boiled solution (72.7%), dust (36.4%), extracted solution (9.1%). Uses of fruit pulp, burning ash, latex, gum were also found to be used in various preparations. Along with herbal ingredients various essential additives like bile of cow, black pepper, honey, kerosene, mustard oil, egg white were frequently used in preparation of remedies. River side soil even found to be used as an important ingredient. To relief from joint pain or fracture caused abnormalities, they mentioned about a bird species called Hornbill. All the ingredients were collected by the healers or some cases the knowledgeable persons of the village from the nearer ecology.

One point should be mentioned here, that number of traditional herbal remedies of Toto population could be preserved for one to six months considering some special precautionary measures.

Route of administration and does

More than half (50%) of the remedies were orally taken and 43% were extremely used. Oral application include the intake of juice, boiled solution, paste; where



as in some specific case such as in curing tooth cavity paste was applied in the affected area. They did not able to specify the exact measurement. Informants generally found to use measuring units such as teaspoon, cup, glass etc. which also differs from one informant to other.

Statistical Analysis

Finally, the data were analyzed by some quantitative tools like Informant Consensus Factor (Fic), Fidelity Level (FL%), Importance Value (IVs) to get more objectivity in the study. In the present study altogether 12 traditional medicine men and knowledgeable person were interviewed who mentioned about the various plant species and their therapeutic use. The species used in remedies for the disease categories with high Fic values are considered as high consensus species which could establish as very prospective one for further studies. Fic value for different disease category ranges from 8.33 to 100.00 which indicate higher agreement among the informants only. During the field study, it had been recorded that the herbal healing techniques were mainly confined among the traditional healers only although the community people took the herbal medicines prescribed and prepared by the healers. Majority of the plant species were known to the healers and few knowledgeable persons only. In case of cough and cold, malaria, skin disease maximum numbers of Taxa were found to be used by the healers as those diseases were frequently found among the studied population. Plant species were chosen considering the seasonal availability.

Fidelity Level (FL%) value of the recorded 32 plant species ranges from 8.33 to 75.00 (table 1). Highest Fidelity level value (75.00) has been recorded for the plant species *Artimisia vulgaris* against skin disease, followed by *Phlogacanthus thyrsoflorus* (66.67%) against cough and cold, pneumonia, *Polyalthia simiarum* (58.33%) and *Swertia chirayita* (50.00%) also possess high Fidelity Level value. The highest FL value could not be considered as confirmed indicator for high healing potential of those plants used against the corresponding disease but as a highest chosen species to fight against the disease. These plant species are commonly found in the natural habitats in the studied area with no difficulty in collection. This could be another probable cause of the maximum use of those plants.

Here IVs Importance Value is calculated to find out the importance of the plant species according to the informants (in this case the healers and few knowledgeable men among the studied population). Here IVs of the plants ranges from 3.13 to 9.38. The highest IVs value recorded in case of *Azadirachta indica* (9.38) against fever, *Terminalia arjuna* (6.25), against heart problem and chest pain, *Toona ciliate* (6.25) against skin disease. The highest score for Importance Value of these plants also highlights that these plants are therapeutically very important and the healers specifically rely on these plant species for effective recovery.

Table 1: Medicinal plant Used by the Toto Tribal people of surrounding villages of Totopara, Madarihat

Formulation no.	Scientific name/Family/Voucher no	Toto name	Part used	Mode of administration	Diseases	FL%	IVs
1	<i>Malotus philipensis</i>	Buta singh	bark	oral intake	dysentery	16.67	3.13
2	<i>Emilia sonchifolia</i>	Sadhimodi	Root	oral intake	diarrhea & stomach ache	16.67	6.25
3	<i>Amaranthus viridis</i>	Ahmiche	stem	external use	scorpion bite	25.00	3.13
4	<i>Scoparia dulcis</i>	Cinijar	leaf	oral intake	cough and cold & pneumonia	25.00	6.25
5	<i>Phlogacanthus thyr-suflorus</i>	Kasai/chua	flower	oral intake	fever & high fever	66.67	6.25
6	<i>Clerodendrum vis-cosum</i>	Ambarsingh/bhate	young leaf	oral intake	malaria	41.67	3.13
7	<i>Areca catechu</i>	Gua gach	Young bud	oral intake	stomach ache	50.00	6.25
8	<i>Cajanus cajan</i>	Lahari	Young bud	oral intake	jaundice	8.33	3.13
9	<i>Ageratum conizoides</i>	Amename	leaf	external use	wound	33.33	3.13
10	<i>Artemisia vulgaris</i>	Dhungchu	leaf & Young bud	external use	skin disease	75.00	6.25
11	<i>Xanthophyllum flavescens</i>	Eyanasim	bark & Young bud	oral intake	urinary problem	33.33	3.13
12	<i>Acorus calamus</i>	Bojo	leaf & Young bud	external use	fracture	16.67	6.25
13	<i>Swertia chirayita</i>	Chirota	leaf	oral intake	jaundice	50.00	3.13
14	<i>Zingiber officinale</i>	Fauching	Rhizome	external use	paralysis	16.67	3.13
15	<i>Terminalia arjuna</i>	Arjun	bark	oral intake	heart problem & chest pain	16.67	6.25
16	<i>Blainvela acmella</i>	Avijal	leaf	internal use	tooth cavity	8.33	3.13
17	<i>Ficus glomerate</i>	Oatang	leaf	oral intake	mumps	41.67	3.13
18	<i>Bauhinia scandens</i>	Naqbili	root	oral intake	psychological disorder	25.00	3.13
19	<i>Mangifera indica</i>	Taiting	leaf	external use	sty	16.67	3.13
20	<i>Sida rhomboidea</i>	Tenke/jharu	leaf	external use	pierce	25.00	3.13
21	<i>Acasia pinata</i>	Buddhi	stem	external use	dandruff	8.33	3.13
22	<i>Cynodon dactylon</i>	Duba	young twig	external use	cheek bleeding	8.33	3.13

23	<i>Diospyros montana</i>	Eoying	leaf	oral intake	gastro-entities, stomach ache	25.00	3.13
24	<i>Gmelina arborea</i>	Gamari	Bark	oral intake	pneumonia	8.33	3.13
25	<i>Toona ciliate</i>	Koremba	bark	external use	skin disease	16.67	6.25
26	<i>Polyalthia simiarum</i>	Langaya	bark	external use	scorpion bite	58.33	3.13
27	<i>Cassia alata</i>	Lutodabai	leaf	external use	skin disease	16.67	3.13
28	<i>Bombax cieba</i>	Losing	leaf	external use	fracture	25.00	6.25
29	<i>Azadirachta indica</i>	Neem	leaf	oral intake	Fever	8.33	9.38
30	<i>Piper sylvestium</i>	Pipla	leaf	oral intake	cough cold	8.33	3.13
31	<i>Sida rhomboidea</i>	Tanke/Jharu	leaf	external use	Pierce	16.67	3.13
32	<i>Clerodendrum infortunatum</i>	Vat	young leaf	oral intake	Malaria	8.33	3.13

Table 2: Informant Consensus Factor (Fic) for each disease category

Sl. No.	Disease	Taxa	Part use	(Fic)
1	Diarrhea & stomach ache	3	3	75.00
2	Scorpion bite	2	2	33.33
3	Cough and cold & pneumonia	4	3	100.00
4	Malaria	3	4	100.00
5	Jaundice	3	2	50.00
6	Wound	2	2	33.33
7	Skin disease	4	3	100.00
8	Urinary problem	2	2	33.33
9	Fracture	3	2	50.00
10	Mumps	2	2	33.33
11	Cheek bleeding	1	1	8.33
12	Curing wound	1	1	8.33
13	Dysentery	1	1	8.33
14	Fever	1	1	8.33
15	Gastro-entities, stomach ache	1	3	25.00
16	Heart problem	1	1	8.33
17	Mosquito repellent	1	1	8.33
18	Paralysis	1	1	8.33
19	Pierce	1	1	8.33
20	Sty	1	1	8.33
21	Tooth cavity	1	1	8.33

Conclusion

The study of ethnomedicine among various indigenous populations is a new area of scientific research which could guide in selection of medicinal

plants having the potential for natural product studies to find out alternative remedial measures for numerous diseases. The traditional knowledge of herbal medicine men among the studied tribe Totos should be conserved through proper documentation before it is lost as most of the medicinal practice was confined within the traditional healers. The study will help in preparation of ethnomedical database which could be exploited and studied further for cost effective herbal drugs.

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