

## Biodiversity Conservation of Plant Taxa Used For Oral and Dental Health Management among the Ethnic Ijaws of Bayelsa State Nigeria

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### Original Research Article

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**Abstract:** Diversity and conservation status of plant species used for oral and dental management by the inhabitants of Bayelsa State, Nigeria were assessed. Information on the indigenous knowledge of the plant species use was obtained via semi-structured questionnaire guide, and field trip involved key informants. Species used for oral and dental care were identified, and their relative abundant status determined. The study revealed that different kinds of plant with varied growth habits were used for orodental care; however some of the plants are becoming rare due to unprecedented deforestation. Fidelity level (FL), and Respondents Consensus Factor (RCF) revealed the relative importance and level of respondents' reliance on the plants. The study further showed that leaves, roots and plant inflorescence played significant role in oral treatment either singly or in combination of other plant parts steeped in ogogoro, a local gin. Many of the plants assessed were obtained from the wild, forest being their primary source. Thus, with the increasing level of deforestation in the State and the unsustainable collection pattern, combined with blasé attitude, the consequence of erosion of culture: it becomes pertinent to document information of plant species used for oral and dental management in the State.

**Keywords:** conservation, oral and dental management, chewing sticks, deforestation, Bayelsa State.

### INTRODUCTION

Oral and dental care remains indispensable to promoting oral hygiene. The use of plants to achieve oral health is a common traditional practice in Nigeria [1-4].

Being one of the Non Timber Forest Products (NTFPs), they form an interface between the forest estate and indigenous people, who extract them to promote oral hygiene on a daily basis. Oral-dental maintenance and management are achieved by indigenous people with different kinds of plants and plant parts [1, 5] and the species selected for chewing sticks are based on properties such as foaminess, bitterness, hardness [6] and the ability to be made into fray. It is rather unfortunate that the forest estate of Nigeria is faced with high depletion of plant species diversity [2]. Unsustainable exploitation of plant species at local level has been pointed as the main driver of plant species diversity loss in the tropics [7, 8]. Chewing stick is an important aid to oral hygiene among the Ijaw people of Bayelsa State. It seems to have local socioeconomic significance especially in rural settlements where alternative source of oral and dental care are difficult to come by.

Essentially, the most valuable of early memoirs and archive of plant use are embodied in indigenous people, yet plant based knowledge gradually

sink into oblivion due to indifferent to plant knowledge among posterity and factor such as western influence on local culture. Thus, it is important that the knowledge of chewing stick and its relatives (in the State) are documented as this could form the basis for the conservation of plants use for orodental care, particularly protection of the rare species.

### MATERIALS AND METHODS

#### The study area

The study was carried out in Bayelsa State located in the Niger Delta region of Nigeria (Figure-1 & 2). Geographically, it is located within Lat. 4<sup>o</sup> 15 and 5<sup>o</sup> 23<sup>1</sup> N and Long. 5<sup>o</sup> 15 and 6<sup>o</sup> 45<sup>1</sup> E. The State is bounded to the north by Delta State, to the east by Rivers State, and to the south and west by the Atlantic Ocean. Its capital is Yenagoa. The State occupies an area of about 10,773km<sup>2</sup>, with 1,703,358 human population figure [9]. The oil rich State is divided into eight Local Government Areas (LGAs), namely: Brass, Ekeremor, Kolokuma\Opokuma, Nembe, Ogbia, Sagbama, South-Ijaw and Yenagoa. The major local language of Bayelsa is Ijaw (Ijo); however some other ijo dialects, especially

Nembe, Ogbia and Epie-Atissa are widely spoken in the State. The local population engages mostly in fishing on both subsistence and commercial levels. Other major occupation in the State are farming, fruits gatherings, hunting, lumbering, trading, palm oil milling, palm wine tapping, local gin making, carving and weaving. The state has one of the largest crude oil and natural gas deposits in Nigeria. Conversely commercial and industrial activities in the State revolve mostly around the oil and gas sub-sector. Bayelsa State receives some of the highest rainfall in the tropical zone of Nigeria:

being one of the most extensive wetland in Africa, and the largest area of mangrove and brackish water zones in the continent. Its ecological zones are influenced by tides of the Atlantic Ocean and flood region of the river Niger. Annual rainfall is between 2000 and 4500mm, and peaks in July and September, with a period of dry season between December and March. The forested zones of the State are rich in verdant plant species diversity, these has subserved the basic needs of the local population for decades.



Fig-1: Map of Nigeria Showing Bayelsa State

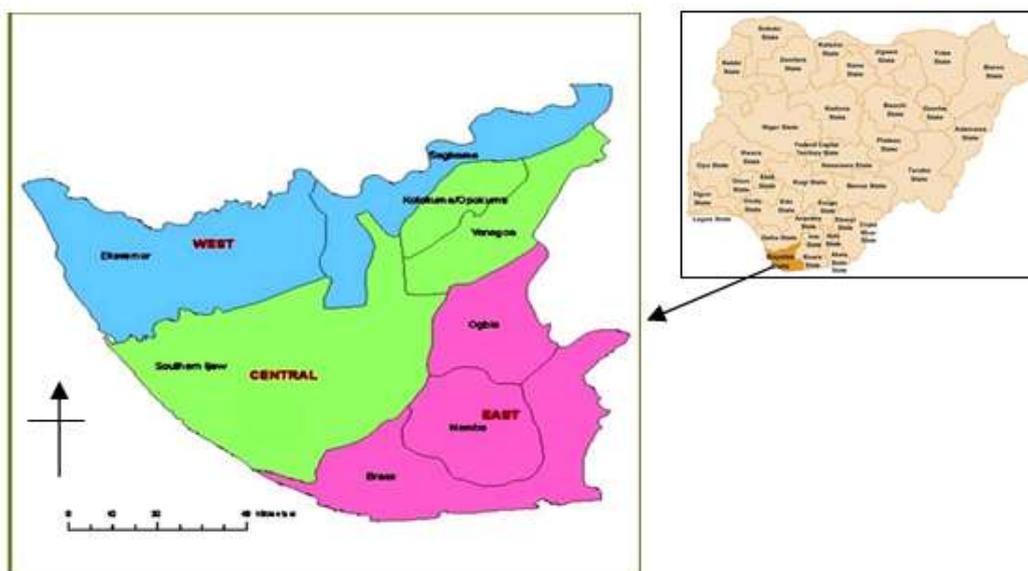


Fig-2: Map of Bayelsa State Nigeria

A combination of social survey and direct field observation was used for the study. The State was divided into 3 zones (Bayelsa east, Bayelsa west, and Bayelsa central) on the basis of the political delineation of Nigeria. A total of 50 households in each zone (comprised of at least 2 persons) were selected and interviewed. Individual interviewed with semi structured questionnaire matrix had maintained a continuous domicile for a number of years. Plant species used for oral and dental care were identified and their voucher specimen were collected, treated and deposited at the herbarium of Ekiti State University. The abundant status of the plants assessed were determined base on the time taken to physically come in contact with the species from the centre of each community according to Kayode and Omotoyinbo [4], those that would take < 1 hour were regarded as being very abundant, 6 – 23 hours as abundant, 1 to 3days as

frequent, and those that would take more than 3 days as rare.

Respondent Consensus Factor (RCF) according to Molares and Ladio [10] was used to determine the consistency of respondent knowledge of a plant assessed for oral and dental management. RCF value range from 0 to 1: A high value close to 1 indicates a well-defined selection among informants. Where  $RCF = \frac{N_x}{N_y}$ ,  $N_x$  denotes number of person that identified the species.  $N_y$  denotes number of person interviewed. Also fidelity level (FL) according to Friedman *et al.*, [11] was used to quantify the percentage importance of the species for oral and dental management, where  $FL = \frac{N_r}{N} \times 100\%$ ,  $N_r$ = number of respondent that mention the species,  $N$ = total number of respondent interviewed.

## RESULTS AND DISCUSSIONS

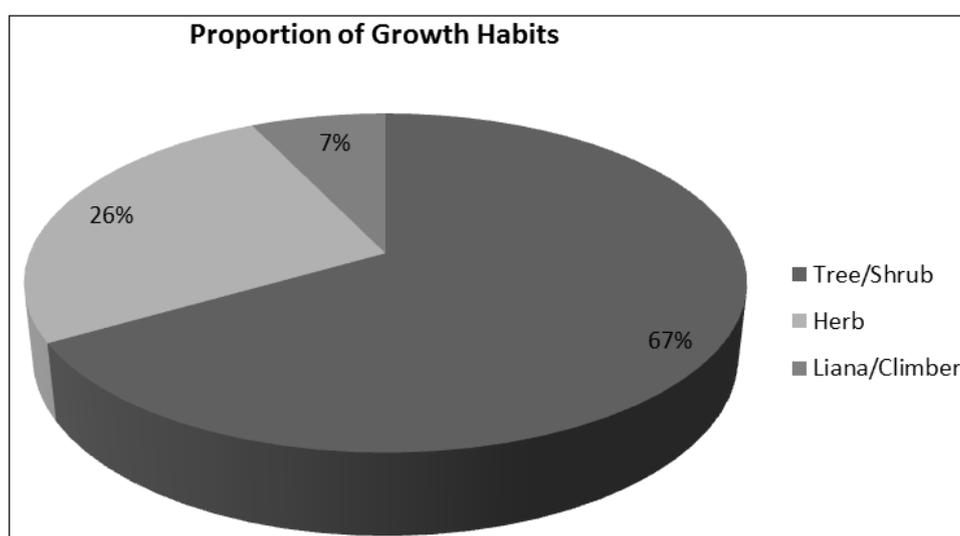


Fig-1: Percentages of growth habits of the accessed plants

**Table-1: Growth Habit of Plant Species Use for Oral and Dental Care**

Family	Botanical name	Local name	††GH
<i>Achyranthes aspera</i> L.	Amaranthaceae	uwoinoudiri \ ipesodiri	H
<i>Alafia baiteri</i> Oliv.	Apocynaceae	doyon	L
<i>Alchornea cordifolia</i> Mull. Arg.	Euphorbiaceae	furu-ipain, Epie tin	S
<i>Allium cepa</i> L.	Alliaceae	yabasi	H
<i>Alstonia boonei</i> De Wild.	Apocynaceae	kigbo\ endoundou	T
<i>Azadirachta indica</i> A. Juss.	Meliaceae	malaria shut-up\ dogonyaro	T
<i>Carapa procera</i> DC.	Meliaceae	ango	T
<i>Carica papaya</i> L.	Caricaceae	beke- undu	T
<i>Carpolobia lutea</i> G.Don.	Polygalaceae	ingolongolo\angalangala	T
<i>Ceiba pentandra</i> L.	Bombacaceae	isaghai	T
<i>Chromolanea odorata</i> L.	Asteraceae	biyenkue\ furutua	H
<i>Cocos nucifera</i> L.	Arecaceae	okokodia\beke imbi	T
<i>Combretum racemosum</i> GF.	Combretaceae	owe-igbali	S
<i>Dennettia tripetala</i> Barker fil.	Annonaceae	ulumaa\ piritin	T
<i>Dichrocephala integrifolia</i> Ku.	Asteraceae	farafa	H
<i>Dioscorea cayenensis</i> Lam.	Dioscoreaceae	ikpeigara	C
<i>Eclipta alba</i> L.	Asteraceae	calm-my-pain	H
<i>Garcinia kola</i> Heckel	Clusiaceae	okan	T
<i>Garcinia manni</i> L.	Clusiaceae	otolo	T
<i>Glyphaea brevis</i> S. Monach.	Tiliaceae	itolo	T
<i>Hekistocarpa minutiflora</i> Hook	Rubiaceae	kalakumo	T
<i>Impatiens irvingii</i> Hook	Balsaminaceae	owe-ilali	H
<i>Laportea aestuans</i> L.	Urticaceae	ere-ombi	H
<i>Magifera indica</i> L.	Anacardiaceae	beke ogboin	T
<i>Massularia acuminata</i> G. Don.	Rubiaceae	awa\okutu	T
<i>Mimosa pudica</i> L.	Mimosoideae	igbanagbana	H
<i>Newbouldia laevis</i> P. Beauv.	Bignoniaceae	ogirizi	T
<i>Musanga cecropoides</i> R.Brown	Urticaceae	akpowei\ afanfan	T
<i>Piper guineense</i> Schum & T.	Piperaceae	oziza	C
<i>Portulaca oleracea</i> L.	Portulacaceae	oborimelei	H
<i>Psidium guajava</i> L.	Myrtaceae	guava- tin	T
<i>Rhizophora racemosa</i> Meyer	Rhizophoraceae	angala	T
<i>Rinorea breviflora</i> Chipp	Violaceae	awa	T
<i>Sacoglottis gabonensis</i> Bail.	Humiriaceae	tala	T
<i>Sida acuta</i> Burm.	Malvaceae	wire weed	H
<i>Smeathmannia pubescens</i> S.	Passifloraceae	owe ombii	T
<i>Spilanthes uliginosa</i> DC.	Compositae	kirigina	H
<i>Symphonia globulifera</i> L.	Clusiaceae	akololo	T
<i>Syzgium guineense</i> Willd DC.	Myrtaceae	epemu	T
<i>Vernonia amygdalina</i> Del.	Asteraceae	orugbo	S
<i>Xylopia aethiopica</i> Dunal	Annonaceae	enge	T
<i>Zanthoxylum gillettii</i> De Willd.	Rutaceae	owe-koromo	T
<i>Zanthoxylum zanthoxyloides</i> Lam.	Rutaceae	owe-koromo	T
<i>Zingiber officinale</i> Rosc.	Zingiberaceae	ginger	S

††GH= Growth Habits: H, S, T, L and C denote Herb, Shrub, Tree, Liana and Climber respectively.

Table-2: Plant Species Sources and Abundant Status

Plant species	Abundant status	* Source of plant sp.	PPS in %
<i>Achyranthes aspera</i>	Very abundant	W	
<i>Alchornia cordifolia</i>	Very abundant	W	
<i>Allium cepa</i>	Very abundant	W	
<i>Carica papaya</i>	Very abundant	C	
<i>Chromolanea odorata</i>	Very abundant	W	
<i>Cocos nucifera</i>	Very abundant	C	
<i>Eclipa alba</i>	Very abundant	W	
<i>Glyphaea brevis</i>	Very abundant	W	40.9
<i>Newbouldia laevis</i>	Very abundant	WC	
<i>Mangifera indica</i>	Very abundant	WC	
<i>Mimosa pudica</i>	Very abundant	W	
<i>Musanga cecropoides</i>	Very abundant	W	
<i>Portulaca oleracea</i>	Very abundant	W	
<i>Psidium guajava</i>	Very abundant	C	
<i>Spilanthes uliginosa</i>	Very abundant	W	
<i>Sida acuta</i>	Very abundant	W	
<i>Vernonia amygdalina</i>	Very abundant	C	
<i>Laportea aestuans</i>	Very abundant	W	
<i>Carapa procera</i>	Abundant	W	
<i>Alstonia boonei</i>	Abundant	W	
<i>Carpolobia lutea</i>	Abundant	W	
<i>Combretum racemosum</i>	Abundant	W	
<i>Dichrocephala integrifolia</i>	Abundant	W	
<i>Dioscorea cayenensis</i>	Abundant	W	25
<i>Garcina mannii</i>	Abundant	W	
<i>Hekistocarpa minutiflora</i>	Abundant	W	
<i>Massularia acuminata</i>	Abundant	W	
<i>Zingiber officinale</i>	Abundant	WC	
<i>Rhizophora racemosa</i>	Abundant	W	
<i>Alafia baiteri</i>	Frequent	W	
<i>Ceiba pentandra</i>	Frequent	W	
<i>Garcina kola</i>	Frequent	W	
<i>Impatiens irvingii</i>	Frequent	W	18.2
<i>Piper guineense</i>	Frequent	W	
<i>Rinorea breviracemosa</i>	Frequent	W	
<i>Zanthoxylum gillettii</i>	Frequent	W	
<i>Zanthoxylum zanthoxyloides</i>	Frequent	W	
<i>Azadirachta indica</i>	Occasional	C	
<i>Dennettia tripetala</i>	Occasional	CW	
<i>Symphonia globulifera</i>	Occasional	W	15.9
<i>Syzygium guineense</i>	Occasional	W	
<i>Sacoglottis gabonensis</i>	Occasional	W	
<i>Smeathmannia pubescens</i>	Occasional	W	
<i>Xylopiya aethiopicum</i>	Occasional	W	

\*Note: C = cultivated, W = wild, CW = cultivated & wild.

PPS = Percentage of the Plant species Status

**Table-3: Plant Part diversity for Oral-Dental Care and their Health Values**

<b>Plant species</b>	<b>Part used</b>	<b>folk oral-health value</b>
<i>Achyranthes aspera</i>	leaves	poultice with pinch of salt cures toothache
<i>Alafia baiteiri</i>	root	cures toothache & dental caries
<i>Alchornea cordifolia</i>	twig	for chewing stick and oral hygiene
<i>Allium cepa</i>	bulb	poultice with pinch of salt cures toothache
<i>Alstonia boonei</i>	twig	for chewing stick and oral hygiene
<i>Azadirachta indica</i>	twig	for chewing stick and oral hygiene
<i>Carapa procera</i>	twig	for chewing stick and dental cares
<i>Carica papaya</i>	seeds sap	cures throat infections
<i>Carpolobia lutea</i>	twig	for chewing stick and oral hygiene
<i>Ceiba pentandra</i>	twig/ bark	for chewing stick and oral hygiene
<i>Chromolaena odorata</i>	leaves	leaves poultice cures toothache
<i>Cocos nucifera</i>	root	paste in local-gin (ogogoro) cure toothache
<i>Combretum racemosum</i>	twig	for chewing stick and oral hygiene
<i>Dennettia tripetala</i>	twig/fruit	fruit cures toothache; twig for chewing stick
<i>Dichrocephala integrifolia</i>	leaves	the poultice removes black spot on teeth
<i>Dioscorea cayenensis</i>	leaves	poultice cures toothache
<i>Eclipa alba</i>	leaves	poultice cures toothache
<i>Garcinia kola</i>	twig	for chewing stick, and toothache
<i>Garcinia mannii</i>	twig	for chewing stick
<i>Glyphaea brevis</i>	twig/bark	cures toothache
<i>Hekistocarpa minutiflora</i>	twig/root	for chewing stick, toothache and caries
<i>Impatiens irvingii</i>	leaves	paste cures toothache
<i>Laportea aestuans</i>	leaves	paste cures toothache
<i>Mangifera indica</i>	twig	for chewing stick
<i>Massularia acuminata</i>	stem/twig/root	for chewing stick and oral hygiene
<i>Mimosa pudica</i>	leaves	cures mouth sore and throat infection
<i>Musanga cecropoides</i>	twig/bark	decoction in ogogoro cures toothache
<i>Newbouldia laevis</i>	twig	for chewing stick
<i>Piper guineense</i>	seeds	pulp cures toothache
<i>Portulaca oleracea</i>	leaves	strengthen teeth, poultice cures mouth ulcer
<i>Psidium guajava</i>	twig/leaves	for chewing stick, oral hygiene and bad breath
<i>Rhizophora racemosa</i>	twig	for chewing stick and oral hygiene
<i>Rinorea breviracemosa</i>	twig	for chewing stick
<i>Sacoglottis gabonensis</i>	twig	for chewing stick and oral hygiene
<i>Sida acuta</i>	root	root infusion in ogogoro cures toothache/mouth ulcer
<i>Smeathmannia pubescens</i>	twig/bark	for chewing stick, the bark pulp cures toothache
<i>Spilanthes uliginosa</i>	flower	pulp of the flower cures toothache
<i>Symphonia globulifera</i>	twig	for chewing stick and oral hygiene
<i>Syzgium guineense</i>	twig	uses for chewing stick
<i>Vernonia amygdalina</i>	twig	for chewing stick and oral hygiene
<i>Xylopia aethiopica</i>	root	decoction cures chronic toothache
<i>Zanthoxylum gillettii</i>	root/bark	decoction cures toothache
<i>Z. zanthoxyloides</i>	root/twig	for chewing stick, root decoction cures toothache
<i>Zingiber officinale</i>	rhizome	paste cures toothache

Table-4: Determination of the suitability of the plant species among respondents

Plant species	Fidelity level index	Respondents consensus facto		
		<sup>†</sup> BW	<sup>††</sup> BC	<sup>†††</sup> BE
<i>Achyranthes aspera</i>	4.8	0.03	0.07	0.03
<i>Alafia baiteri</i>	6.3	0.07	0.04	0.08
<i>Alchornia cordifolia</i>	32.0	0.35	0.29	0.33
<i>Allium cepa</i>	3.3	0.05	0.03	0.03
<i>Alstonia boonei</i>	27.8	0.27	0.25	0.31
<i>Azadirachta indica</i>	13	0.04	0.20	0.12
<i>Carapa procera</i>	42.3	0.50	0.38	0.41
<i>Carica papaya</i>	1.5	0.02	0.01	0.01
<i>Carpolobia lutea</i>	3.3	0.01	0.06	0.02
<i>Ceiba pentandra</i>	3.8	0.03	0.06	0.02
<i>Chromolanea odorata</i>	9.3	0.90	0.13	0.09
<i>Cocos nucifera</i>	11.8	0.04	0.15	0.14
<i>Combretum racemosum</i>	17.0	0.10	0.21	0.18
<i>Dennettia tripetala</i>	9.5	0.12	0.15	0.03
<i>Dichrocephala integrifolia</i>	19.5	0.04	0.14	0.37
<i>Dioscorea cayenensis</i>	2.8	0.01	0.05	0.00
<i>Eclipa alba</i>	2.8	0.03	0.04	0.01
<i>Garcina kola</i>	33.5	0.37	0.37	0.27
<i>Garcina kola Garcina mannii</i>	32.3	0.39	0.31	0.29
<i>Glyphaea brevis</i>	35.3	0.31	0.35	0.39
<i>Hekistocarpa minutiflora</i>	8.8	0.00	0.23	0.00
<i>Impatiens irvingii</i>	0.8	0.01	0.01	0.00
<i>Laportea aestuans</i>	4.8	0.05	0.07	0.02
<i>Mangifera indica</i>	12.0	0.16	0.05	0.16
<i>Massularia acuminata</i>	54.3	0.62	0.51	0.52
<i>Mimosa pudica</i>	1.8	0.03	0.02	0.01
<i>Musanga cecropoides</i>	15.5	0.09	0.17	0.18
<i>Newbouldia leavis</i>	1.5	0.00	0.04	0.00
<i>Piper guineense</i>	5.0	0.05	0.10	0.00
<i>Portulaca oleracea</i>	2.3	0.03	0.01	0.03
<i>Psidium guajava</i>	27.8	0.13	0.34	0.31
<i>Rhizophora racemosa</i>	12.0	0.01	0.01	0.31
<i>Rinorea breviflora</i>	6.0	0.04	0.09	0.05
<i>Sacoglottis gabonensis</i>	4.3	0.17	0.00	0.00
<i>Sida acuta</i>	0.8	0.00	0.02	0.00
<i>Smeathmannia pubescens</i>	2.3	0.01	0.03	0.02
<i>Spilanthes uliginosa</i>	31.8	0.54	0.23	0.26
<i>Symphonia globulifera</i>	24.8	0.29	0.27	0.19
<i>yzgium guineense</i>	38.0	0.50	0.31	0.37
<i>Vernonia amygdalina</i>	22.5	0.13	0.23	0.28
<i>Xylopiya aethiopia</i>	8.3	0.09	0.13	0.03
<i>Zanthoxylum gillettii</i>	5.8	0.05	0.11	0.01
<i>Zanthoxylum zanthoxyloides</i>	5.0	0.05	0.07	0.07
<i>Zingiber officinale</i>	0.8	0.01	0.01	0.00

<sup>†</sup>Bayelsa West, <sup>††</sup> Bayelsa Central, <sup>†††</sup> Bayelsa East

The results obtained revealed that a total of 44 plant species belonging to 34 families were assessed. Their growth habits were distributed according to the following categories: herb, shrub, tree, and liana/climber (Table-1). Most of the species used for achieving oral and dental hygiene are predominantly tree/shrub 67% (Fig-1); liana/climber (7%) are the least utilized plant taxa, while the herbs (26%) assessed were

mostly for orodental treatment. This corroborated the previous study of [4, 12, 13] who asserted that stems, roots and twigs of numerous plants are use for dental hygiene and treatment in Africa. Also, the plant species used for oral-health-care are sourced from the wild (Table-2), those cultivated were mainly for other purposes other than orodental care. This substantiates the previous assertion of [14, 15] that cultivated plant

species are mainly for secondary and tertiary values. Data from the relative abundant status of the species (Table-2) revealed that 40.9% of the plants were very abundant, 25% were abundant while 18.2% and 15.9% were frequent and occasional (by abundant status) respectively. Plants in the “Very abundant” category are mainly wild herbs and few cultivated plant whose basic uses are for other purposes. However species in the abundant, frequent and occasional statuses serve mostly for chewing sticks and their extraction pattern are usually predatory. Thus, the unsustainable collection pattern, and over exploitation of the species perhaps for other use are rationale for the marked depletion of the species in the study area. Table 4 shows the Fidelity levels (FL) for all the species assessed; high FL indicates that the species is suitable for dental care among the respondents. Besides, Respondents Consensus Factor (RCF) of the three geopolitical zones reveals that the level of awareness and acceptability of the species for orodental management range from 0.20 to 1.00; although choices for oral maintenances depend

largely on cultural preference [6]. Yet, socioeconomic front reveals that preference among respondents skewed toward species with higher RCF values, thus: *M. acuminata*, *D. integrifolia*, *S. globulifera*, *P. guajava*, *A. boonei*, *S. uliginosa*, *C. procera*, *A. cordifolia*, *G. mannii*, *S. guineenses*, *G. brevis*, *G. kola* and *V. amygdalina* are the most commonly used, and perhaps well acquainted species for orodental care in the study area.

Plant part diversity for oral care (Fig-3) reveals that twig is the predominant plant section for oral-dental hygiene but leaves, roots and flowers play significant role in oral treatments either singly, in combination of other plants or steep in local gin. Awareness of the plants and plant part assessed for oral-dental care spread across socioeconomic and religion affiliate of respondents (Table-5), however availability of a chewing stick species determine respondent’s daily choice.

**Table-5: Socio-economic status of respondents in the study area**

Features		†BC	††BW	†††BE
Age	<20	39	24	37
	20-65	85	58	78
	>65	26	18	35
Religious	Christian	110	84	115
	Other	40	16	35
Lit status	literate	111	68	92
	Illiterate	39	32	50
Eco. Status	Small	25	41	58
	Median	42	53	84
	Large	13	6	8
Occupation	Agric	128	91	138
	Non agric	22	9	12
Location	Onshore	11	5	7
	Offshore	4	5	8
Sex	Male	61	43	74
	Female	89	57	76

†Bayelsa West, †† Bayelsa Central, ††† Bayelsa East

Although the extraction of chewing sticks for local use is not a tool of deforestation, nevertheless commercial production involving extraction by collector and fellers, who are often paid by wholesale traders, is one of the culprits. Large scale extraction of stems for chewing stick in the State is in conflict with forest conservation and may lead to the reduction of hitherto abundant species in the study area. A number of strategies recommended by [2, 16, 17] are applicable in the study area. This might serve as benign strategy to sustainable management of plant species used for chewing sticks in the State.

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