DOI: https://doi.org/10.36094/sc.v89.2024.Traditional_Medicine_Used_for_Oral_Hygiene.Mitra_Mukherjee.126

Sci. and Cult. 90 (3–4) : 126-134 (2024)

Traditional Medicine Used for Oral Hygiene by Toto Tribe of West Bengal, India

***Abstract*: Toto tribe is an endemic, endangered, endogamous, tribe, lives in the sub-Himalayan foot hills at Totopara in the Madarihat subdivision of Alipurduar district of West Bengal. They have a rich knowledge about Traditional medicinal knowledge. Here it has been observed that out of 17 plant species used by Toto tribe for their oral hygiene, 5 have already been employed in the codified Traditional medicine system literature and their efficacy is also becomes true under the light of Laboratory experimental knowledge. The rest 12 species which are also efficacy to treat Dental problem may need further screening based on laboratory-based screening process.**

Keywords: Oral hygiene, Toto tribe, West Bengal

Since their origin, human being is totally dependent on the plants for their livelihood. All their procurement for day to day livelihood like the food, fodder, cloth, house building material, medicine, etc., human being collected from the vegetable world. Man has learned about the curative properties of plants by observing the nature and applied that for their wellbeing. This wisdom developed by the oldest written evidence of medicinal plants usage for preparation of drugs has been found on a *Sumerian* clay slab from *Nagpur*, approximately 5000 years old. It comprised 12 recipes for drug preparation referring to over 250 various plants species, some of them are alkaloid such as poppy, henbane, and mandrake[1]. As per WHO report[2] about 80% of the world population is depends on the traditional medicines for primary health care. In developing countries, it is commonly prevalent due to cultural acceptability, low cost, easy availability, and faith in the system and lesser side effects[3]. In a Biodiversity rich developing country like India where 9000 plant species[4] were used traditionally by its more than 550 different tribal groups regularly for the treatment of different ailments and many of which such traditionally used medicinal plants species has already been included in the literature. This work is an attempt in search of such phyto-medicine can be used for Oral hygiene.

Oral health and hygiene play an important role in the general wellbeing of individuals and potentially affects both the quality and length of life apart from an aesthetic standpoint[5]. This is integral part of the health treatment and is neglected in various types of dental ailments such as Dental carries, toothache, pyorrhea, along with several periodontal diseases.

"Toto" – are the one and the only endogamous endemic tribe of the state of West Bengal lived in Totopara of Madarihat subdivision of Alipurduar district. Totopara situated at the foot of the Himalayas just to the south of the borderline between Bhutan and West Bengal (on the western bank of *Torsa* River), in between 89° 20' E longitude and 26° 50' N, latitude, covering an area of 8.084 sq Km (Map of the Totopara – Map - I). The Toto localities of the village are sub-divided into six segments - *Panchayatgaon, Mandolgaon, Subbagaon, Mitranggaon, Pujagaon and Dumchigaon.* This tribal group was in verge of extinction as predicted in the first census report after independence where the numbers of Toto people was only 321 and they resided in 69 households in the Totopara. Later on, under Govt. initiative this tribal group flourishes. At present during this study in 2017 – 2018, first author has observed that their population is increased to 1564 and they lives in 163 households. By religion Toto are neither Hindu nor Muslim or Christian, but they are worshipers of Nature. In general, the Toto's have two main gods whom they worship:

1. *Ishpa* - He is supposed to live in the Bhutan hills, and causes sickness when displeased. The Totos offer him animal sacrifices and *Eu*.
2. *Cheima* - She keeps the village and its people safe from troubles and sicknesses. She is also offered rice, fowls and *Eu*.

The Toto's have priests; but may also offer their worship and sacrifices on their own. *Ishpa* is worshipped in the open, outside the house and *Cheima* inside the house.

This Tribal group is in the center of study of almost all sphere of science[6 – 15]. But most of these studied were from view point of the socioeconomic aspects of this tribal

group. As this tribal group is worshiper of nature so, mostly for treating their ailments they relay on the nature and natural resources. But at present after death of *Budhware Toto*, and *Ganesh Toto* there is no reliable '*Bai – Dangi*' - (Toto folk medicine man) in the Toto society. As a result, today there are only 16% Toto family who entirely depends on the traditional Toto medicine for the treatment of their ailments, and this number is gradually decreasing. But unfortunately, except for a few stray publications [16 – 20], no complete ethnobotanical survey was carried out till date among this tribe. Among this tribal society chronic periodontitis is a prevalent dental problem[21]. Beside this due to regular consumption of alcoholic beverage and chewing of betel nut along with betel leaf some other dental problems like dental caries, bad mouth odour, toothache, bleeding from the gum, etc. are prevalently observed. For treating this problem, they also relay on the natural resources and mostly of which are plants products.

Tribal people live in the lap of the nature and discovered various uses of the natural resources around them by a close observation and based on the necessity, instinct, application with trial and error and long experience of the man of that tribal group entirely developed a vast knowledge bank which known as traditional knowledge. The main objective of this work is –

i. Documentation of the traditional medicinal knowledge of the Toto tribe regarding the treatment of the oral and gum care and

ii. Highlight the prospect of further research of all the plants species associated with the folk claims for the dental problems selected for this analysis.

Methodology: Author visited Totopara several times during the last two decades (since 1995), in different seasons of the year to record the ethnobotanical wisdom of this endogamous endangered primitive sub – Himalayan tribal groups, covering as much as species possible as well as to collect plant species in their flowering and fruiting condition. All together 25 Toto Informants were selected from all six Toto villages of which 5 – peoples are professionally medicine men of the Toto Society and others 20 peoples are knowledgeable men and women of the villages. Primary importance was given to select most of the informants above age of 45 Years and they were selected based on a vivid discussion and suggestion of the village headman and by as informants using purposive sampling method[22]. Before interview, Prior Informed Consent (PIC) were taken from all informants. A semi structured, open questionnaires were prepared to collect information about the utility of the plants for Oral Health and Hygeine[23 - 24].

During field trips, all the ethnobotanical information regarding oral health were collected along with the voucher plant specimens needed for future documentation, which are later on treated as per standard methodology of herbarium technique[25 – 26] and identified with the published literature [27 – 32.] The Herbarium made on the collected species is deposited at the herbarium of Department of Botany, University of Kalyani, Kalyani-741235. Vernacular name of each plant species is recorded carefully for future documentation. Emphasis is given on the tribal pharmacology, especially on the preparation, administration and dose of the drug. After primary report of the information all the data are crosschecked and then all the data are represented here in the table – I.

Quantitative Ethnomedicinal Data Analysis: In this present study different quantitative tools used in Ethnobotany[37] like Consensus Value for Plant Parts (CPP)[33], Informant Consensus Factor (F_{ic})[34], Fidelity level (FL%)[35] Importance values (IV_s)[36], etc.

Consensus Value for Plant Parts (CPP) measures the degree of agreement among informants connecting the plant parts used and is calculated by CPP = $P_x \div P_t$ [where P_x = Numbers of Time a given plant part was cited & P_t = Total numbers of citation of all parts].

Informant Consensus Factor (F_{ic}) has been determined to identify the most potential medicinal plants species used in the culture Toto people of the study area. It is expressed by a formula:

$$F_{ic} = (N_{ur} - N_t) \quad (N_{ur} - 1)$$

[Where N_{ur} is the number of use reports for a particular disease category, N_t is the number of taxa that are for that disease category]. (F_{ic}) value ranges from 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 as:

FL = (N_p N) x 100 [Where N_p = Number of informants who cited the species for a particular ailments and N = total numbers of informants that cited the species to treat any given disease].

Preference ranking exercise[34] was conducted by 5 – key Toto medicine men on selected 5 – medicinal plants used to treat Toothache in the study area, as toothache is

Table – I.: Enumeration of Plants used in Oral Hygiene by Toto Tribe of West Bengal

Sl. No.	Name and Family of Plant	Local/ Common Name	Parts Use	Use for	Mode of Use	IV_s	(FL%)
1	*Achyranthes aspera* L. **Amaranthaceae**	*Apang* (B) *Bishkuti* (T)	WP	Tooth brush;	Tooth Brush: Stem used as Tooth brush.	0.32	79
				Check Gum bleeding;	Plant Ash about 1 – teaspoon full is made into paste with a pinch of turmeric powder and a little Alum and that paste is applied on the gum as tooth paste to check Bleeding.	.052	37
				Toothache	Plant ash about ½ - teaspoon is made into paste with Camphor and a pinch of common salt. The paste thus obtained is applied on the tooth with pain to reduce the toothache.	0.56	68
				Bad Smell	Plant ash about 1 – teaspoonful is made into paste with Camphor and a pinch of common salt. The paste thus obtained is applied as tooth paste to wash the tooth two times daily after meal to prevent bad smell in mouth.	0.60	66
2	*Albizia lebbeck* (L.) Wall. *ex* Benth. *Mimosa lebbeck* L. **Fabaceae**	*Sirish* (B); *Sirisha* jar (T)	St; Lf.	Bad Smell	Twigs are used as tooth brush to reduce foul oral smell (Pyorrhoea).	0.25	79
				Gum Pain & Gum Bleeding	Twigs are used as tooth brush to reduce the Gum pain and bleeding from the Gum.	0.6	82
				Gum Swelling & anti carries agent	Fresh Leaves about 10g are made into paste with a pinch if alum and turmeric powder and that paste 0.56is applied as tooth paste to reduce swelling of the gum and as anti carries agent.	0.33	100
3	*Argemone mexicana* L. **Papaveraceae**	*Sial Kanta* B); (*Shiinujhar* (T)	Sd	Tooth worm	Seeds are put in the "Bidi Patta" and inhale that bidi (a local cigar) to expel the tooth worm and reduced the pain. In case of children the dried seeds or seeds powder is placed on a hot plate and the fume is inhale to expel the tooth worm and reduce the toothache	0.72	69
4	*Azadirachta indica* A. Juss. **Meliaceae**	*Neem* (B); *Nimba jhari* (T)	Tw; Fl	Tooth Brush	Young twigs are used as tooth brush to fix the loosen teeth of the children and adult also.	1	100
				Gum Swelling	Young twigs are used as tooth brush to prevent gum infection and to reduced the swelling of gum.	0.79	87
				Mouth sores, Gum bleeding	Fresh or dried flower about 1 – 2 teaspoonful is boiled in a cup of water in a brass container. The aqueous infusion thus obtained is filtered and the filtrate is used as mouth freshener for gurgle purposes twice daily at early morning and at the bed time to cure the mouth sores, gum infection and bleeding gum problems.	1	100
5	*Blainvillea acmella* (L.) *Philipson. Verbesina acmella* L. **Asteraceae**	*Chita* (T)	Fl; Rt	Bad Smell	Fresh root decoction of the is used as mouth rinse to reduce and prevent bad mouth smell (Pyorrhoea).	1	100
				Anti-carries	Flower heads (2 - 3) at a time is chewed to reduce dental carries and toothache.	0.52	57

Sl. No.	Name and Family of Plant	Local/ Common Name	Parts Use	Use for	Mode of Use	IV_s	(FL%)
6	*Buchanania cochinchinensis* (Lour.) M. R. Almeida. *Toluifera cochinchinensis* Lour. **Anacardiaceae**	Jhaanti jhari (T)	St; Lf.	Toothache	Young twigs are used as tooth brush to reduce the toothache. Dried stem bark is made into paste with few drops of water and a pinch of common salt. That paste is used as tooth paste to shining the tooth and to reduces the chance of gum infection.	0.6	44
				Gum Swelling	Latex is applied on the gum to reduce the swelling and also to reduce the pain	0.32	61
7	*Glycosmis pentaphylla* (Retz.) DC. *Limonia pentaphylla* Retz **Rutaceae**	*Ram Dantan* (B); *Tanshonk* (T)	St	Fixing loose teeth	Stem ash mixed with alum is used as tooth powder for scouring teeth. It is said that this tooth powder is good for tooth health and it is also helps to fix the loosen teeth in the gum.	1	100
8	*Jatropha gossipiifolia* L. **Euphorbiaceae**	*Lalvarenda* (B); *Pajedie* (T)	St	Tooth Brush	Stem used as toothbrush to cure toothache.	0.32	100
				Toothache	Leaves are boiled and the aqueous diffusion thus obtained is used as mouth rinse against toothache.	0.36	71
9	*Lawsonia inermis* L. **Lythraceae**	*Mehendi* (B); *Methi* (T)	Lf	Gum Bleeding	Fresh leaves about 5g made into paste with a pinch of common salt and applied on the gum like tooth paste twice or thrice in a day and 10 - 15 minutes after application is washed it off. This paste helps to check bleeding from the gum.	0.47	63
10	*Mesosphaerum suaveolens* (L.) Kuntz *Ballota suaveolens* L. **Lamiaceae**	*Dompaishing* (T)	WP	Toothache	Whole plant decoction is used as mouth rinse to reduce the toothache.	0.6	73
11	*Mimosa pudica* L. **Fabaceae**	*Lajjabati* (B); *Budhi* (T)	Rt	Toothache	Root about one inch in length is boiled in water for 30 minutes and the decoction is filtered. The filtrate after cooling is used as mouth rinse to reduce toothache.	0.59	53
12	*Mimusops elengi* L. **Sapotaceae**	*Bakul* (B); *Gaiidei* (T)	Lf	Bad Smell	Dried leaves are burned and the ash is used as tooth powder after mixing with a pinch of alum and camphor. It is said that it helps to prevent bad smell of the mouth (Pyorrhoea) and also to shining of the teeth.	0.4	56
13	*Phyllanthus reticulatus* Poir. **Phyllanthaceae**	*Bhuin amla* (B); *Dirisat* (T)	Lf	Gum bleeding	Leaf paste applied as tooth paste and scouring teeth with this paste twice a day to check bleeding from the gum.	0.50	77
14	*Psidium guajava* L. **Myrtaceae**	*Piyara* (B); *Tomporse* (T)	Lf	Fixing loose teeth	Dried leaves are burned into ash and that ash is made into paste with a few drops of Mastered oil and a pinch of turmeric powder. This paste is applied as tooth paste to fix the loosen teeth tightly in the gum again.	0.81	100
				Toothache	Young leaves are boiled and the boiled and the aqueous diffusion is used as mouth rinse to reduce the toothache.	1	100

Sl. No.	Name and Family of Plant	Local/ Common Name	Parts Use	Use for	Mode of Use	IV_s	(FL%)
15	*Scoparia dulcis* L. **Plantaginaceae**	*Sagar Chini* (B); *Grounsi* (T)	Rt	Toothache	Root paste with a pinch of common salt and a few drops of ginger extract is applied as poultice on the affected teeth to reduce the toothache.	0.29	41
16	*Solanum nigrum* L **Solanaceae**	*Banbegun* (B); *Doronshe* (T)	Fr	Anti - carries agent	Dried fruits 5 - 6 pieces are grind and that powder is smoke as bidi (a local cigar) to expel the tooth worm and prevent the formation of carries. In case of the children the dried fruit powder are placed on a hot plate and the smoke is inhaled by the children for the same purposes.	0.40	64
17	*Vachella nilotica ssp. tomentosa* (Benth.) Kyal. & Boatwr. *Acacia arabica var. tomentosa* Benth. **Fabaceae**	*Babool* (B); *Bichi* (T)	Tw	Tooth Brush	Young twigs are used as tooth brush, it is said that brushing with this twig is good for oral health.	0.24	45
				Toothache	Young leaves and twigs and burn into ash and that ash is made into paste with a few drops of mastered oil and a pinch of turmeric powder and common salt. The paste thus obtained is applied on the affected tooth to reduce the toothache.	44	56

Abbreviation Used: Common Name: (B) = Bengali; (T) = Toto. Parts Use: (Rt) = Root; (St) = Stem; (Lf) = Leaf; (Fl) = Flower; (Fr) = Fruit; (Sd) = Seed; (WP) = Whole Plant.

the most common dental problem and most of the species are employed to treat this. The medicinal plants which believe to be the most effective to treat this problem is given the highest mark of 5 and the plant with least effectiveness is given mark 1 and finally, rank was determined based on the total score of each species.

The Importance value (IV_s) measures the proportion of informants who regard a species as most important and is calculated as: IVs = N_{is} N [Where N_{is} = number of informants who consider the species as most important on and N = total numbers of informants].

Table – III. Numerical Analysis of Plant Parts Used

Sl. No.	Name of the plant Parts	Numbers of Use	CPP value
1	Root	03	0.10
2	Stem and Twigs	09	0.30
3	Leaf	08	0.26
4	Flower	02	0.06
5	Fruit	01	0.03
6	Seeds	01	0.03
7	Whole Plants	05	0.16
8	Latex	01	0.03

Table – II. Statistical Analysis of the Treated Diseases

Sl. No.	Category of Disease	Sl. No.	Name of the Disease	Numbers of Occurence
1	Dental Care	1.	Toothache	8
		2	Tooth Worm	1
		3	Fixing Loosen Teeth	2
		4	Anticarries agent	3
2	Gum Care	5	Gum Bleeding	5
		6	Gum Swelling	2
3	General Oral Hygiene	7	Tooth Brush	4
		8	Bad Mouth Smell	4
		9	Mouth Sores	1
		Total		**30**

Obseervation: A short list of 17 plant species were recorded from the Totopara, which have uses for the treatment of oral hygiene and teeth and gum problem were enumerated in the Table – I. In the list the species are arrange alphabetical order of their Scientific name followed by their botanical family, Vernacular name, parts use, used for, mode of preparation, and dose. The (FL%) and the (IVs) value is also mentioned in that table.

Result and Discussion: Oral hygiene is in the central point of the general health of a person. Toto people are not habituated to

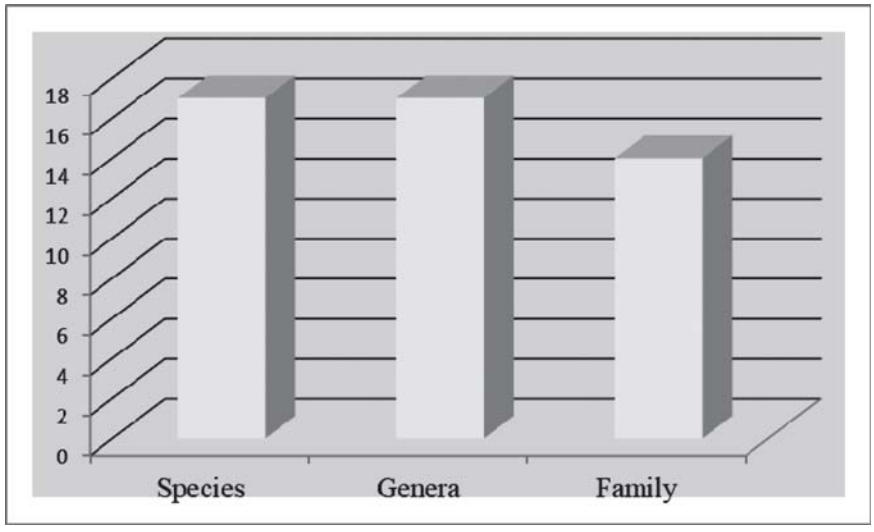

Fig. 1. Conspectus of Species, Genera and Families

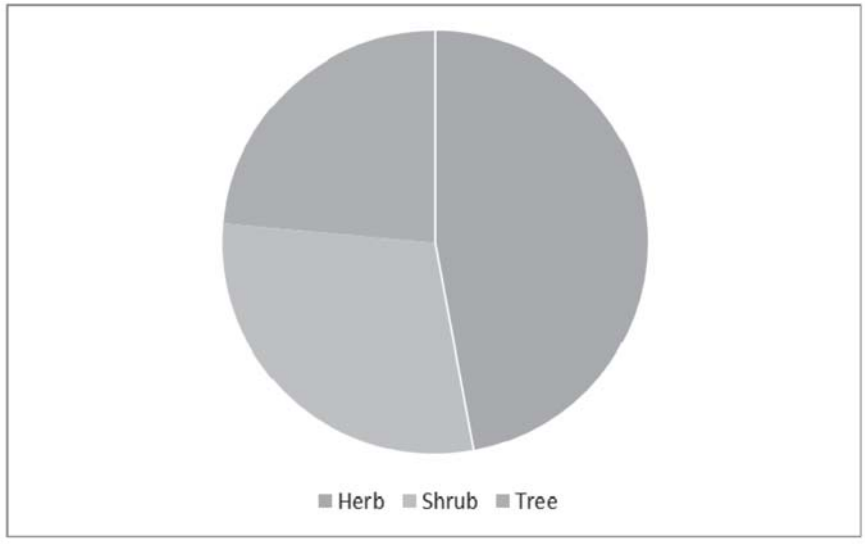

Fig. 2. Statiscal analysis of habit diversity of collected species

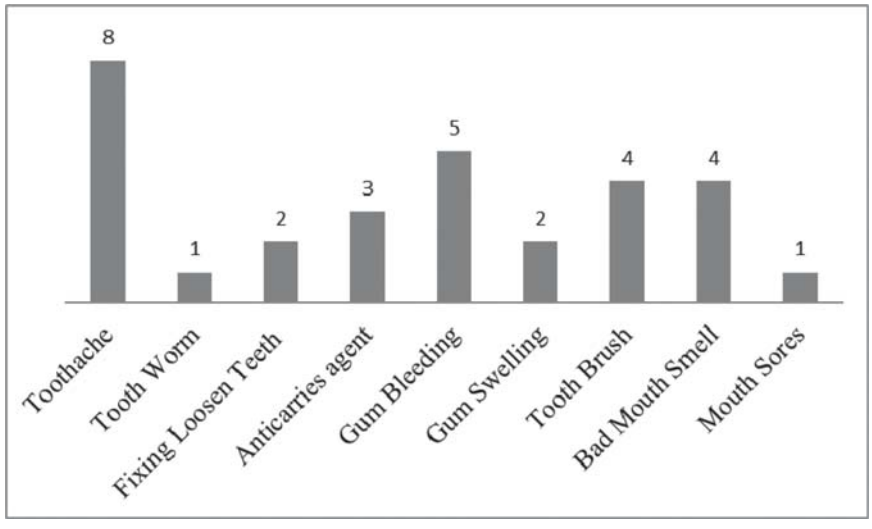

Fig. 3. Statistical analysis of categories of Dental Ailments

clean their teeth properly as a result specially among the children dental plaque occurred on the teeth, which makes the teeth yellowing, facilitated microbial growth and cause caries, gum bleeding, bad smell etc. In the present work, 17 such plant species were finding out belonging to 17 genera under 14 family of Angiosperms which are extensively used by the Toto medicine men to treat the dental problems of the Toto people. Among these 17 plant species Fabaceae is the most diversified plant families represented with 3 species (17.6%) followed by Euphorbiaceae 2 – species (11.76%). Conspectus of the family genera and species are given in the Fig. – 1.

Habitually the investigated taxa are fall under 3 – categories, the numbers of species in each category followed by their percentage is as follows – herbs 8 (47. 05%), shrubs 5 (29.41%) and trees 4 (23.52%) respectively. This statistic clearly mentioned that the most dominant life forms are the herbs (47.05%) which are largely used by the Toto tribe (Fig. – 2). Main reason of such may be its easy accessibility and available commonly in more or less all places.

All these 17 – species of plants are profusely used for the treatment of 7 – different oral problem and as well as to brushing teeth. These 7 ailments can be grouped into 3 – broad category which are given in the table – II, Fig. – 3.

Among the different plant parts used for the treatment of different oral problems the stems and the twigs portion used at maximum cases 9 (CPP value 0.28), followed by leaves in 8 cases (CPP value 0.25). A numerical analysis of the plant's parts use and their respective CPP value is given in the Table – III, Fig. – 4.

It is very interesting to note that,

Table IV. Informant Consensus Factor (F_{ic}) for each disease category

Sl. No.	Name of the Disease Category	No. of Taxa (N_t)	No. of use – reported (N_{ur})	F_{ic} Value
1	Dental Care	6	14	0.62
2	Gum Care	5	8	0.43
3	General Oral Hygeine	6	8	0.29

most of the drugs applied externally and in this list of mode of application paste is the highest forms of mode of application 21 cases (65.63%), followed by direct local application 4 cases (12.5%) and decoction 3 cases (9.3%). Statistical analysis of the mode of the application of the drug is shown in the Fig. – 5.

Finally, all the collected information was analysis with the help of various quantitative data analyzing tools like IV's, Preference ranking exercise, FL%, F_{ic}, etc., which help this present study more and more reliable and acceptable to the science (Table – I, III & IV).

Table V. Preferance Ranking of Five Medicinal plants reported for Treating Gum Bleeding

Sl. No.	Medicinal Plants	A	B	C	D	E	Total Score	Rank
1	*Achyranthes aspera* L.	**2**	**4**	**3**	**3**	**2**	**14**	**5TH**
2	*Albizia lebbeck* (L.) Wall. *ex* Benth.	**5**	**3**	**4**	**2**	**3**	**17**	**3RD**
3	*Azadirachta indica* A. Juss.	**5**	**4**	**5**	**5**	**4**	**23**	**1ST**
4	*Lawsonia inermis* L.	**4**	**5**	**5**	**3**	**3**	**20**	**2ND**
5	*Phyllanthus reticulatus* Poir.	**3**	**1**	**4**	**3**	**4**	**15**	**4TH**

Informants = A = Ganesh Toto; B = Budhbare Toto; C= Shanta Toto; D = Gobinda Toto; E = Kartik Toto.

Table VI. List of the Plants with Highest (IV) Value

Sl. No.	Name of the Plant Species	Disease treated	IV value
1	*Azadirachta indica* A. Juss. (Meliaceae)	Tooth Brush	1
2	*Azadirachta indica* A. Juss. (Meliaceae)	Gum Bleeding	1
3	*Blainvillea acmella* (L.) Philipson. (Asteraceae)	Bad Mouth Smell	1
4	*Glycosmis pentaphylla* (Retz.) DC. (Rutaceae)	Fixing loose teeth	1
5	*Psidium guajava* L. (Myrtaceae)	*Toothache*	1

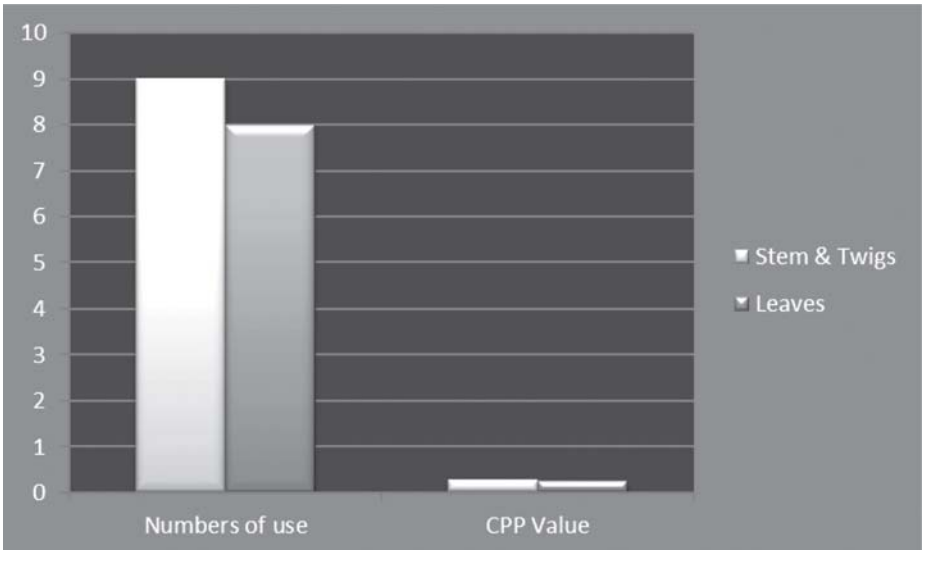

Fig. 4. Conspectus of Plant Parts use

The analysis shows that, there is a high range of consensus among the informants regarding disease cure and medicinal plants usages. The (F_{ic}) value as obtained for different disease categories ranges between 0.29 – 0.62, which reveals a greater agreement among the informants regarding the phyto-therapeutic uses of medicinal plants (table – IV). Perusal of existing literature[33, 38. 39] it has been confirmed that high consensus species are the prospective candidates for investigation of their phytochemical and pharmacological properties. So, this (F_{ic}) can be considering as a useful tool for development of evidence based phytomedicine for the tribal people of the studied area.

Fiedelity level (FL%) value of the recorded 17 plant species ranges from 13 – 100% (Table - 1), highest (FL%) for 7 Plant species has been recorded and those are - *Albizia lebbeck*;; *Argemone mexicana;*; *Azadirachta indica.*; *Blainvillea acmella*; *Glycosmis pentaphylla.*; *Jatropha gossipiifolia.*; *Psidium guajava;* etc., The highest (FL%) value indicates the high healing efficacy of the respective

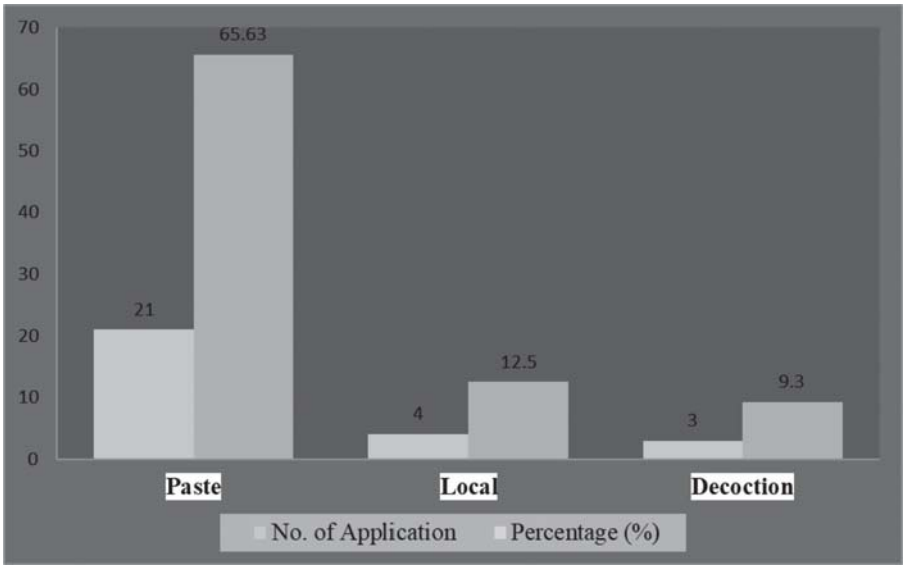

Fig. 5. Conspectus of Mode of application of medicine

ailments. So, this may be used an indicator for further phytochemical investigation to identify its potential bioactive components. Though these plants species are now easily available in the study area but as they are used in excessive, so, if a moderate measure for their conservation is not considered they will become rare and decline in those areas.

The Importance value (IV) ranges between 0.24 – 1 (Table 1). There are 5 – plant species with highest IV value which indicates that, these plant species are very effective for the treatment of the respective disease as considered. (Table - VI).

Preference ranking exercise was carried out on five medicinal plants those are extensively used for the treatment of the Gum-bleeding. Gum bleeding is considered as the most prevalently occurred oral problem in the studied area and it is observed that, *Azadirachta indica* is the most potent medicinal plants used for the treatment of the disease. It also considered that this plant has the highest efficacy to treat the oral problem.

Conclusion

Finally, from the above study it may conclude that, informant-based qualitive and quantitative ethnobotanical indices used in this study would be helpful to prepare ethnobotanical information regarding plants used for the treatment of oral and gum problems. Further, this study may provide some important insights to carried out pharmacological and phytochemical study to reveals new molecule that can be used for the treatment of different oral problem in near future.

Acknowledgement

Author is deeply indebted to Mr. Dhaniram Toto, a Poet, Philosopher and above all a very friendly gentleman for providing all necessary helps during this study. Thanks also given to the Forest Rangers and Beat Officers for their kind permission and providing help during field study in the forest territory. Last but not least, the first author is thankful to the Principal RPM College for providing all sorts of necessary facilities and support during this study.

Conflict of Interest: We hereby declare that, we have no competing or conflict of interest. ❐

SUNIT MITRA
SOBHAN KUMAR MUKHERJEE[1]

Associate Professor
Department of Botany
Raja Peary Mohan College,
Uttarpara, Hooghly - 712258.
Email: drsunitmitra.1@gmail.com

[1]Professor (Retd.) Taxonomy &
Plants Biosystematics Laboratory
Department of Botany
University of Kalyani, Kalyani Nadia, W. B. - 741235
Email: sobhankr@gmail.com

Received: 6, June, 2023
Revised: 18 December, 2023

1. K. Kelly, *History of Medicine*, (New York, 2009). Facts on File *pp.* 29 – 50.
2. www.http:// WHO/EDM/2004.5 & WHO/EMP/2009.1.
3. V. P. Kamboj. *Curr. Sci.* 78 : 35 – 38. (2000).
4. S. Nautiyal, K. S. Rao, R. K. Maikhuri, R. L. Semwal, & K. G. Saxena. *J. Medicinal & Aromatic Plants Science* 23 : 428 – 441. (2000).
5. P. Gilbert, A. McBain & P. Sreenivasan. *Clin. Microbiol. Inf.* 13(4) :17 – 24. (2007).
6. Annonymous, *Cultural Research Project Report on Totos of Jalpaiguri, West Bengal.* (SC & ST welfare Deptt., Govt. of West Bengal 1980).
7. M. Bhattacharya. *Toto at Cross Roads.* (Aparna Book Distributors. Calcutta, 1998.
8. P. K. Bhoumik. *Primitive tribal groups in Eastern India: Welfare and Evolution.* (Gyan Publishing House, New Delhi. 1994).
9. A. K. Biswas, *Contemporary Research in India.* 3 : 16 – 20. (2013).

10. P .Chakrabarty & K. Chattopadhyay. *Bull. of Cultural Research Institute.* 3(2) : 51 – 62. (1964).

11. Mrinal Das & Kallol Chatterjee,. *Asian J. Science and Technology*. 5(2) : 129 – 132. (2014).

12. Anindita Dawn. *J. Mordn. Res. Revs.* 2(4) : 161 – 164. (2014) .

13. R . Dutta. Concept of health Disease and Treatment among the Totos of Totopara in Jalpaiguri District, West Bengal. *Ph. D. Thesis (Unpub.) Deptt. Of Anthropology University of North Bengal.*

14. B. K. Roy Burman. *Bull. Cultural Research Institute*. 3(3&4) : 16 – 19. (1964).

15. C. C. Sanyal, *The Meches and the Totos of North Bengal: Tow sub – Himalayan Tribes*. (North Bengal University Publication: Darjeeling. 1972).

16. S. N. Das, K. P. Janardhan., & S. C. Roy. *J. Econ. Tax. Bot.* 4 : 453 – 474. (1983).

17. V. Mudgal, D. C. Pal, R. N. Kayal & S. Saha, *Ethnobotany of Totopara*. (Bishen Singh Mahendrapal Singh Publication, Dehra Dun. 1997.)

18. Akrom Sardar, Suvankar Paul and Priyabrata Mondal. *International J. of Community Medicine and Public Health* 8(6) : 2869 – 2873. (2021).

19. S. Mitra & Sobhan Kr Mukherjee. *Indian J. Trad. Knowledge* 9(4) : 705 – 712. (2010).

20. Sunit Mitra & Sobhan Kumar Mukherjee. *Ethnobotanical Evaluation of some Pteridophytes in North Bengal, West Bengal India*. In Kumar Sanjeev (ed.) *Recent Advances in Ethnobotany*. (Deep Publication. New Delhi. pp 26 – 40. 2014).

21. Sudarshana Mukherjee, Sohini Banerjee, Chhanda Biswas, & P. K. Bandyopadhyay. *J. Int. Clin. Dent. Res. Organ* 13 (2021) 58 – 62.

22. S. K. Jain. *A Manual of Ethnobotany.* (Scientific Publisher, Jodhpur, India. 1987).

23. S. K. Jain, & V. Mudgal. *A Hand Book of Ethnobotany.* (Bishen Singh Mahendra Pal Singh Publishers, Dehradun, India Pp. 39 – 41. 1999).

24. M. A., Dolores, C. Tangco. *Ethn Res Appl* 5 : 147 – 158. (2007).

25. A. P. Das. *Herbarium Technique,* In Bhandari, JB & Gurung, C.(eds.) *Instrumentations Manual in Biology.* (Narosa Publishing House, New Delhi, India. pp. 78 – 94. 2020).

26. S. K. Jain, & R. R. Rao. *A Handbook of Field and Herbarium Methods*. (Today & Tomorrow's Printers and Publishers, New Delhi. 1977.).

27. Sunit Mitra & Sobhan Kumar Mukherjee. *Flora and Ethnobotany of West Dinajpur District*. (Bishen Singh Mahendra Pal Singh Publishers, Dehradun, India. 2012).

28. David Prain. *Bengal Plants. Vol – I & II.* (Govt. Press Kolkata. 1903).

29. M. N. Sanyal. *Flora of Bankura District.* (Bishen Singh Mahendra Pal Singh, Dehradun, India. 1997).

30. D. N. Guha Bakshi. *Flora of Murshidabad District*, (Scientific Publisher, Jodhpur, India. 1984).

31. S. S. R. Bennet. *Flora of Howrah District.* (Today & Tommrow Publication New Delhi. 1979).

32. Annonymous, *Flora of West Bengal vol. I – IV* (Dicotyledons). (Botanical Survey of India, Kolkata).

33. R. T. Trotter, M. H. Longan, Informant consensus: A new approach for identifying potentially effective medicinal plants. In Etkin NL (eds.) *Plants in Indigenous Medicine and Diet, Behavorial Approaches*. Bredfort Hill New York: (Redgrave Publishing Company Pp 91 – 112. 1986).

34. A. Byg, H. Balasev. *Biodivers Conserv.* 10 : 951 – 970. (2001).

35. J. Friedman, Z. Yaniv Dafni Palewith. *J. Ethnopharmacol.* 14: 275 – 278. (1986).

36. G. J. Martin, *Ethnobotany: Principle & Applications*. (Jhon Willy and Sons. Pvt. Ltd. New York: 1995.)

37. S. Haft, S. K. Barik, A. M. Lukke Quantitative ethnobotany: Application of multivariate and statistical analysis in ethnobotany. People and Plants Working Paper. (United Nations Educational Scientific and Cultural Organization, UNESCO. 1999).

38. M. Heinrich. *Phytother. Res.* 14: 479 – 488. (2000).

39. D. J. Leman, J. T. Amason, R. Yusuf, H . Sangat – Roemantyo, H. Soedjito, C. K. Angerhoefer, J. M. Pezutto. *J. Ethnopharmacol.* 49(1) : 1 – 16. (1995).