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Quantitative Analysis of Ethnobotanical data in Chatra district, Jharkhand

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Abstract: *Ethnobotany accounts for the study of the relationship between people and plants for their use as medicines, food, shelter, clothing, fodder, fuel and some other household purposes. In Chatra district of Jharkhand more than 75 % of people in the rural area use traditional medicine to help meet their health care needs.*

In the present study the descriptive statistical methods of 323 medicinal plants of Chatra in terms of percentage and frequency have been employed to analyze the ethnobotanical data. The different quantitative indices used in ethnobotanical data analysis were use value (UV), frequency of citation (FC), relative frequency of citation (RFC), family importance value (FIV), informant consensus factor (ICF), fidelity level (FL %) and preference ranking.

The results revealed that the use value of sixty medicinal plants was high, greater than 0.300. Their use report (UR), frequency of citation (FC) and relative frequency of citation (RFC) were also high and, therefore, considered to be the most important medicinal plants of this district. Of the 323 medicinal plants 163 plant species had the lowest use value of <0.200. Other medicinal plant species had moderate use value in the range of 0.200 to 0.300. Of these the seventeen (17) medicinal plant species had highest percentage of citation. The informant consensus factor (ICF) values ranged from 0.10 to 0.93 for the 49 disease categories. Thirty two medicinal plants have highest fidelity level of greater than 0.90.

Key words: *Ethnobotany, Medicinal plants, Chatra district, Use value, Frequency of citation, Informant consensus factor, Fidelity level Traditional medicine.*

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I. Introduction

Ethnobotany accounts for the study of the relationship between people and plants for their use as medicines, food, shelter, clothing, fodder, fuel and some other household purposes (Sumer *et al*., 2015) [1]. In Chatra district of Jharkhand more than 75 % of people in the rural area use traditional medicine to help meet their health care needs. Traditional herbal medicines are less costly in comparison to allopathic drugs (Mekonnen *et al*., 1990; Tesema Tanto, 2003) [2, 3].

From the beginning of human civilization, indigenous people developed their own knowledge on plant use, management and conservation (Cotton, 1996) [4]. This traditional knowledge on medicinal plants passes down from generation to generation. This knowledge is prune to loss if not documented properly (Jansen, 1981) [5]. Moreover, due to ecological shifts and environmental perturbations, plant resources are dwindling at an alarming rate. This suggests the rapid loss of medicinal plants and their associated indigenous knowledge. Documentation of ethnobotanical knowledge on medicinal plants is one of the basic criterions for conservation and community developments. Ethnobotanical studies reveal locally important plant species especially for the discovery of new drugs (Wright, 2005) [6]. Despite the agro-ecological and cultural diversity Jharkhand, the documentation of medicinal plants and associated indigenous knowledge is incomplete. There is no significant record of documentation about ethnobotanical data on medicinal plants in Chatra district, Jharkhand. Therefore, an attempt has been made to document the ethnobotanical data quantitatively.

II. Materials and Methods

In the present study descriptive statistical methods in terms of percentage and frequency have been employed to analyze the ethnobotanical data. The different quantitative indices used in ethnobotanical data analysis were use value (UV), frequency of citation (FC), relative frequency of citation (RFC), family importance value (FIV), informant consensus factor (ICF), fedality level (FL %) and preference ranking.

Use Value (UV)
The UV is a quantitative index used to determine the relative importance of an indigenous plant species. According to Phillips *et al*., (1994) [7], the use value was calculated by using the formula:

$$UV = U / n$$

Where, "U" refers to the number of uses mentioned by the participant for a given species and "n" refers to the total number of informants interviewed that used the given species. High UV score indicates that there are many use reports for that plant and vice versa.

Frequency of Citation (FC) and Relative Frequency Citation (RFC)
The Frequency of Citation (FC) is number of informants mentioning the use of plant species. The Relative Frequency Citation (RFC) index was evaluated by using the formula:
$RFC = FC / N$ $(0 < RFC < 1)$

N is the total number of informants participating in the study. The RFC index ranges from "0" when nobody referred to a plant as useful to "1" when all informants referred to as useful. (Vitalini et al., 2013) [8].

Informant Consensus Factor (ICF)

Informant Consensus Factor (ICF) was calculated using the formula (Heinrich *et al*., 1998) [9]:

$$ICF = (Nur - Nt) / Nur - 1$$

Where, "Nur" refers to the total number of use reports mentioned for a particular disease category and "Nt" refers to the total number of plant taxa used for particular disease category. This formula was opted to find out the homogeneity in the ethnomedicinal information documented from the traditional informants. ICF was calculated because it provides and to determine the consistency of the data concerning certain sorts of disease categories (Canales *et al*., 2005; Heinrich *et al*., 1998) [10, 9]. The result of this consensus ranged from 0 to 1. A high value (close to 1) predicted that the plants are used by the high percentage of the informants for a number of illness related to that comprehensive category, whereas, the low value (close to 0) showed that the plants are selected arbitrarily for a few or a single complaint or that informants did not share or exchange facts and data about the usage of plants (Abu-Irmaileh and Afifi, 2003; Akerele, 1988; Kloutsos *et al*., 2001) [11, 12, 13]. Medicinal used to treat very few diseases are supposed to be pharmacologically less active and thereby have low lower ICF values (Gazzaneo *et al*., 2005; Sharma *et al*., 2012; Teklehaymanot, 2009) [14, 15, 16].

The fidelity level (FL) was also calculated for the most frequently reported diseases or ailments using the following equation as suggested by Teklehymanoy Tilahun *et al*., (2007) [17].

$$FL (\%) = NP/N \times 100$$

Where Np is the number of informants that claim the use of a plant species to treat a particular disease and N is the number of informants that use the plants as a medicine to treat any given disease.

Preference ranking: Preference ranking is used to compare the effectiveness of medicinal plants used by the community to treat the particular disease. This ranking was conducted by method suggested by Martin (1995) [18] and Cotton (1996) [4] for twenty most important medicinal plants having high citation frequency used in treating bloating, as traditional healers treat it usually. For this purpose, ten informants were selected to identify the best preferred medicinal plant species for treatment of the illness. Each informant was provided with twenty medicinal plants reported to cure bloating with leaves of medicinal plant used being paper tagged then asked to assign the highest value (20) for the most preferred species against the illness and the lowest value (1) for the least preferred plant and in accordance of their order for the remaining one. The value of each species was summed up and the rank for each species was determined based on the total score. This helps to indicate the rank order of the most effective medicinal plants used by the community to treat the disease.
The results obtained have been presented in Table-14-18.

Table-14: Ethnobotanical data analysed for medicinal plants of Chatra

S. No.	Scientific name	UV	UR	FC	RFC
1	*Adhatoda vasica* (Linn) Nees	*0.335*	*5*	*440*	*0.70*
2	*Andrographis paniculata* (Burm.f.) Nees	*0.111*	*3*	*150*	*0.25*
3	*Achyranthus aspera*. Linn.	*0.335*	*10*	*450*	*0.75*
4	*Acorus calamus* Linn.	*0.131*	*2*	*130*	*0.21*
5	*Artemisia vulgaris* L.	*0.551*	*3*	*160*	*0.26*

6	*Ageratum conyzoides* (L.) L.	*0.035*	*2*	*260*	*0.43*
7	*Alangium salvifolium* (L.F) Wangerin	*0.013*	*4*	*375*	*0.62*
8	*Abrus precatorius Linn*	*0.111*	*2*	*135*	*0.22*
9	*Aloe vera (Linn.) Webb & Benth*	*0.526*	*15*	*565*	*0.94*
10	*Asparagus racemosus Willd*	*0.112*	*4*	*235*	*0.39*
11	*Abelmoschus moschotus Medik*	*0.014*	*3*	*255*	*0.42*
12	*Acacia catechu (L.) Willd, Olive*	*0.025*	*4*	*340*	*0.56*
13	*Acacia nolotica (Linn.) Del (Benth) brenan*	*0.016*	*2*	*135*	*0.22*
14	*Albizia lebbek (Linn.) Benth*	*0.026*	*2*	*140*	*0.23*
15	*Azadirachta indica A. Juss*	*0.312*	*12*	*565*	*0.94*
16	*Anthocephalus caddamba (Roxb.) Mia*	*0.111*	*3*	*250*	*0.41*
17	*Allanthus excelsa Roxb.*	*0.026*	*1*	*126*	*0.21*
18	*Abutilon indicum* (L.)	*0.251*	*3*	*136*	*0.22*
19	*Acacia modesta* Wall.	*0.175*	*3*	*350*	*0.58*
20	*Aerva javanica* (Burm.f.) Juss. ex Schult	*0.215*	*4*	*360*	*0.6*
21	*Ajuga bracteosa* Wall. ex Benth	*0.435*	*6*	*255*	*0.42*
22	*Albizia procera* (Roxb.) Benth	*0.161*	*8*	*245*	*0.40*
23	*Alhagi maurorum* Medik	*0.512*	*3*	*235*	*0.39*
24	*Alternanthera pungens* Kunth	*0.231*	*4*	*165*	*0.27*
25	*Amaranthus graecizans* L	*0.151*	*5*	*167*	*0.28*
26	*Amaranthus viridis* L	*0.151*	*7*	*167*	*0.28*
27	*Anagallis arvensis* L	*0.251*	*8*	*367*	*0.61*
28	*Anisomeles indica* (L.) Kuntze	*0.172*	*8*	*350*	*0.58*
29	*Argemone mexicana* L.	*0.271*	*2*	*265*	*0.44*
30	*Arisaema tortuosum* var. *curvatum* (Roxb.) Engler	*0.241*	*2*	*255*	*0.42*
31	*Arundo donax* L	*0.425*	*3*	*216*	*0.36*
32	*Asparagus capitatus* Baker	*0.165*	*5*	*145*	*0.24*
33	*Asphodelus tenuifolius* Cav.	*0.187*	*6*	*175*	*0.29*
34	*Buchnanea latifoli* Roxb	*0.113*	*4*	*185*	*0.30*
35	*Blumea balsimifera* (L.) DC.	*0.241*	*4*	*175*	*0.29*
36	*Bombax malabaricum* DC. B. thorelii	*0.031*	*3*	*165*	*0.27*
37	*Bouhinia retusa* L.	*0.113*	*4*	*135*	*0.22*
38	*Bouhinia variegata (L.) Benth*	*0.113*	*5*	*365*	*0.60*
39	*Butea monosperma (Lam.) Taub.*	*0.112*	*4*	*275*	*0.45*
40	*Bombax ceiba L.*	*0.034*	*2*	*185*	*0.30*
41	*Boerhaavia diffusa Linn.*	*0.026*	*2*	*185*	*0.30*
42	*Bambusa arundinacea Willd*	*0.013*	*3*	*325*	*0.54*
43	*Bacopa monnieri* (L.) Wettst	*0.254*	*8*	*168*	*0.28*
44	*Barleria cristata* L	*0.251*	*9*	*165*	*0.27*
45	*Boerhavia procumbens* Banks ex. Roxb.	*0.315*	*8*	*465*	*0.77*
46	*Broussonetia papyrifera* (L.) Vent.	*0.511*	*7*	*450*	*0.75*
47	*Calotropis procera* (Ait) R. Br	*0.314*	*10*	*545*	*0.90*
48	*Catharanthus roseus* (Linn.) Don	*0.315*	*12*	*565*	*0.94*
49	*Centella asiatica* (Linn.) Urban	*0.321*	*15*	*575*	*0.95*
50	*Cuminum cyminum* L.	*0.112*	*11*	*435*	*0.72*
51	*Chlorophytum tuberosum* (Roxb.) Baker	*0.111*	*9*	*455*	*0.75*
52	*Cyanthillium cinereum* (L.) H.Rob.	*0.321*	*7*	*425*	*0.70*
53	*Chromolaena odorata* (L.) R.M.King & H.Rob.	*0.251*	*7*	*425*	*0.70*
54	*Commiphora mukul*/*C. wightii* (Arn.) Bhandari	*0.021*	*6*	*367*	*0.61*
55	*Carica papaya* L.	*0.312*	*13*	*575*	*0.95*
56	*Citrulus colocynthis* (L.) Schrad	*0.035*	*12*	*565*	*0.94*
57	*Cassia angustifolia* Vahl	*0.021*	*7*	*375*	*0.62*
58	*Cassia fistula* Linn.	*0.023*	*5*	*265*	*0.44*
59	*Cassia occidentalis* Linn	*0.121*	*5*	*265*	*0.44*
60	*Cassia tora* Linn.	*0.012*	*3*	*167*	*0.27*
61	*Colchicum luteum* Linn.	*0.314*	*6*	*268*	*0.45*
62	*Cyperus scariosus* R. Br.	*0.012*	*3*	*265*	*0.44*
63	*Cheilocostus speciosus* (J. Koningh) C. specth	*0.016*	*3*	*265*	*0.44*
64	*Celastrus paniculatus* Willd.	*0.113*	*3*	*265*	*0.44*
65	*Curculigo orchioides Gaerth*	*0.112*	*4*	*315*	*0.52*
66	*Clerodendrum serratum (Linn.) Moon*	*0.026*	*5*	*325*	*0.54*
67	*Coleus barbetus (Andrews) Benth*	*0.521*	*16*	*575*	*0.95*
68	*Cubela officinalis L. f.*	*0.031*	*7*	*455*	*0.75*
69	*Cissus quandragularis Linn.*	*0.216*	*4*	*315*	*0.52*
70	*Curcuma angustifolia*	*0.320*	*12*	*575*	*0.95*
71	*Curcuma longa Linn*	*0.324*	*10*	*525*	*0.87*
72	*Curcuma caesis Roxb.*	*0.056*	*10*	*525*	*0.87*
73	*Calligonum comosum* L'Hér	*0.171*	*7*	*426*	*0.71*

74	*Cannabis sativa* L	*0.162*	*6*	*375*	*0.62*
75	*Capparis spinosa* L.	*0.251*	*5*	*268*	*0.44*
76	*Capparis decidua* (Forssk.) Edgew.	*0.111*	*5*	*268*	*0.44*
77	*Capsella bursa-pastoris* (L.) Medik.	*0.162*	*3*	*268*	*0.44*
78	*Caralluma tuberculata* N.E.Br.	*0.151*	*3*	*128*	*0.21*
79	*Cardamine hirsuta* L.	*0.321*	*3*	*128*	*0.21*
80	*Cardaria draba* (L.) Desv	*0.321*	*2*	*125*	*0.20*
81	*Carthamus oxyacantha* M. Bieb	*0.121*	*4*	*175*	*0.29*
82	*Cenchrus echinatus* L	*0.011*	4	*175*	0.29
83	*Centaurium pulchellum* (Sw.) Druce	*0.182*	*5*	*265*	*0.44*
84	*Ceratonia siliqua* L.	0.075	5	265	0.44
85	*Chenopodium murale* L.	*0.121*	*5*	*265*	*0.44*
86	*Chenopodium album* L.	*0.121*	*5*	*265*	*0.44*
87	*Chloris gayana* Kunth	*0.012*	*4*	*185*	*0.30*
88	*Chrozophora tinctoria* (L.) A. Juss.	*0.231*	*7*	*351*	*0.58*
89	*Cichorium intybus* L.	*0.245*	*6*	*385*	*0.64*
90	*Cirsium vulgare* (Savi) Ten.	*0.271*	*6*	*385*	*0.64*
91	*Cistanche tubulosa* (Schenk) Wight	*0.212*	*3*	*165*	*0.21*
92	*Clematis grata* Wall.	*0.313*	*5*	*245*	*0.40*
93	*Clerodendrum phlomidis* L.f.	*0.512*	*5*	*245*	*0.40*
94	*Cocculus hirsutus* (L.) Diels	*0.425*	*4*	*245*	*0.40*
95	*Cocculus pendulus* (J.R.Forst. & G.Forst.) Diels	*0.357*	*4*	*245*	*0.40*
96	*Coix lacryma-jobi* L.	*0.111*	*3*	*175*	*0.29*
97	*Convolvulus arvensis* L.	*0.121*	*6*	*415*	*0.69*
98	*Convolvulus prostratus* Forssk.	*0.121*	*6*	*415*	*0.69*
99	*Conyza canadensis* (L.) Cronquist.	*0.065*	*2*	*125*	*0.20*
100	*Croton bonplandianum* Baill.	*0.210*	*3*	*167*	*0.27*
101	*Cucumis melo* var. *agrestis* Naudin	*0.212*	*5*	*268*	*0.44*
102	*Cuscuta reflexa* Roxb.	*0.511*	*3*	*175*	*0.29*
103	*Cynodon dactylon* (L.) Pers	*0.154*	*2*	*166*	*0.28*
104	*Cymbopogon commutatus* (Steud.) Stapf	*0.175*	*2*	*166*	*0.28*
105	*Dolichos biflorus Linn.*	*0.111*	*4*	*255*	*0.42*
106	*Dalbergia sissoo Roxb.*	*0.012*	*2*	*165*	*0.27*
107	*Datura metel Linn*	*0.115*	*6*	*315*	*0.52*
108	*Dactyloctenium aegyptium* (L.) Willd	*0.012*	*7*	*367*	*0.61*
109	*Desmostachya bipinnata* (L) Stapf	*0.011*	*5*	*315*	*0.52*
110	*Dichanthium annulatum* (Forssk.) Stapf	*0.011*	*3*	*268*	*0.44*
111	*Dicliptera bupleuroides* Nees	*0.312*	*4*	*285*	*0.47*
112	*Digera muricata* (L.)Mart.	*0.211*	*2*	*185*	*0.30*
113	*Dodonaea viscosa* (L.) Jacq.	*0.215*	*2*	*187*	*0.31*
114	*Eclipta alba* (L.) Hassk	*0.295*	*15*	*519*	*0.86*
115	*Euphorbia tithymaloides* L.	*0.034*	*5*	*266*	*0.44*
116	*Euphorbia hirta Linn.*	*0.124*	*16*	*575*	*0.95*
117	*Euphorbia thymifolia Linn.*	*0.121*	*6*	*135*	*0.22*
118	*Emblica officinalis Gaertn.*	*0.253*	*16*	*585*	*0.97*
119	*Embelia ribes Burm. F.*	*0.024*	*4*	*235*	*0.39*
120	*Echinops echinatus* Roxb	*0.211*	*4*	*265*	*0.44*
121	*Eclipta prostrata* (L.)L.	*0.342*	*8*	*435*	*0.72*
122	*Ehretia obtusifolia* Hochst. ex A. DC.	*0.211*	*2*	*367*	*0.61*
123	*Eichhornia crassipes* (Mart.) Solms	*0.211*	*1*	*121*	*0.20*
124	*Epilobium hirsutum* L	*0.334*	*3*	*126*	*0.21*
125	*Eruca sativa* Mill	*0.167*	*4*	*215*	*0.35*
126	*Eucalyptus camaldulensis* Dehnh.	*0.214*	*8*	*368*	*0.61*
127	*Euphorbia helioscopia* L	*0.334*	*7*	*268*	*0.45*
128	*Euphorbia helioscopia*	*0.335*	*7*	*268*	*0.45*
129	*Euphorbia heterophylla*	*0.654*	*7*	*268*	*0.45*
130	*Euphorbia peplus* L	*0.253*	*7*	*268*	*0.45*
131	*Euphorbia serpens*	*0.334*	*6*	*268*	*0.45*
132	*Evolvulus alsinoides* (L.) L	*0.212*	*5*	*175*	*0.29*
133	*Ficus benghalensis L.*	*0.025*	*8*	*415*	*0.69*
134	*Ficus glomerata Roxb*	*0.025*	*8*	*415*	*0.69*
135	*Ficus racemosa* L	*0.275*	*8*	*425*	*0.70*
136	*Ficus religiosa*	*0.245*	*8*	*465*	*0.77*
137	*Ficus virgata* Reinw. ex Blume	*0.215*	*6*	*412*	*0.68*
138	*Fagonia indica* Burm.f	*0.325*	*3*	*215*	*0.36*
139	*Filago hurdwarica* (Wall. ex DC.) Wagenitz	*0.245*	*3*	*212*	*0.35*
140	*Fumaria indica* (Hausskn.) Pugsley	*0.452*	*2*	*185*	*0.30*
141	*Forsskaolea tenacissima* L.	*0.175*	*2*	*165*	*0.27*
142	*Galium aparine* L.	*0.265*	*3*	*125*	*0.20*
143	*Gastrocotyle hispida* (Forssk.) Bunge	*0.375*	*3*	*125*	*0.20*

144	*Geranium mascatense* Boiss	*0.251*	*3*	*135*	*0.22*
145	*Glandularia pulchella* (Sweet) Tronc. *(*Syn. *Verbena tenisecta* Briq.)	*0.451*	*3*	*145*	*0.24*
146	*Grewia optiva* J.R.Drumm. ex Burret	*0.152*	*3*	*155*	*0.25*
147	*Grewia villosa* Willd	*0.155*	*3*	*165*	*0.27*
148	*Grewia tenax* (Forssk.) Fiori	*0.151*	*3*	*165*	*0.27*
149	*Gymnosporia spinosa* (Blanco) Merr. & Rolfe	*0.334*	*4*	*175*	*0.29*
150	*Gynandropsis gynandra* (L.) Briq./	*0.334*	*4*	*215*	*0.35*
151	*Homalanthus populneus* (Geiseler) Pax	*0.035*	*4*	*216*	*0.36*
152	*Hoppea dichotoma B. Hayne ex Willd*	*0.012*	*3*	*185*	*0.30*
153	*Hydrolea zeylanica (Linn.) Vahl*	*0.013*	*2*	*165*	*0.27*
154	*Helicteres isara L.*	*0.021*	*2*	*168*	*0.28*
155	*Hibiscus rosa-sinensis Linn.*	*0.012*	*6*	*426*	*0.71*
156	*Hyoscyamus niger L.*	*0.124*	*6*	*425*	*0.70*
157	*Heliotropium currasavicum* L.	*0.314*	*3*	*268*	*0.44*
158	*Heliotropium europaeum* L	*0.334*	*3*	*268*	*0.44*
159	*Heliotropium indicum* L.	*0.315*	*3*	*268*	*0.44*
160	*Hibiscus mutabilis* L	*0.255*	*6*	*465*	*0.77*
161	*Ipomoea carnea* Jacq	*0.178*	*5*	*368*	*0.61*
162	*Juncus elegans* Royle ex Sam.	*0.025*	*3*	*275*	*0.45*
163	*Justicia adhatoda* L.	*0.255*	*3*	*145*	*0.24*
164	*Jatropha curcas* L.	*0.257*	*4*	*165*	*0.27*
165	*Kickxia ramoissima* (Wall.) Janch	*0.371*	*2*	*125*	*0.20*
166	*Lepidium sativum* L.	*0.035*	*2*	*115*	*0.19*
167	*Lawsonia inermis Linn*	*0.013*	*2*	*155*	*0.25*
168	*Linum usitatissimum Linn.*	*0.012*	*3*	*262*	*0.43*
169	*Lactuca serriola* L.	*0.054*	*5*	*265*	*0.44*
170	*Lantana camara* L.	*0.265*	*5*	*268*	*0.45*
171	*Lathyrus aphaca* L.	*0.235*	*4*	*215*	*0.35*
172	*Launaea capitata* (Spreng.) Dandy	*0.025*	*3*	*215*	*0.35*
173	*Leptadenia pyrotechnica* (Forssk.) Decne	*0.215*	*4*	*265*	*0.44*
174	*Leucaena leucocephala* (Lam.) de Wit.	*0.235*	*2*	*185*	*0.30*
175	*Lindenbergia abyssinica* Hochst. ex Benth	*0.265*	*5*	*235*	*0.39*
176	*Lindenbergia indica* Vatke	*0.265*	*5*	*240*	*0.40*
177	*Linum strictum* L	*0.251*	*4*	*245*	*0.41*
178	*Mangifera indica* L.	*0.114*	*11*	*458*	*0.76*
179	*Mesua ferrea Linn.*	*0.527*	*6*	*325*	*0.54*
180	*Mallotus philippensis (Lam) Mucell. Arg*	*0.114*	*4*	*326*	*0.54*
181	*Macuna pruriens (L.) DC*	*0.021*	*5*	*167*	*0.27*
182	*Mentha viridis Linn.*	*0.421*	*16*	*548*	*0.91*
183	*Michelia champaca Linn.*	*0.021*	*12*	*525*	*0.87*
184	*Moringa oleifera Lamk*	*0.031*	*15*	*528*	*0.88*
185	*Musa paradisica Linn.*	*0.024*	*16*	*550*	*0.92*
186	*Mimosa pudica L.*	*0.013*	*4*	*265*	*0.44*
187	*Madhuca indica Gmelin*	*0.212*	*6*	*367*	*0.61*
188	*Mimusops elengi Linn.*	*0.211*	*2*	*168*	*0.28*
189	*Maerua arenaria* Hook. f. & Thomson	*0.212*	*2*	*168*	*0.28*
190	*Malvastrum coromandelianum* (L.) Garcke	*0.165*	*2*	*168*	*0.28*
191	*Medicago sativa* L.	*0.335*	*10*	*478*	*0.79*
192	*Melilotus indicus* (L.) All.	*0.125*	*10*	*485*	*0.80*
193	*Mentha longifolia* (L.) L	*0.075*	*12*	*512*	*0.85*
194	*Merremia dissecta* (Jacq.) Hallier f.	*0.645*	*6*	*365*	*0.60*
195	*Millettia pinnata* (L.) Panigrahi	*0.165*	*4*	*268*	*0.44*
196	*Minuartia hybrida* (Vill.) Schischk	*0.025*	*4*	*268*	*0.44*
197	*Misopates orontium* (L.) Raf.	*0.012*	*4*	*270*	*0.45*
198	*Momordica balsamina* L.	*0.254*	*8*	*425*	*0.70*
199	*Monotheca buxifolia* (Falc.) A. DC.	*0.256*	*6*	*411*	*0.68*
200	*Morus alba* L	*0.125*	*14*	*565*	*0.94*
201	*Morus laevigata* Wall. ex Brandis	*0.125*	*14*	*565*	*0.94*
202	*Morus nigra* L	*0.125*	*13*	*512*	*0.85*
203	*Nerium indicum* Mill.	*0.113*	*8*	*425*	*0.70*
204	*Nymphaea pubescens Willd*	*0.215*	*7*	*415*	*0.69*
205	*Nelumbo nucifera Gaerth*	*0.251*	*7*	*415*	*0.69*
206	*Nyctanthus arbor-tristis Linn.*	*0.035*	*6*	*368*	*0.61*
207	*Nerium oleander* L.	*0.116*	*7*	*416*	*0.69*
208	*Nannorrhops ritchieana* (Griff.) Aitch	*0.211*	*5*	*315*	*0.52*
209	*Operculina turpethum* Linn. Silva Manso	*0.115*	*6*	*315*	*0.52*
210	*Ocimum sanctum Linn.*	*0.325*	*12*	*485*	*0.80*
211	*Ocimum americanum* L.	*0.256*	*12*	*485*	*0.80*
212	*Ocimum basilicum* L.	*0.325*	*12*	*485*	*0.80*
213	*Olea ferruginea* Wall. ex Aitch.	*0.245*	*3*	*262*	*0.44*

214	*Opuntia dillenii* (Ker Gawl.) Haw	*0.165*	*3*	*260*	*0.43*
215	*Otostegia limbata* (Benth.) Boiss	*0.351*	*3*	*260*	*0.43*
216	*Oxalis corniculata* L	*0.235*	*5*	*375*	*0.62*
217	*Oxalis corymbosa* DC.	*0.235*	*5*	*375*	*0.62*
218	*Pongamia glabra Vent.*	*0.031*	*4*	*385*	*0.64*
219	*Pterocarpus marsupium Roxb.*	*0.041*	*6*	*375*	*0.62*
220	*Pithecellobium dulce* (Roxb.) Benth.	*0.221*	*5*	*375*	*0.62*
221	*Pterocarpus indicus* Willd.	*0.031*	*6*	*375*	*0.62*
222	*Psoralea carylifolia Linn.*	*0.112*	*8*	*415*	*0.69*
223	*Piper betel Linn.*	*0.562*	*9*	*385*	*0.64*
224	*Phyllanthus niruri Linn.* Schum. & Thonn	*0.025*	*9*	*425*	*0.70*
225	*Phyllanthus fraternus Linn.* G.L.Webster	*0.021*	*8*	*425*	*0.70*
226	*Plumbago zeylanica Linn.*	*0.231*	*7*	*368*	*0.61*
227	*Punica granatum Linn.*	*0.012*	*4*	*215*	*0.35*
228	*Putranjiva roxberghii Wall.*	*0.112*	*2*	*168*	*0.28*
229	*Papaver dubium* L.	*0.265*	*5*	*365*	*0.60*
230	*Parthenium hysterophorus* L.	*0.175*	*5*	*375*	*0.62*
231	*Peganum harmala* L	*0.135*	*5*	*385*	*0.64*
232	*Pentatropis spiralis* (Forssk.) Decne.	*0.254*	*9*	*415*	*0.69*
233	*Periploca aphylla* Decne.	*0.211*	*7*	*375*	*0.62*
234	*Persicaria glabra* (Willd.) M. Gomez	*0.311*	*7*	*375*	*0.62*
235	*Persicaria lapathifolia* (L.) Delabre (Syn. *Polygonum lapathifolium* L.	*0.278*	*7*	*375*	*0.62*
236	*Phoenix sylvestris* (L.) Roxb.	*0.212*	*5*	*168*	*0.28*
237	*Phragmites australis* (Cav.) Trin. ex Steud.	*0.035*	*4*	*185*	*0.30*
238	*Phyla nodiflora* (L.) Greene	*0.312*	*3*	*268*	*0.44*
239	*Physalis minima* L	*0.251*	*5*	*270*	*0.45*
240	*Physorrhynchus chamaerapistrum* (Boiss.) Boiss.	*0.165*	*6*	*245*	*0.40*
241	*Pistia stratiotes* L.	*0.031*	*1*	*112*	*0.18*
242	*Plantago boissieri* Hausskn. & Bornm.L.	*0.345*	*5*	*245*	*0.40*
243	*Pluchea arabica* (Boiss.) Qaiser & Lack	*0.451*	*3*	*375*	*0.62*
244	*Polygonum persicaria* L.	*0.355*	*5*	*385*	*0.64*
245	*Polygonum plebeium* R. Br.	*0.355*	*6*	*425*	*0.70*
246	*Portulaca oleracea* L.	*0.135*	*5*	*365*	*0.60*
247	*Prosopis glandulosa* Torr.	*0.252*	*5*	*365*	*0.60*
248	*Prosopis cineraria* (L.) Druce	*0.252*	*4*	*275*	*0.45*
249	*Prosopis juliflora* (Sw.) DC.	*0.252*	*4*	*275*	*0.45*
250	*Pseudogaillonia hymenostephana* (Jaub. & Spach) Linchevskii	*0.253*	*2*	*255*	*0.42*
251	*Pulicaria glutinosa* (Boiss.) Jaub. & Spach	*0.351*	*6*	*245*	*0.40*
252	*Punica granatum* L.	*0.241*	*6*	*465*	*0.77*
253	*Pupalia lappacea* (L.) Juss.	*0.051*	*2*	*115*	*0.19*
254	*Psidium guajava Linn*	*0.511*	*5*	*348*	*0.58*
255	*Rauvolfia serpentine* (L.) Benth. Ex Kutz	*0.115*	*12*	*545*	*0.90*
256	*Ranunculus hispidus* Michx.	*0.275*	*5*	*255*	*0.42*
257	*Ranunculus muricatus* L.	*0.075*	*5*	*255*	*0.42*
258	*Rhazya stricta* Decne.	*0.125*	*3*	*215*	*0.35*
259	*Ricinus communis* L.	*0.115*	*6*	*275*	*0.45*
260	*Ruellia nudiflora* (Engelm. & A. Grey) Urb.	*0.112*	*5*	*265*	*0.44*
261	*Ruellia tuberosa* L.	*0.112*	*5*	*265*	*0.44*
262	*Rumex dentatus* L.	*0.056*	*5*	*275*	*0.45*
263	*Rumex vesicarius* L	*0.055*	*3*	*265*	*0.44*
264	*Semecarpus anacardium* L. f.	*0.115*	*7*	*395*	*0.66*
265	*Sausserea lappa* Decne.	*0.115*	*7*	*390*	*0.65*
266	*Sphaeranthus indicus* L.	*0.115*	*8*	*415*	*0.69*
267	*Saraca indica* (Linn.) Beddome	*0.456*	*8*	*425*	*0.70*
268	*Sesbania grandiflora Pers.*	*0.562*	*8*	*450*	*0.75*
269	*Senna alata* (L.) Roxb.	*0.036*	*8*	*465*	*0.77*
270	*Syzgium cumini (Linn.) Skeels*	*0.213*	*7*	*455*	*0.75*
271	*Sesamum indicum Linn.*	*0.213*	*6*	*415*	*0.69*
272	*Saccharum officinarum Linn.*	*0.341*	*6*	*412*	*0.68*
273	*Santalum album Linn.*	*0.215*	*6*	*465*	*0.77*
274	*Sapindus mukoro ssi Guerth*	*0.031*	*7*	*475*	*0.79*
275	*Schleichera oleasa (Lour.) Oken*	*0.020*	*5*	*365*	*0.60*
276	*Solanum surattiens L.* Burm.f	*0.116*	*5*	*375*	*0.62*
277	*Solanum nigrum Linn*	*0.114*	*5*	*375*	*0.62*
278	*Saccharum bengalense* Retz	*0.112*	*4*	*268*	*0.44*
279	*Saccharum revennae* (L.) L.	*0.112*	*4*	*268*	*0.44*

280	*Saccharum spontaneum* L.	*0.112*	*4*	*272*	*0.45*
281	*Salvadora persica* L.	*0.075*	*3*	*168*	*0.28*
282	*Salvia moorcroftiana* Wall. ex Benth.	*0.165*	*4*	*275*	*0.46*
283	*Schweinfurthia papilionacea* (L.) Boiss.	*0.015*	*1*	*110*	*0.18*
284	*Senecio* sp.	*0.035*	*3*	*263*	*0.43*
285	*Sisymbrium irio* L.		*3*	*265*	*0.44*
286	*Solanum elaeagnifolium* Cav.	*0.145*	*4*	*275*	*0.46*
287	*Solanum incanum* L.	*0.145*	*4*	*275*	*0.46*
288	*Solanum xanthocarpum* Schrad. & H. Wendl.	*0.185*	*5*	*275*	*0.46*
289	*Sonchus asper (*L.) Hill	*0.211*	*6*	*285*	*0.47*
290	*Stellaria media* (L.) Vill.	*0.211*	*4*	*265*	*0.44*
291	*Taberbaemantana coronaria* R. Br.	*0.015*	*2*	*155*	*0.25*
292	*Tagetes erecta* Linn	*0.076*	*2*	*165*	*0.27*
293	*Terminalia arjuna* (Roxb. ex DC) Wt and Arn	*0.431*	*13*	*568*	*0.94*
294	*Terminalia bellirica* (Gaerth.) Roxb.	*0.452*	*13*	*570*	*0.95*
295	*Terminalia chebula* Retz.	*0.456*	*14*	*517*	*0.86*
296	*Tinospora cordifolia* (Willd) Miers ex Hook. F. & Thoms	*0.335*	*15*	*525*	*0.87*
297	*Tephrosia purpurea* (L.) Pers	*0.051*	*12*	*468*	*0.78*
298	*Tribulus terrestris Linn.*	*0.312*	*9*	*425*	*0.71*
299	*Tamarix aphylla* (L.) H. Karst.	*0.115*	*6*	*365*	*0.61*
300	*Tamarix dioica* Roxb. Ex Roth.	*0.115*	*6*	*365*	*0.61*
301	*Taraxacum officinale* (L.) Weber F. H. Wigg.	*0.115*	*6*	*365*	*0.61*
302	*Taverniera glabra* Boiss.	*0.356*	*8*	*465*	*0.77*
303	*Taverniera spartea* (Burm.f.) DC.	*0.354*	*8*	*465*	*0.77*
304	*Tecomella undulata* (sm.) Seem.	*0.075*	*2*	*125*	*0.21*
305	*Tephrosia apollinea* (Delile) DC.	*0.215*	*6*	*268*	*0.45*
306	*Trianthema portulacastrum* L.	*0.145*	*2*	*135*	*0.22*
307	*Trichodesma indicum* (L.) Lehm.	*0.145*	*2*	*140*	*0.23*
308	*Typha angustata* Bory & Chaub.	*0.075*	*2*	*116*	*0.19*
309	*Typha latifolia* L.	*0.075*	*2*	*116*	*0.19*
310	*Urtica dioica* L.	*0.065*	*1*	*113*	*0.18*
311	*Verbascum thapsus* L.	*0.265*	*6*	*267*	*0.44*
312	*Verbena officinalis* L.	*0.375*	*7*	*295*	*0.49*
313	*Vernonia arabica* Boiss.	*0.275*	*7*	*285*	*0.47*
314	*Vicia sativa* L.	*0.256*	*7*	*285*	*0.47*
315	*Viola cinerea* Boiss.	*0.121*	*5*	*135*	*0.22*
316	*Withania coagulans* (Stocks) Dunal.	*0.145*	*6*	*138*	*0.23*
317	*Withania somnifera* (L.) Dunal	*0.421*	*12*	*515*	*0.85*
318	*Xanthium strumarium* L.	*0.315*	*6*	*325*	*0.54*
319	*Ziziphus mauritiana* Lam.	*0.115*	*3*	*268*	*0.44*
320	*Ziziphus nummularia (*Burm.f.) Whigt. & Arn.	*0.115*	*3*	*270*	*0.45*
321	*Zizyphus jujuba Lam*	*0.113*	*6*	*272*	*0.45*
322	*Glycyrrhiza glabra Linn*	*0.116*	*6*	*275*	*0.46*
323	*Gloriosa supurba Linn*	*0.121*	*7*	*285*	*0.47*

UR: Use report; UV: Use value; FC: Frequency of citation; RFC: Relative frequency of citation

Table-15: Medicinal plants of Chatra cited by most of the informants

Medicinal plant species	Family	Diseases treated	Number of informants	Percentage (%)
Adhatoda vasica (Linn) Nees	Acanthaceae	Cough, Fever, Tuberculosis, Malaria,	440	73.33
Achyranthus aspera. Linn.	Amaranthaceae	Dropsy, hydrophobia, ophthalmia	450	75.00
Aloe vera (Linn.) Webb & Benth	Liliaceae	Antioxidant and antibacterial	565	94.16
Azadirachta indica A. Juss	Meliaceae	Liver diseases, antimicrobial	565	94.16
Boerhavia procumbens Banks ex. Roxb.	Nyctaginaceae	Febrifuge, snake bite, piles	465	77.50
Broussonetia papyrifera (L.) Vent.	Moraceae	Dysentery	450	75.00
Calotropis procera (Ait) R. Br	Asclepiadaceae	Emetic, leprosy, elephantiasis, snakebites, asthma	545	90.83
Catharanthus roseus (Linn.) Don	Apocyanaceae	Muscle pain, central nervous system, wounds, diabetes, cancer.	565	94.16
Centella asiatica (Linn.) Urban	Apiaceae	Spinal injury, neuromuscular disorder, skin treatment.	575	95.83
Cuminum cyminum L.	Apiaceae	Respiratory, allergic rhinitis, dyspepsia, diabetes mellitus, inflammatory diseases	435	72.50
Chlorophytum tuberosum (Roxb.) Baker	Asteraceae	Tonic and aphrodisiac	455	75.83

Cyanthillium cinereum (L.) H.Rob.	Asteraceae	Measles	425	70.83
Chromolaena odorata (L.)	Asteraceae	Wounds, Stomach ache, diarrhea, fever, vomiting	425	70.83
Carica papaya L.	Caricaceae	Warts, sinuses, eczema, tumors, dyspepsia, constipation, amenorrhoea	575	95.83
Citrulus colocynthis (L.) Schrad	Cucurbitaceae	cathartic, ecbolic, emmenagogue, vermifugal	565	94.16
Coleus barbetus (Andrews) Benth	Lamiaceae	allergies, dry eye eczema, obesity, painful menstrual periods, irritable bowel syndrome (IBS), urinary tract infections (UTI),	575	95.83
Cubela officinalis L. f.	Piperaceae	Seizure, ulcers, gout, RA, dizziness, paralysis, diarrhea,	455	75.83
Curcuma angustifolia	Zingiberaceae	Soothe coughs and bronchitis	575	95.83
Curcuma longa Linn	Zingiberaceae	anticancer, antimicrobial, antiinflammatory	525	87.50
Curcuma caesis Roxb.	Zingiberaceae	leprosy, cancer, wounds,	525	87.50
Calligonum comosum L'Hér	Polygonaceae	Digestive, body pain, headache	426	71.00
Convolvulus arvensis L.	Convolvulaceae	Wound healing, stomach problems	415	69.16
Convolvulus prostratus Forssk.	Convolvulaceae	Wound healing, stomach problems	415	69.16
Euphorbia hirta Linn.	Euphorbiaceae	Cancer, diarrhea, asthma, bronchitis, fever,	575	95.83
Emblica officinalis Gaertn.	Euphorbiaceae	Antioxidant, immune modulatory, antipyretic, analgesic	585	97.50
Eclipta prostrata (L.)L.	Asteraceae	Jaundice, constipation	435	72.50
Ficus glomerata Roxb	Moraceae	Diabetes, liver disorders, diarrhea	415	69.16
Ficus racemosa L	Moraceae	Gynecological disorders, diabetes, cough, fever	425	70.83
Ficus religiosa	Moraceae	Sexual diseases, obesity, diabetes	465	77.50
Ficus virgata Reinw. ex Blume	Moraceae	Stomach ache, menstrual problems	412	68.66
Hibiscus rosa-sinensis Linn.	Malvaceae	painful menstruation, bronchial catarrh, coughs	426	71.00
Hyoscyamus niger L	Solanaceae	Rheumatism, toothache, asthma, cough, nervous diseases	425	70.83
Mentha viridis Linn.	Lamiaceae	Fevers, headaches, antispasmodic, carminative, diuretic	548	91.33
Michelia champaca Linn.	Magnoliaceae	Diabetes, quick wound healing, cardiac disorders	525	87.50
Moringa oleifera Lamk	Moringaceae	Diabetes. Cancer, fever, antihypertensive,	528	88.00
Musa paradisica Linn.	Musaceae	Ulcers, dysentery,	550	91.66
Medicago sativa L.	Fabaceae	Hair tonic	478	79.66
Melilotus indicus (L.) All.	Fabaceae	Wasp bite, inflammation	485	80.83
Mentha longifolia (L.) L	Lamiaceae	Gastrointestinal disorders, obesity, aphrodisiac,	512	85.33
Momordica balsamina L.	Cucurbitaceae	Diabetes, skin problems, blood purifier, throat infection, liver	425	70.83
Monotheca buxifolia (Falc.) A. DC.	Sapotaceae	Constipation, laxative, liver problem	411	68.50
Morus alba L	Moraceae	Laxative, expectorant, jaundice, respiratory	565	94.16
Morus nigra L	Moraceae	Laxative, expectorant, jaundice, respiratory	512	85.33
Nerium indicum Mill.	Apocyanaceae	Cardiac illnesses, asthma, corns, cancer, and epilepsy	425	70.83
Nymphaea pubescens Willd	Nymphaeaceae	Dyspepsia, diarrhoea, piles, nephritis, insomnia, jaundice,	415	69.16
Nelumbo nucifera Gaerth	Nymphaeaceae	Depression, diarrhea, heart problems, hypertension and insomnia	415	69.16
Nerium oleander L.	Apocyanaceae	Snake, scorpion and wasp bite	416	69.33
Ocimum sanctum Linn.	Lamiaceae	Bronchitis, malaria, diarrhea, dysentery.	485	80.83
Ocimum americanum L.	Lamiaceae	Cough, malaria, depression, constipation	485	80.83
Ocimum basilicum L.	Lamiaceae	Obesity, fever, hypertension, malaria, anxiety	485	80.83
Phyllanthus niruri Linn. Schum. & Thonn	Phyllanthaceae	Kidney stones, gallbladder stones, liver cancer and jaundice	425	70.83
Phyllanthus fraternus Linn. G.L.Webster	Phyllanthaceae	Thirst, bronchitis, asthma, leprosy, anaemia, venereal diseases,	425	70.83
Pentatropis spiralis (Forssk.)	Asclepiadaceae	Blood purifier, antidote	415	69.16

Decne.				
Polygonum plebeium R. Br.	Polygonaceae	Diabetes, Digestive, body pain, headache	425	70.83
Punica granatum L.	Lythraceae	Malaria, pimples, anemia, cooling effect, fatigue, weakness	465	77.50
Rauvolfia serpentine (L.) Benth. Ex Kutz	Apovyanaceae	High blood pressure, schizophrenia,	545	90.83
Sphaeranthus indicus L.	Asteraceae	Jaundice, diabetes, leprosy, fever, cough, gastropathy, hernia,	415	69.16
Saraca indica (Linn.) Beddome	Caesalpiniaceae	Uterine tonic, menstrual irregularities	425	70.83
Sesbania grandiflora Pers.	Fabaceae	Diuretic, emetic, emmenagogue, febrifuge, laxative	450	75.00
Senna alata (L.) Roxb.	Fabaceae	Ringworm and other fungal infections	465	77.50
Syzgium cumini (Linn.) Skeels	Myrtaceae	Diabetes, ulcer, dysentery	455	75.83
Sesamum indicum Linn.	Pedaliaceae	Laxative, emollient and demulcent, antibacterial	415	69.16
Saccharum officinarum Linn.	Poaceae	Aphrodisiac, laxative, antiseptic, Joundice	412	68.66
Santalum album Linn	Santalaceae	Common colds, bronchitis, skin disorders, heart ailments, fever, infection of the urinary tract	465	77.50
Sapindus mukoro ssi Guerth	Sapindaceae	Gout and rheumatism	475	79.16
Terminalia arjuna (Roxb. ex DC) Wt and Arn	Combretaceae	kapha, pitta, and vata.	568	94.66
Terminalia bellirica (Gaerth.) Roxb.	Combretaceae	Respiratory tract infections, cough, and sore throat	570	95.00
Terminalia chebula Retz.	Combretaceae	High cholesterol and digestive disorders	517	86.16
Tinospora cordifolia (Willd) Miers ex Hook. F.	Combretaceae	Diabetes, high cholesterol, allergic rhinitis, RA	525	87.50
Tephrosia purpurea (L.) Pers	Fabaceae	Leprosy, ulcers, asthma, and tumors	468	78.00
Tribulus terrestris Linn.	Zygophyllaceae	Increases testosterone levels	425	70.83
Taverniera glabra Boiss.	Fabaceae	Body pain, obesity, poor appetite	465	77.50
Taverniera spartea (Burm.f.) DC.	Fabaceae	Cancer, blood purification, pimples	465	77.50

Table-16: Informant Consensus Factor (ICF) value of medicinal plants used for treatment of various diseases

Disease categories	Nt (Number of species used for the ailment)	Nur (Number of use citation for each ailment)	ICF (Informant Consensus factor)
Respiratory and pulmonary diseases	95	135	0.29
Gastrointestinal diseases	93	145	0.36
Genitourinary diseases	62	75	0.17
Sexual disorders	76	85	0.10
Skin inflammation	70	97	0.28
Musculoskeletal dosorders	76	85	0.10
Glandular disorders	38	55	0.31
Antidote	21	25	0.16
Cardiovascular diseases	65	105	0.38
Neurological disorders	33	86	0.62
ENT problems	25	31	0.20
Eye ailments	7	16	0.60
Fever and headache	78	85	0.08
Malaria	55	87	0.37
Oral and dental problems	29	33	0.12
Hair problems, dandruff	7	15	0.57
Epilepsy	65	77	0.15
Common cold and cough	97	123	0.21
Tonsilitis	17	105	0.84
Swelling wound	19	109	0.83
Hemorrhoid	18	105	0.84
Rabies	16	87	0.82
Snake bite	21	85	0.76
Spider poison	15	63	0.77
Diabetes	65	175	0.63
Blood pressure	12	65	0.82
Jaundice	14	67	0.80
Toothache	8	31	0.76
Menorrhea	7	76	0.92
Leucorrhea	7	85	0.92
Tuberculosis	9	65	0.87

Dropsy	6	35	0.85
Hydrophobia	5	27	0.84
Antioxidant and antibacterial	87	131	0.33
Leprosy	7	21	0.70
Elephantiasis	8	19	0.61
Measles	6	45	0.88
Amenorrhea	14	56	0.76
Painful menstrual problems	16	83	0.81
Rheumatoid arthritis (RA)	15	43	0.66
Cancer	21	81	0.75
Constipation	65	107	0.39
Bronchitis	35	95	0.63
Obesity	27	75	0.64
Anxiety	13	35	0.64
Kidney stone	9	33	0.75
Schizophrenia	13	28	0.55
Ringworm and other fungal infection	14	58	0.77
Hypercholesterolemia	53	97	0.45

Table-17: Fidelity index of some of the medicinal plants of Chatra cited by most of the informants

Medicinal plant species	Diseases treated	NP	N	FL	FL (%)
Adhatoda vasica (Linn) Nees	Cough, Fever, Tuberculosis, Malaria,	452	457	0.98	98
Achyranthus aspera. Linn.	Dropsy, hydrophobia, ophthalmia	385	395	0.97	97
Aloe vera (Linn.) Webb & Benth	Antioxidant and antibacterial	325	385	0.84	84
Azadirachta indica A. Juss	Liver diseases, antimicrobial	355	425	0.83	83
Boerhavia procumbens Banks ex. Roxb.	Febrifuge, snake bite, piles	365	372	0.98	98
Broussonetia papyrifera (L.) Vent.	Dysentery	345	385	0.89	89
Calotropis procera (Ait) R. Br	Emetic, leprosy, elephantiasis, snakebites, asthma	425	478	0.88	88
Catharanthus roseus (Linn.) Don	Muscle pain, central nervous system, wounds, diabetes, cancer.	435	512	0.84	84
Centella asiatica (Linn.) Urban	Spinal injury, neuromuscular disorder, skin treatment.	445	515	0.86	
Cuminum cyminum L.	Respiratory, allergic rhinitis, dyspepsia, diabetes mellitus, inflammatory diseases	325	375	0.86	86
Chlorophytum tuberosum (Roxb.) Baker	Tonic and aphrodisiac	365	385	0.94	94
Cyanthillium cinereum (L.) H.Rob.	Measles	345	386	0.89	89
Chromolaena odorata (L.)	Wounds, Stomach ache, diarrhea, fever, vomiting	355	367	0.96	96
Carica papaya L.	Warts, sinuses, eczema, tumors, dyspepsia, constipation, amenorrhoea	485	495	0.97	97
Citrulus colocynthis (L.) Schrad	cathartic, ecbolic, emmenagogue, vermifugal	365	375	0.97	97
Coleus barbetus (Andrews) Benth	allergies, dry eye eczema, obesity, painful menstrual periods, irritable bowel syndrome (IBS), urinary tract infections (UTI),	375	390	0.96	96
Cubela officinalis L. f.	Seizure, ulcers, gout, RA, dizziness, paralysis, diarrhea,	325	345	0.94	94
Curcuma angustifolia	Soothe coughs and bronchitis	325	355	0.91	91
Curcuma longa Linn	anticancer, antimicrobial, antiinflammatory	378	395	0.95	95
Curcuma caesis Roxb.	leprosy, cancer, wounds,	378	395	0.95	95
Calligonum comosum L'Hér	Digestive, body pain, headache	325	335	0.91	91
Convolvulus arvensis L.	Wound healing, stomach problems	315	356	0.88	88
Convolvulus prostratus Forssk.	Wound healing, stomach problems	315	356	0.88	88
Euphorbia hirta Linn.	Cancer, diarrhea, asthma, bronchitis, fever,	435	478	0.91	91
Emblica officinalis Gaertn.	Antioxidant, immune modulatory, antipyretic, analgesic	425	486	0.87	87
Eclipta prostrata (L.)L.	Jaundice, constipation	365	378	0.96	96
Ficus glomerata Roxb	Diabetes, liver disorders, diarrhea	345	375	0.92	92
Ficus racemosa L	Gynecological disorders, diabetes, cough, fever	345	375	0.92	92
Ficus religiosa	Sexual diseases, obesity, diabetes	345	385	0.89	89
Ficus virgata Reinw. ex Blume	Stomach ache, menstrual problems	345	365	0.94	94
Hibiscus rosa-sinensis Linn.	painful menstruation, bronchial catarrh, coughs	325	385	0.84	84
Hyoscyamus niger L	Rheumatism, toothache, asthma, cough, nervous diseases	365	425	0.85	85
Mentha viridis Linn.	Fevers, headaches, antispasmodic, carminative, diuretic	367	455	0.80	80

Michelia champaca Linn.	Diabetes, quick wound healing, cardiac disorders	315	385	0.81	81
Moringa oleifera Lamk	Diabetes. Cancer, fever, antihypertensive,	365	425	0.85	85
Musa paradisica Linn.	Ulcers, dysentery,	345	415	0.83	83
Medicago sativa L.	Hair tonic	415	485	0.85	85
Melilotus indicus (L.) All.	Wasp bite, inflammation	412	465	0.88	88
Mentha longifolia (L.) L	Gastrointestinal disorders, obesity, aphrodisiac,	345	375	0.92	92
Momordica balsamina L.	Diabetes, skin problems, blood purifier, throat infection, liver	295	316	0.93	93
Monotheca buxifolia (Falc.) A. DC.	Constipation, laxative, liver problem	290	355	0.81	81
Morus alba L	Laxative, expectorant, jaundice, respiratory	325	335	0.97	97
Morus nigra L	Laxative, expectorant, jaundice, respiratory	325	345	0.94	94
Nerium indicum Mill.	Cardiac illnesses, asthma, corns, cancer, and epilepsy	285	325	0.87	87
Nymphaea pubescens Willd	Dyspepsia, diarrhoea, piles, nephritis, insomnia, jaundice,	355	415	0.85	85
Nelumbo nucifera Gaerth	Depression, diarrhea, heart problems, hypertension and insomnia	375	465	0.80	80
Nerium oleander L.	Snake, scorpion and wasp bite	375	475	0.78	78
Ocimum sanctum Linn.	Bronchitis, malaria, diarrhea, dysentery.	425	426	0.99	99
Ocimum americanum L.	Cough, malaria, depression, constipation	425	426	0.99	99
Ocimum basilicum L.	Obesity, fever, hypertension, malaria, anxiety	425	428	0.99	99
Phyllanthus niruri Linn. Schum. & Thonn	Kidney stones, gallbladder stones, liver cancer and jaundice	375	425	0.88	88
Phyllanthus fraternus Linn. G.L.Webster	Thirst, bronchitis, asthma, leprosy, anaemia, venereal diseases,	365	426	0.85	85
Pentatropis spiralis (Forssk.) Decne.	Blood purifier, antidote	315	385	0.81	81
Polygonum plebeium R. Br.	Diabetes, Digestive, body pain, headache	317	385	0.82	82
Punica granatum L.	Malaria, pimples, anemia, cooling effect, fatigue, weakness	346	415	0.83	83
Rauvolfia serpentine (L.) Benth. Ex Kutz	High blood pressure, schizophrenia,	425	428	0.99	99
Sphaeranthus indicus L.	Jaundice, diabetes, leprosy, fever, cough, gastropathy, hernia,	365	415	0.87	87
Saraca indica (Linn.) Beddome	Uterine tonic, menstrual irregularities	426	430	0.99	99
Sesbania grandiflora Pers.	Diuretic, emetic, emmenagogue, febrifuge, laxative	345	385	0.89	89
Senna alata (L.) Roxb.	Ringworm and other fungal infections	315	385	0.81	81
Syzgium cumini (Linn.) Skeels	Diabetes, ulcer, dysentery	325	412	0.78	78
Sesamum indicum Linn.	Laxative, emollient and demulcent, antibacterial	326	415	0.78	78
Saccharum officinarum Linn.	Aphrodisiac, laxative, antiseptic, Joundice	375	415	0.90	90
Santalum album Linn	Common colds, bronchitis, skin disorders, heart ailments, fever, infection of the urinary tract	265	375	0.70	70
Sapindus mukoro ssi Guerth	Gout and rheumatism	275	385	0.71	71
Terminalia arjuna (Roxb. ex DC) Wt and Arn	kapha, pitta, and vata.	455	485	0.93	93
Terminalia bellirica (Gaerth.) Roxb.	Respiratory tract infections, cough, and sore throat	475	485	0.97	97
Terminalia chebula Retz.	High cholesterol and digestive disorders	475	485	0.97	97
Tinospora cordifolia (Willd) Miers ex Hook. F.	Diabetes, high cholesterol, allergic rhinitis, RA	465	475	0.97	97
Tephrosia purpurea (L.) Pers	Leprosy, ulcers, asthma, and tumors	345	425	0.81	81
Tribulus terrestris Linn.	Increases testosterone levels	315	415	0.75	75
Taverniera glabra Boiss.	Body pain, obesity, poor appetite	326	389	0.83	83
Taverniera spartea (Burm.f.) DC.	Cancer, blood purification, pimples	326	390	0.83	83

Np is the number of informants that claim the use of a plant species to treat a particular disease, and N is the number of informants that use the plants as a medicine to treat any given disease.

Table-18: Preference ranking of medicinal plants used to treat diseases

Medicinal plants with high citation frequency	Informants											
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Total	Ranks
Adhatoda vasica (Linn) Nees	18	17	16	15	18	14	13	15	17	15	158	8th
Achyranthus aspera. Linn.	15	16	14	14	16	13	15	14	12	13	142	12th
Aloe vera (Linn.) Webb & Benth	20	18	19	19	20	17	20	19	19	20	191	1st
Calotropis procera (Ait) R. Br	14	16	15	16	15	17	14	14	13	14	148	9th
Catharanthus roseus (Linn.) Don	13	12	14	13	15	12	11	13	14	15	132	16th
Centella asiatica (Linn.) Urban	12	13	14	13	14	13	12	12	14	16	133	15th
Carica papaya L.	16	15	16	17	15	15	16	15	16	17	158	8th
Citrulus colocynthis (L.) Schrad	13	12	14	12	11	13	14	16	14	12	131	17th
Coleus barbetus (Andrews) Benth	20	19	20	19	18	20	19	18	16	18	187	3rd
Curcuma angustifolia	14	14	15	16	16	13	14	15	16	15	148	9th
Euphorbia hirta Linn.	14	13	16	15	15	14	12	12	12	13	136	14th
Emblica officinalis Gaertn.	20	20	18	20	19	17	16	20	18	20	188	2nd
Mentha viridis Linn.	15	15	14	16	15	14	13	16	14	13	145	11th
Morus alba L	11	16	15	13	17	14	15	16	14	15	146	10th
Rauvolfia serpentine (L.) Benth. Ex Kutz	18	19	17	19	18	16	19	17	19	18	180	5th
Terminalia arjuna (Roxb. ex DC) Wt and Arn	16	15	17	16	15	17	18	18	18	19	169	6th
Terminalia bellirica (Gaerth.) Roxb.	16	15	16	18	16	15	17	17	18	18	166	7th
Terminalia chebula Retz.	16	15	17	16	15	17	18	18	17	20	169	6th
Tinospora cordifolia (Willd) Miers ex Hook. F. & Thoms	20	20	20	19	18	19	17	16	15	19	183	4th
Moringa oleifera Lamk	13	14	16	15	14	16	14	11	13	14	140	13th

R1 to R10 represents informants

III. Results

The ethnobotanical data was analysed for 323 medicinal plants collected from twelve block areas of Chatra district, Jharkhand in terms of use value (UV), use report (UR), frequency of citation (FC) and relative frequency of citation (RFC) (Table-14). It was found that the use value of sixty medicinal plants viz. *Adhatoda vasica, Achyranthus aspera, Artemisia vulgaris, Aloe vera, Azadirachta indica, Arundo donax, Boerhavia procumbens, Broussonetia papyrifera, Calotropis procera, Catharanthus roseus, Centella asiatica, Cyanthillium cinereum, Carica papaya, Coleus barbetus, Curcuma longa, Curcuma angustifolia, Cardamine hirsute, Cardaria draba, Clematis grata, Clerodendrum phlomidis, Cocculus hirsutus, Cocculus pendulus, Cuscuta reflexa, Eclipta prostrate, Epilobium hirsutum, Euphorbia helioscopia, Euphorbia heterophylla, Euphorbia serpens, Fagonia indica, Fumaria indica, Gastrocotyle hispida, Glandularia pulchella, Gymnosporia spinosa, Gynandropsis gynandra, Heliotropium currasavicum, Heliotropium europaeum, Heliotropium indicum, Kickxia ramoissima, Mesua ferrea, Millettia pinnata, Ocimum sanctum, Ocimum basilicum, Otostegia limbata, Persicaria glabra, Plantago boissieri, Polygonum persicaria, Polygonum plebeium, Pulicaria glutinosa, Saraca indica, Sesbania grandiflora, Saccharum officinarum, Terminalia arjuna, Terminalia bellirica, Terminalia chebula, Tinospora cordifolia, Tribulus terrestris, Taverniera glabra, Taverniera spartea, Verbena officinalis* and *Xanthium strumarium* have high use value, greater than 0.300. Their use report (UR), frequency of citation (FC) and relative frequency of citation (RFC) were also high and, therefore, considered to be the most important medicinal plants of this district. Of the 323 medicinal plants 163 plant species had the lowest use value of <0.200. Other medicinal plant species had moderate use value in the range of 0.200 to 0.300 (Table-14).

The medicinal plant species citation by most of the informants of Chatra district, their medicinal uses and percentage of citation among 600 informants has been depicted in Table-15. From the result it is clear that 72 medicinal plant species were cited by most of the informants. Of these the seventeen (17) medicinal plant species had highest percentage of citation viz. *Aloe vera (94.16%), Azadirachta indica* (94.16%), *Calotropis procera* (90.83%), *Catharanthus roseus* (94.16%), *Centella asiatica* (95.83%), *Carica papaya* (95.83%), *Citrulus colocynthis* (94.16%), *Coleus barbetus* (95.83%), *Curcuma angustifolia* (95.83%), *Euphorbia hirta* (95.83%), *Emblica officinalis* (97.50%), *Mentha viridi* (91.33%), *Musa paradisica* (91.66%), *Morus alba* (94.16%), *Rauvolfia serpentine* (90.83%), *Terminalia arjuna* (94.66) and *Terminalia bellirica* (95.00%) (Table-15).

Ethnobotany plays an important role in exploring the human-plant relationship and medicinal uses of native flora of that area. In the present investigation the traditional knowledge of medicinal plants was recorded among the people with low to high level of education and among the age group of 25 to 70 years. The

inhabitants of Chatra mostly in the rural areas are associated with raring of animals. But they have intimate relation and have enough knowledge about the use of medicinal plants.

IV. Discussion

Highest use report of sixty medicinal plant species is due to their dominance and wider occurrence. These are easily available plants and are used frequently by local inhabitant (Agelet and Valles, 2001; Johns *et al*., 1990) [19, 20]. A more or less similar use reports was also reported by Cornara *et al*., (2009) [21]; Giday *et al*., (2009) [22]; Saslis-Lagoudakis *et al*., (2011) [23]; Teklehaymanot, (2009) [16]. Moreover, the ascendancy of these medicinal plants reveals the presence of a wide range of bioactive compounds. The diversity of bioactive compounds and secondary metabolites may be the reason for the multiple use of the medicinal plants for more than one health problems (Verpoorte et al., 2005) [24]. Plants of family Poaceae had less aforementioned proceedings in ethno botanical investigations (Cakilcioglu and Turkoglu, 2010; Kadir *et al*., 2012; Rokaya *et al*., 2010) [25, 26, 27] conducted at global level. In the present study the main reason of frequent use of plants of family Poaceae is mainly due to their dependency for fuel by local people. These plants with low use reports were *Saccharum bengalense*, *S. revennae*, *S. spontaneum* etc.), thatching (*Arundo donax*, *Phragmites australis* etc.) , forage (*Cymbopogon commutatus*, *Cynodon dactylon*, *Cenchrus echinatus*, *Chloris gayana*, *Coix lacryma-jobi*, *Dactyloctenium aegyptium*, *Desmostachya bipinnata*, *Dichanthium annulatum* etc. The present findings indicate great reliance of inhabitants of Chatra on a diversity of plant species to treat ailments, and represent a good sign of the intense facts on plant based treatments (Nadembega et al., 2011). Among the reported plant species (323 species) of Chatra, some medicinal plants were of high indigenous priority, and are thus commonly cited by majority of the respondents. The highly cited medicinal plant species (72 species) were Adhatoda vasica, Achyranthus aspera *Aloe vera*,*Azadirachta indica, Boerhaavia procunbens, Broussonetia papyrifera, Calotropis procera, Catharanthus roseus, Centella asiatica, Cuminum cyminum, Chlorophytum tuberosum, Cynthillium cinereum, Chromolaena odorata, Carica papaya, Citrulus colocynthis, Coleus barbetus, Cubela officinalis, Curcuma angustifolia, C. longa, C. caesis, Calligonum comosum, Convulvulus arvensis, C. prostrates, Euphorbia hirta, Emblica officinalis, Eclipta prostrate, Ficus glomerata, F. racemosa, F. religiosa, F. virgata, Hibiscus rosa-sinensis, Hyoscyamus niger, Mentha viridis, Michelia champaca, Moringa oleifera, Musa paradisica, Medicago sativa, Melilotus indicus, Mentha longifolia, Momordica balsamia, Monotheca buxifolia, Morus alba, Morus nigra, Nerium indicum, Nymphaea pubescens, Nelumbo nucifera, Nerium oleander, Ocimum sanctum, O. Americana, O. basilicum, Phyllanthus niruri, P. fraternus, Pentatropis spiralis, Polygonum plebejum, Punica granatum, Rauvolfia serpentine, Sphaeranthus indicus, Saraca indica, Sesbania grandiflora, Senna alata, Syzgium cumini, Sesamum indicum, Saccharum officinarum, Santalum album, Sapindus mukoro, Terminalia arjuna, T. bellerica, T. Chebula, Tenospora cordifolia, Tephrosia purpurea, Tribulus terrestris, Taverniera glabra and T. spartea*. These plants are reported frequently due to their abundance in the Chatra district and are considered medicinally effective. The reason of frequent citation of these plants might be due to the presence of valuable and pharmacologically bioactive compounds. Favorable climatic and topographical conditions of Chatra might have positive contribution toward the rapid adaptation of medicinal plant species (Ayyanar and Ignacimuthu, 2011; Giday *et al*., 2003; Mesfin *et al*., 2012; Uniyal *et al*., 2006) [28, 29, 30, 31]. A more or less similar result was also reported by Rajnandani *et al*., (2020) and some other documentations about medicinal plants (Megersa *et al*., 2013; Upadhyay *et al*., 2010; Upadhyay *et a*l., 2007) [32, 33, 34]. Herbs are richest source of bioactive compounds (Srithi et al., 2009). The major use of floral parts and leaves is unique to this study in comparison to other ethnomedicinal studies (Rahman *et al*., 2016; Shah and Rahim, 2017) [35, 36]. Local people believe that collecting a plant in flowering period is very important for the effectiveness of the formulation. This may be due to the richness of essential oils or the existence of bioactive compounds in flowers as compared to other vegetative parts. However, collection of juvenile plants and premature flower may have negative impacts on plants sustainability. Furthermore, over-exploitation of seeds and roots can lead to a drastic decline in the populations of medicinal plants (Ghimire *et al*., 2008) [37] and consequent extinction of medicinal species from the area. Therapeutic uses of leaves and other vegetative parts are defensible (Giday *et al*., 2003; Zheng and Xing, 2009) [29 38], which is reported as the second highest part used in the present study. Use of leaves and other vegetative parts in traditional medication is a common practice which has also been reported by several workers viz. Rajnandani *et al*., (2019) [39], Asase *et al*., (2010) [40], Asase and Oppong-Mensah, (2009) [41], Koudouvo *et al*., (2011) [42], Nadembega *et al*., (2011) [43], Nguta *et al*., (2010) [44]. The use of leaves may be of high preference due to its photosynthetic function and presence of secondary metabolites which could be medicinally important for curing various ailments in humans (Bhattarai *et al*., 2006; Ghorbani, 2005) [45, 46]. In addition, collection of leaves is ecologically sustainable as compared to other plant parts of plants (Giday *et al*., 2009) [22].

Use of boiled leaves, stem, bark, flowers and other plant parts as decoction is considered more effective as compared to other methods. It has been observed that heating process speed up several biological reactions ensuring the extraction of countless vigorous compounds (Al-Adhroey *et al*., 2010; Chen *et al*., 2008; Han *et al*.,

2007; Zhang *et al*., 2005) [47, 48, 49, 50]. Infusion is the second rated mode of utilization of plants. Infusion is prepared from fresh and healthy plant parts. Infusion is one of the highly effective recipes that play a crucial role in the medication (Dike *et al*., 2012; Idowu *et al*., 2010) [51, 52]. A handful amount infusion of a patient is considered as an exact dose for medication from generation to generation. Doses of decoction and infusion of plant parts are taken twice or thrice a day depending upon the severity of the diseases. Water is the main and common solvent used in the preparation of herbal remedies (Andrade-Cetto, 2009; Lee *et al*., 2008; Poonam and Singh, 2009; Prashanth *et al*., 2001; Ssegawa and Kasenene, 2007) [53, 54, 55, 56, 57] since most of them were prepared as decoction or infusion. This practice is highly convenient because water is easily accessible, and not to disturb the chemical composition of the active constituents (Nunkoo and Mahomoodally, 2012) [58]. Some other ingredients viz. sugar, salt, honey, olive oil, mustard oil and lemon are also added to improve the taste and to to reduce nausea, vomiting and constipation.

The diseases of the study area have been grouped into 49 categories on the basis of the site of incidence of the disease, condition of the disease as well as treatment resemblance of the disease to the local people. Result showed that the informant consensus factor (ICF) values ranged from 0.10 to 0.93 for the disease categories (Table-16). Of the categorized diseases, Tonsilitis, swelling wound, hemorrhoid, rabies, blood pressure, jaundice, menorrhea, leucorrhea, tuberculosis, dropsy, hydrophobia, measles and painful menstrual problems had highest ICF value, 0.84, 0.83, 0.84, 0.82, 0.82, 0.80, 0.92, 0.93, 0.87, 0.85, 0.84, 0.88 and 0.81 respectively. This suggested the common occurrence of these problems in the study area and agreement of the people on their remedy. It has been shown that medicinal plants that are effective in treating certain diseases and well known by community members have higher ICF values. The lowest ICF values indicated the rare occurrence of these diseases.

The main reason of high ICF values could be the common happening of these illnesses in the community due to poor sanitation practice, low economic status and lack of adequate modern health care of in the Valley (Bieski *et al*., 2015) [59]. High ICF values undoubtedly disclose a noteworthy number of reports on the use of these medicinal plants for a group of health problems (Baydoun *et al*., 2015) [60]. The slightest agreement among the informants was detected for plants used for group of sexual disorders, respiratory disorders, genitourinary problems, skin inflammation, musculoskeletal disorders, glandular disease, antidote, cardiovascular diseases, neurological disorders, ear, nose and throat problems (ENT), eye ailments, fever and headache, malaria, oral and dental problems, epilepsy, common cold and cough, diabetes, anxiety, kidney stone, schizophrenia and other diseases which include pain, small pox, mumps, insect repellent, antitumor and anti-allergic, all these groups containing the lowest ICF value. The lowest values of ICF for ear, nose and throat problems (ENT) and eye diseases and is in accordance with other studies (Bibi *et al*., 2015; Jamila and Mostafa, 2014) [61, 62]. These lowest ICF values could be credited to the trend of folks in native or urban societies of Chatra to use conventional medicines for curing predictable diseases, even in current times (Upadhyay *et al*., 2011) [63].

Fidelity Level (FL) is an index, which shows the specificity of a given medicinal plant to treat a particular disease effectively. Fidelity level was then calculated for some commonly used medicinal plants to treat ailments. Result showed that *Adhatoda vasica, Achyranthus aspera*, *Boerhavia procumbens, Chlorophytum tuberosum, Chromolaena odorata, Carica papaya, Citrulus colocynthis, Coleus barbetus, Cubela officinalis, Curcuma angustifolia, Curcuma longa, Curcuma caesis, Calligonum comosum, Euphorbia hirta, Eclipta prostrata, Ficus glomerata, Ficus racemosa, Ficus virgata, Mentha longifolia, Momordica balsamina, Morus alba, Morus nigra, Ocimum sanctum, Ocimum americanum, Ocimum basilicum, Rauvolfia serpentine, Saraca indica, Saccharum officinarum, Terminalia arjuna, Terminalia bellirica, Terminalia chebula* and *Tinospora cordifolia* had the highest FL value of greater than 0.90 (Table-17). The species of medicinal plants that are widely used by the local people to treat one or very few ailments/diseases have higher FL values than those that are less popular (Semayat Oyda, 2017) [76]. . High FL could also be an indication of efficiency of the reported plant to cure a specific ailment.

When different medicinal plant species are prescribed for the same health problem, people show the preference of one over the other. Preference ranking of twenty medicinal plant species that were reported for treating Bloating/diseases was conducted after selecting ten key informants (R1 to R10). The informants were asked to compare the given medicinal plant species on the basis of their efficacy and to give the highest number (20) for the medicinal plant which they thought most effective in treating Bloating/ailments and the lowest number (1) for the least effective plant in treating Bloating/ailments. *Aloe vera* scored 191 and ranked first indicating. This indicated that it is the most effective in treating Bloating/ailment followed by *Emblica officinalis* (2^{nd} rank), *Coleus barbetus* (3^{rd} rank), *Tinospora cordifolia* (4^{th} rank), *Rauvolfia serpentina* (5^{th} rank), *Terminalia arjuna* and *T. chebula* (6^{th} rank), *T. bellirica* (7^{th} rank), *Adhatoda vasica* and *Carica papaya* (8^{th} rank), *Calotropis procera* and *Curcuma angustifolia* (9^{th} rank), *Morus alba* (10^{th} rank), *Mentha viridis* (11^{th} rank), *Achyranthus aspera* (12^{th} rank), *Moringa oleifera* (13^{th} rank), *Euphorbia hirta* (14^{th} rank), *Centella asiatica* (15^{th} rank), *Catharanthus roseus* (16^{th} rank) and *Citrulus colocynthis* (17^{th} rank) (Table-18). The present

findings gain support from the work of Mekonen Wolditsadik Beyi (2018) who also ranked medicinal plant species in order of their preference.

Toxicity of medicinal plants: In the present study the documented ethnobotanical data generally elaborate the medicinal usage of the indigenous plant species. However, it was found that the informants were very much careful in using some of the plant species such as *Achyranthes aspera, Calotropis procera, Cannabis sativa, Croton bonplandianum, Cuscuta reflexa, Datura metel, Dodonaea viscosa, Euphorbia helioscopia, E. heterophylla, E. hirta, E. peplus, E. prostrata, E. serpens, Heliotropium currasavicum, H. europaeum, Ipomoea carnea, Lantana camara, Lathyrus aphaca, Nerium oleander, Ricinus communis, Rhazya stricta, Solanum elaeagnifolium, S. xanthocarpum, S. nigrum, S. surattense, S. incanum*, *Parthenium* sp. *Hyoscyamus niger, Schweinfurthia papilionacea, Phyllanthus nirurietc.* The local inhabitants are fully aware about the fact that these plants can cause symptom of toxicity including abortion, restlessness, depression, skin inflammation, vomiting, abdominal pain, nausea, impotency, sterility, dizziness and hallucination. People of Chatra also have a general knowledge about toxic signs and their interpretation of toxicity is based on the observation from generation to generation. Foremost taxonomic classification level for assessing the efficacy of plant to native societies is family (Thomas *et al*., 2009) [65]. Same is factual for the toxicity of plants (Huai *et al*., 2010) [66]. Fabaceae, Asteraceae, Euphorbiaceae and Apocynaceae have been described as the chief families of flowering plants comprising toxic plants in various studies (Levetin and McMahon, 2008; Huai *et al*., 2010; Ozturk *et al*., 2008) [67, 66, 68]. The reason of toxicity of these families is the presence of different toxic substances such as alkaloids, dicoumarin, glycosides, photosensitizing compounds, saponin, selenium (Fabaceae), acrid substances, alcohol, alkaloids, glycosides, nitrogenous compounds, photosensitizing compounds, saponins, selenium, volatile oils (Asteraceae), acrid substances, croton oil, photosensitizing compounds, biterpinoids, triterpenoids, steroids, alkaloids, cyanogenic glycosides and glucosinolates, (Euphorbiaceae) and resin, glycosides (Apocynaceae) (Barla *et al*., 2006; Madureira *et al*., 2004; RIZK, 1987; Yamamura *et al*., 1989; Zhang and Guo, 2006) [69, 70, 71, 72, 73]. The investigation related to herbal toxicity in human requires further investigation at scientific level.

Rural people (tribal and non-tribal community) need plants for their livelihood in different aspects. In the present study several factors both human and natural were found to contribute to the threats that affect survival of medicinal plants species in the study area. From the interview with informants of Chatra various factors were noticed as the main threats to medicinal plants. Agricultural encroachment, firewood collection, charcoal production, plant use for house and fence construction, overgrazing and urbanization were reported to the factors for the dwindling of natural vegetation and medicinal plants. As a result, the accessibility of medicinal plants has become less when compared to the previous times.

Traditional healers also keep their knowledge on medicinal plants for the sake of securing means of income and a cultural belief that telling information may make plants ineffective to cure the ailments/diseases. More or less similar observations were also reported by Fassil Kibebew (1998) [74] and Mirutse Giday, Gobana Amini (2003), Srithi and Balsev (2009), Teklehaymont, (2009), Teklehaymont et al., (2007) [75, 77, 78, 79].

V. Conclusions:

The present study area revealed that people in the Chatra district, Jharkhand have substantial amount of indigenous knowledge on traditional medicine, which needs to be further strengthened by all age groups and gender. As this study revealed the knowledge of traditional medicine mainly reside in the hand of illiterate and aged groups. Indigenous people of the study area have their own ways of managing health problems of human and they are endowed with specific culture, tradition and ethical norms. Biochemical profiles of plant species used for diseases categories of high ICF should be investigated at scientific level for screening of the active principles.

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