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## Survey and documentation on ethnomedicinal plants used for the treatment of osteoporosis by traditional healers in Eastern Ghats of Andhra Pradesh, India

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### Abstract

Medicinal plants are nature's gift to mankind and are rich heritage of India. India is well known as an "Emporium of medicinal plants". About 70% of the rural folk depend on medicinal plants for their health care. Osteoporosis is a disorder in which the bones and joints become degenerated, less dense, brittle, porous, weak and could be easily damaged/ broken. The Eastern Ghats are a long chain of broken hills that pass mainly through three states viz., Orissa, Andhra Pradesh and Tamilnadu. In Andhra Pradesh and Telangana they situated between 120 38' – 22° N latitudes and 780 50' – 840 46' E longitudes. Several field trips have been conducted during 2014-2019 in the tribal pockets of Eastern Ghats of A. P. The methodology were adopted which were described by earlier scientists. A total of 77 species belonging to 66 genera and 49 species have been recorded which are being potentially exploited by the tribal and non-tribal groups in treating osteoporosis. Pharmacognostic studies are to be conducted for ascertaining the active ingredients, alkaloids, flavonoids for the species which are not yet covered hitherto.

**Keywords:** Medicinal plants, osteoporosis, Eastern Ghats, Andhra Pradesh

### 1. Introduction

Medicinal plants are nature's gift to mankind and are rich heritage of India. India is well known as an "Emporium of medicinal plants". About 70% of the rural folk depend on medicinal plants for their health care. India is a treasure of biodiversity which host a large variety of plants and ranks tenth among plant rich countries of the world and fourth among the Asian countries. India is the largest producer of medicinal plants and is rightly called the "Botanical garden of the World". The world is endowed with a rich wealth of medicinal plants. These plants are a local heritage with global importance. It is estimated that around 70, 000 plant species from lichens to flowering trees, have been used at one time or other for medicinal purposes. It is estimated that 64-84% of world's population depends on traditional medicine <sup>11-21</sup> Osteoporosis is a disorder in which the bones and joints become degenerated, less dense, brittle, porous, weak and could be easily damaged/ broken. Osteoporosis occurs when there is an imbalance between new bone formation and old bone resorption. The body may fail to form enough new bone or too much old bone may be reabsorbed or both. Osteoporosis starts progressing from middle age and often seen in elderly people. Osteoporosis results in stress fractures wrist and hip and severe back pain due to spinal compressions and collapsed vertebrae.

#### 1.1 Causative factors

- Menopause stage in women – Due to decreased secretion levels of Estrogen Hormone.
- Menopause stage in Men – Due to decreased secretion levels Testosterone Hormone.
- Usage of Allopathic Medicines for treating Cancer, Arthritis, Asthma
- Progression in Age
- Intake of diet containing less Calcium, Vitamins- D, C, E, Phosphorous, Zinc, Magnesium etc.,
- Addiction to Alcohol, Smoking
- Improper functioning of Kidneys
- Lack of proper physical Exercise
- Consuming Unwanted/Unhealthy Diet and not consuming the required and healthy diet

#### 1.2 Chronic constipation

Generally in Andhra Pradesh the osteoporosis has been treating by the tribal people by using

different plant crude drugs. But there is no proper documentation in connection with osteoporosis. So, the present survey deals with ethnomedicinal plants used to treat osteoporosis from Eastern Ghats of Andhra Pradesh.

## 2. Study area

The Eastern Ghats are a long chain of broken hills that pass mainly through three states viz., Orissa, Andhra Pradesh and Tamil Nadu [3]. They run about 1750 km with an average width of about 100 km between Mahanadi and Vaigai rivers along the Indian east coast. In Andhra Pradesh and Telangana they situated between 120 38' – 22° N latitudes and 780 50' – 840 46' E longitudes. The altitudes range from 300 – 1000 M above MSL and the vegetation varies from semi-evergreen forests to scrub jungles. Tribes like Koyas, Kondareddis, Valmikis, Chenchus, Lambadas, Jatapus, Savaras, Bagatas, Porjas, Khonds, Yanadis and Yerukalas are inhabitants of the forest regions of Eastern Ghats.

## 3. Material and Methods

Several field trips have been conducted during 2014-2019 in the tribal pockets of Eastern Ghats of A. P., India and contacted different age group peoples and collected information on osteoporosis. Information was gathered from

traditional healers / vaidyas / gurus/ men and women of the tribal community and housewives. Repeated enquiries were made with the tribal doctors /Gurus to know about their knowledge of healing, treatment of diseases and mode of drug preparation. The methodology were adopted which were described [4-8] After completion of the field visit each plant was critically studied and identified with the help of Gamble's "Flora of the Presidency of Madras"[9] using the field observations. The identifications were later confirmed with the help of Flora of Andhra Pradesh [10-12] and by comparison with authentic literature which are locally available

## 4. Results and Discussion

A total of 77 species belonging to 66 genera and 49 species have been recorded which are being potentially exploited by the tribal and non-tribal groups in treating osteoporosis. The in detailed information like remedies, part used, dosage and mode of preparation are presented in (Tables 1-5). The present survey on ethnomedicinal plants, the below mentioned plants are being used for treating and curing **Osteoporosis** by Tribal doctors and Native village doctors. [13-23] etc are worked on ethnomedicinal plants of different areas of Andhra Pradesh but they have not concentrate exclusively on medicinal plants which are used for the treatment of osteoporosis.

**Table 1:** Plants used for the treatment of osteoporosis

S. No	Name of the species Family and Local name	Parts Used	Dose	Method of preparation and use
1.	<i>Withania somnifera</i> Solanaceae Aswagandha	Roots/ Tubers Powder	3 grams	The powders of these 3 species indicated against 1,2,3 are mixed in cow milk along with 2 grams turmeric powder and 1 gram of pepper powder and given daily for 40 days
2.	<i>Asparagus racemosus</i> Liliaceae Satavari, Pillitegalu	Roots/Tubers Powder	3 grams	
3.	<i>Tinospora cordifolia</i> Menispermaceae Tippateega	Stem powder Powder	3 grams	
4	<i>Aegle marmelos</i> RutaceaeMaaredu	Fruit pulp	1 fruit	Fruit pulp mixed with a pinch of pepper powder is to be taken orally @ 1 fruit per day throughout the season
5	<i>Annona sqamosa</i> Anonaceae Seethaphal	Fruit pulp Bark powder	5 grams	Fruit pulp is consumed orally every day throughout the season In other seasons bark powder decoction is to be taken orally for 20 days.
6.	<i>Annona reticulata</i> AnonaceaeRaamaphal	Fruit pulp		Fruit pulp is consumed orally every day throughout the season
7.	<i>Artocarpus heterophyllus</i> Moraceae Panasa	Fruit pulp	150 grams	Fruit pulp is consumed orally every day throughout the season
8.	<i>Ziziphus mauritiana</i> Rhamnaceae Regu	Fruits pulp	50 grams	Fruits pulp is to be consumed orally throughout the season
9	<i>Syzizium cumuni</i> Myrtaceae. Neredu	Fruits Stem bark powder	5 grams	Fruits are to be consumed every day throughout the season. Stem bark decoction is given orally every day for 40 days
10	<i>Ficus bengalensis</i> Moraceae. Marri	Ripen Fruits	1 kg	In the fruiting season fruits are to be collected separately from the 3 species shown against sl. nos. 10, 11, 12, pounded separately and sun dried under hygienic conditions. After the moisture is completely lost, they should be made into fine powders separately and to be mixed thoroughly by adding the 500 grams of powdered organic jaggery/ jiggery crystal/ Patikabellam. 10 grams this powder mix is to be mixed in hot cow milk and taken orally in the morning and evening daily for 3 months. This is the best, cost effective, food medicine that cures osteoporosis, and pain in all joints. This regularises the effective functioning of all endocrinal glands in the body, including pancreas for diabetes cure. So many other diseases are also cured by this including darkening of face.
11	<i>Ficus religiosa</i> Moraceae. Raavi	Ripen Fruits	1 kg	
12.	<i>Ficus racemosa</i> Moraceae. Medi	Ripen Fruits	1 kg	
13.	<i>Terminalia chebula</i> Combretaceae Karaka	Dry fruit pulp powder	2 grams	
14	<i>Terminalia bellarica</i>	Dry fruit	2 grams	

	Combretaceae.Taani	pulp powder		The decoction of the powders of the 5 plant species mentioned against the sl. nos. 13 to 18 is to be consumed orally in two split doses by MALE Patients of osteoporosis, for a period of 40 days. FEMALE Patients are given the same decoction without the powder shown against sl. no. 17 ie., curculligo, and by adding 2 grams Turmeric powder.
15	<i>Terminalia arjuna</i> Combretaceae Tellamaddi	Stem bark powder	2 grams	
16	<i>Phyllanthus emblica</i> Euphorbiaceae Vusiri	Dry fruit pulp powder	2 grams	
17	<i>Curculigo orchoides</i> Amaryllidaceae Nelataadi/kaalamusli	Root stock dried powder	2 grams	
18	<i>Coriandrum sativum</i> Apiaceae Dhaniyalu	Seed powder	2 grams	
19	<i>Piper betle</i> Piperaceae Tamalapaku	Fresh green leaves	3 nos	The leaf shown against the item no. 20 is to be placed in piper betel, 2 grams of nut meg ( <i>Myristica fragrans</i> ) and a pinch of shell lime paste is added and is given to the patient every day in the night before bed time for a month for strong bones.
20	<i>Cannabis sativa</i> Cannabinaceae Ganjayiaku	leaves	1 gram	
21	<i>Boswellia serrata</i> Burseraceae Anduga	Gum	1 gram	Plant parts shown against the item nos. 21 to 22 are to soaked in 50 ml. water, overnight and to be mixed with plant parts shown against 23 and 24 and given orally every day for a month.
22	<i>Commifora mukul</i> Burseraceae. Guggulu	Gum	1 gram	
23	<i>Aloe vera</i> Asphodelaceae kalabanda	Leaf gel	6 grams	
24	<i>Alpine galanga</i> Zingiberaceae Dumparastram	Rhizome paste	1 gram	
25	<i>Sesamum indicum</i> Pedaliaceae. Nuvvulu /Tila	Seed	20 grams	20 grams of sesame seed is to fried adequately, in a pan, without oil, made into powder is mixed in hot milk, with 5 grams of organic jaggery and to be taken orally as a beverage every day for 40 days.
26	<i>Solanum nigrum</i> Solanaceae Kaamanchi	Leaves juice	10 ml	10 ml of leaves juice is diluted in 30 ml. of water and taken orally every day in the morning for 40 days for correcting hormonal imbalance in osteoporosis.
26	<i>Lawsonia inermis</i> Lythraceae. Gorinta	Leaves juice	10 ml	10 ml of leaves juice is diluted in 30 ml. of water and taken orally for 40 days for osteoporosis.
27	<i>Bacopa monneri</i> Scrophulariaceae Jalabrahmi	Leaves juice	10 ml	10 ml of leaves juice is diluted in 30 ml. of water and taken orally for 40 days for ost Juice is extracted from the leaves and consumed early in the morning in empty stomach for 40 dayseoporosis.
28	<i>Litsia glutinosa</i> Linaceae Naramamidi	Stem bark powder	2 grams	Decoction is prepared by mixing 2 grams of bark powder in 60 ml. of water and given orally for 40 days for osteoporosis.
29	<i>Trigonella foenum-graecum</i> Fabaceae Menthiakukura	Leaves juice	10 ml.	Juice is extracted from the fresh green leaves and consumed early in the morning in empty stomach for 40 days.
30	<i>Mentha spicata</i> Lamiaceae Pudina	Leaves juice	10 ml.	Juice is extracted from the fresh green leaves and consumed early in the morning in empty stomach for 40 days
31	<i>Coriandrum sativum</i> Apiaceae kothhimeera	Leaves juice	10 ml.	Juice is extracted from the fresh green leaves and consumed early in the morning in empty stomach for 40 days.
32	<i>Moringa oleifera</i> Moringaceae	Leaves juice	20 ml	Juice is extracted from the fresh green leaves and consumed early in the morning in empty stomach for 40 days.
33	<i>Trianthema portulacastrum</i> Aizoaceae Tellagalijeru	Leaves juice	20 ml	Juice is extracted from the fresh green leaves and consumed early in the morning in empty stomach for 40 days.
34	<i>Cissus quadrangularis</i> Vitaceae Nalleru	Tender stem	50 gr	Epidermis of the tender stem are to be removed and inner fleshy portion weighing about 50 grams is to be made into chutney and eaten daily for 40 days.

**Table 2:** Plants used for oral administration, act as purgatives and curing osteoporosis

S. No.	Name of the species Family and Local name	Part used	Dose	Method of Preparation and usage
1	<i>Ricinus communis</i> Euphorbiaceae Aamudamu	Seeds and roots	5 to 10 ml	1 kg of fresh and clean roots of castor plant are to be pounded and to be placed in a stainless steel vessel containing 4 litres of water. To be boiled till to get finally 1 litre of decoction. This is to be filtered and to be transferred to another vessel containing 1 litre of pure castor oil and boiled till to get finally 1 litre of concentrated castor oil. This oil is given to Arthritis patients @ 10 ml mixed in milk or Luke warm water and administered orally in the night, before bedtime daily or on alternate days for a period of 40 days. This acts as not only a purgative, but removes and drains out from all the infected bone joints, all the deposited salts as well as unwanted wastes, causing damage and inflammation. Dosage is adjusted basing on the condition of the patient.
2	<i>Anisomeles malabarica</i> Lamiaceae Magabeera/Magalinga	Leaves Juice	5 to 10 ml	Juice obtained from leaves is to be mixed in boiled buffalo milk in Luke warm state and then made into curds. The milk of a buffalo given birth to male calf is to be preferred. The prepared curds are to be mixed with rice and eaten in the morning. The vitiated "vaatham" along with all the deposited salts as well as unwanted wastes, causing damage and inflammation of joints are drained out.
3	<i>Moringa tomentosa</i> Rubiaceae Togaru	Stem Bark Powder	10 gms	Stem bark powder is to be mixed in water, 60 ml. decoction is prepared and is given orally for relieving vitiated "vaatham".
4	<i>Euphorbia antiquorum</i> Euphorbiaceae Bonthajemudu	Latex or Viscous acid milky juice of stem	2 to 5 drops	Latex is mixed in boiled and Luke warm milk, made into curds and eaten with rice. This act as purgative, acts very much effectively and drains out all the unwanted salts, and waste materials deposited in joints.

**Table 3:** Plants that strengthen kidneys and help in excretion of nitrogenous waste materials, unwanted salts, and free radicals generated in osteoporosis patients

S. No.	Name of the species Family and Local name	Part used	Dose	Method of Preparation and usage
1	<i>Boerhavia diffusa</i> Nyctaginaceae Punarnava / tellagalijeru	Whole plant powder	2 gms	The indicated powders of these 3 species are to be mixed in 60 ml of water and boiled to get decoction and given orally every day, for 40 days.
2	<i>Abutilon indicum</i> Malvaceae Tutturubenda	Root powder	2 gms	
3	<i>Aerva lanata</i> Amaranthaceae Konda pindi	Root powder	2 gms	

**Table 4:** Plants used for boosting immunity, preventing and curing osteoporosis effectively

S. No.	Name of the species Family and Local name	Part used	Dose	Method of Preparation and usage
1	<i>Allium sativum</i> Liliaceae Garlic / vellulli	Bulb's paste	4 clefts	These 3 ingredients are to be mixed in 100 ml of water, boiled for 10 minutes, cooled and filtered. This is to be taken early in the morning for 40 days.
2	<i>Zinziber officinalis</i> Zinziberaceae adrak / allam	Rhizome paste	1 cm length of rhizome	
3	<i>Citrus aurantifolia</i> Rutaceae Acid lime / nimma	Fruits	1 fruit juice	

**Table 5:** Plants used for external applications for pain relief

S. No.	Name of the species Family and Local name	Part used	Dose	Method of Preparation and usage
1	<i>Ricinus communis</i> Euphorbiaceae Aamudam	Seed oil + Root extract	1 kg. 1 lit.	As explained in this document under Arthritis, castor oil + root extract is to be boiled to get 1 lit. of concentrate, and applied every day on the painful joints.
2	<i>Vitex negundo</i> Verbinaceae Vaavili	Leaves	1 kg	1 kg. of <i>Vitex negundo</i> leaves are to be pounded, mixed in 4 lits. of water in a earthen vessel. Boiled till 4 lits. of water become to 1 lit and filtered. This solution is to be mixed in 1 lit. of gingelly oil in another vessel and boiled to get finally one lit of the concentrated oil. 10 to 15 grams of pepper powder is added to this. This is applied every day on painful joints of Arthritis.
3	<i>Dodonea viscosa</i>	Leaves	1kg	1 kg. of <i>Dodonea</i> leaves are to be pounded, mixed in 4 lit.of water in an

	Sapindaceae			earthen vessel. Boiled till 4 lits. of water become to 1 lit. and filtered. This solution is to be mixed in 1 lit. of gingelly oil in another vessel and boiled to get finally one lit. of the concentrated oil. This is applied every day on painful joints of Arthritis. Dodonea leaves can also be pounded and tied around painful joints with a thin cloth.
4	<i>Celastrus paniculata</i> Celastraceae Jyothishmathi	Seed	10ml	Oil extracted from the seed is applied on painful joints of arthritis.
5	<i>Litsia glutinosa</i> Linaceae Naramamidi	Seed	10ml	Oil extracted from the seed is applied on painful joints of arthritis
6	<i>Simarouba glauca</i> Simaroubaceae	Seed	10ml	Oil extracted from the seed is applied on painful joints of arthritis
7	<i>Barlaria montana</i> Acanthaceae Mulugorinta	Leaves juice	15grams	Leaves juice is applied gently on painful joints of arthritis.
8	<i>Calophyllum inophyllum</i> Clusiaceae Ponnachettu	Seed	10ml	Oil extracted from seed is applied gently on painful joints of Arthritis
9	<i>Allium sativum</i> Liliaceae Garlic/ vellulli	Bulbs	400grams	400 gm. Of garlic bulbs paste is mixed in 1 lit of boiling gingili oil stirred thoroughly on the fire for 5 minutes put off fire, allowed to be cooled and applied daily on painful joints of arthritis.
10	<i>Ruta chalepensis</i> Rutaceae Sadapaku	Whole plant	10ml	Oil extracted from whole plant is applied on the painful joints.
11	<i>Pinus sps</i> Pinaceae	Resin	150grams	Resin obtained from stem bark is applied on the painful joints.
12	<i>Brassica napus</i> Brassicaceae Canola/ Aavalu	Seed	250 grams	250 grams of canola oil is taken in a glass bottle keep it aside. In a separate glass bottle keep 100 grams of pure camphor lump, an extract of <i>Cinnamomum camphora</i> (karpuram) + Menthol crystals of Menthaspecies( pudinapuvvu) + Vaamupuvvu, crystals of the extract of <i>Trachyspermum ammi</i> , together. A chemical reaction takes place and Within 10 minutes these three solids will become a liquid. Add A+B = To get an excellent oil, and application of same externally gives relief for all the rheumatic pains. OR A and B may be used separately.
13	<i>Cissus pallida</i> Vitaceae Adavigummadi	Roots	50 grams	Bruised roots are applied on swellings of arthritic joints
14	<i>Cleome viscosa</i> Cleomaceae Vaaminta	Leaves and fruits	25 grams	Leaves along with fruits are to be made into paste and applied on the painful joints
15	<i>Cleome gynandra</i> Cleomaceae Tellavaaminta	Leaves and fruits	25 grams	Leaves along with fruits are to be made into paste and applied on the painful joints
16	<i>Cuscuta reflexa</i> Convolvulaceae Bangaaruteega,	Whole plant	50 grams	Whole plant's paste is applied and bandaged on painful joint
17	<i>Vanda cristata</i> Orchidaceae Badanika,	Whole plant	50 grams	Whole plant's paste is applied and bandaged on painful joint
18	<i>Argyrea nervosa</i> Convolvulaceae Samudrapaala	Leaves	100 grams	Leaves are made into paste and bandaged on the painful joints.
19	<i>Merrima tridanta</i> Convolvulaceae Seethammavaarijada	Whole plant	100 grams	Whole plant is made into paste and applied on painful joints
20	<i>Achyranthus aspera</i> Amaranthaceae Vuttareni	Whole plant	100 grams	Whole plant is made into paste and applied on painful joints
21	<i>Cardiospermum helicacabum</i> Sapindaceae vekkuduteega	Whole plant	100 grams	Whole plant is made into paste and applied on painful joints
22	<i>Delonix alata</i> Caesalpinaceae Sunkesula	Leaves	100 grams	Leaves paste is applied on the painful joints.
23	<i>Crateva roxburghii</i> Capparidaceae Isukaraasi	Leaves	100 grams	Leaves paste is applied on the painful joints.
24	<i>Euphorbia tirucalli</i>	Latex	5ml	Latex of this plant is applied externally

	Euphorbiaceae Sannajemudu			
25	<i>Abutilon indicum</i> Malvaceae Tutturubenda	Leaves	100 grams	Leaves paste is applied externally
26	<i>Codenia procumbens</i> Boraginaceae Chepputtaku	Leaves	100 grams	Leaves paste is applied externally
27	<i>Commifera mukul</i> Burseraceae Guggulu	Resin	5 grams	Gum resin mixed with <i>Zingiber officinalis</i> rhizome paste is applied externally on the painful joints.
28	<i>Pergularia daemia</i> Asclepiadiaceae Dustapaaku	Whole plant paste	25 grams	Whole plant's paste is mixed with turmeric powder and applied externally on painful joints of arthritis
29	<i>Nerium oleander</i> Apocynaceae Tellaganneru	Leaves	25grams	Leaves paste is applied externally on painful joints.
30	<i>Plumbo zeylanicum</i> Plumbaginaceae Tellachitramulam	Leaves	25grams	This plant is a Vesicant and applied in acute conditions.
31	<i>Plumbago rosea</i> Plumbaginaceae Yerrachitramulam	Leaves	25gram	This plant is a Vesicant and applied in severe/acute conditions.
32	<i>Holoptelia integrifolia</i> Ulmaceae Nemalinaara	Leaves	25gram	Leaves are vesicant. Leaf is dipped in water for a while and placed on knee/painful joint and bandaged in severe and acute condition.
33	<i>Sansevieria roxburghii</i> Agavaceae	Leaves juice	25gram	Leaves are gently heated on fire and squeezed to get juice and applied on painful joints.
34	<i>Calotropis gigantea</i> Asclepiadaceae Jilledu	Leaves	200 Grams.	500 ml of raw Gingelly seed oil is poured in earthen / stainless steel vessel or kadai, heated well on fire, pounded calotropis leaves are added in the heated oil. Heating is to be continued for few minutes till the leaves turn grey in colour. Fire is put off, oil is allowed to cool, screened and the oil is applied externally on the painful joints and muscles.
35	<i>Pueraria tuberosa</i> Fabaceae Nelagummudu	Tubers	50 grams	The plant parts shown against sl. nos 35 and 36 are made into a paste and applied externally on painful joints of Arthritis.
36	<i>Brassica juncea</i> Braicaceae Mustard	Seed	5 grams	
37	<i>Capparis zeylanica</i> Are donda	Leaves	15 grams	Leaves paste is mixed with egg white yolk, poultice is prepared and applied on painful joints of Arthritis
38	<i>Phyla nodiflora</i> Verbinaceae Jalapippali	Whole plant	50 grams	Whole plants paste is applied on painful joints of Arthritis.

### Special diet being prescribed by the local village vidyas for Strong & Healthy Bones, Development of Synovial fluid and cartilage in the Bone joints

- *Setaria italica*/ Fox millets. Family. Poaceae, Local name: Korraluand
- *Triticum dicoccum*/ wheat. Family. Poaceae, Local name : Godhumalu, seeds of Godhumalu and korralu are made in to Rawa(broken in to small pieces), cooked and eaten daily in place of Rice/pulka.
- *Eleusine coracana*/ Finger millet. Family: Poaceae, Local name: Ragi. Ragi seeds powder is cooked with water to make Jawa/ soup, to be consumed with curds/jaggery made from ie., *Saccharum officinarum*/sugar cane juice and to be taken orally daily.
- *Sorghum bicolor*/Great millet, Family: Poaceae. Local name: Jonna. Jonna seeds powder is used to prepare Rotis and eaten along with palak/Bhendi curry daily.
- *Vigna mungo*/Black gram, Family: Fabaceae. Local name: Minumulu. Seeds are soaked in water, grinded into paste roasted in gingely oil-and 'vadas' are prepared and consumed daily or seeds are to fried in ghee, powdered, mixed with cow ghee and jaggery powder made into round balls called 'Sunni vundalu' (each weighing about

20 grams) and eaten daily.

- *Sesamum indicum*/Gingelly seed, Family: Pedaliaceae, Local name: Nuvvulu. Nuvvulu seeds are to be powdered and to be mixed with pure jaggery and eaten daily. Egg white yolk 2 nos. are to be consumed / swallowed in raw along with jaggery daily followed by intake of one glass of cow milk mixed with one to two grams of Gomuthra Shilajith.
- *Abelmoschus esculanthus*/ Ladies finger. Family: Malvaceae, Local name: Bhendi is to be consumed daily.
- Piper betle / Betel leaves, Family: Piperaceae. Local name: Tamalapaku: Betel leaves 3 to 4 nos are to be chewed along optimum quantity of shell lime powder daily and to be gulped without spitting.
- *Annona squamosa*/Custard apple, Family: Anonaceae. Local name: Seethaphal. Fruits are to be taken before meal
- *Annona reticulata* / Family: Anonaceae. Local name: Ramaphal. Fruits are to be taken before meal
- *Psidium guajava*/ Guava, Family: Myrtaceae. Fruits are to be taken before meal
- *Musa paradisiaca* / Banana, Family: Musaceae. Fruits are to be taken before meal

- *Phoenix dactylifera* / Date palm, Family: Arecaceae, Local name; khajoor fruits are eatendaily.
- *Citrus sinensis*/ Batevia, Family: Rutaceae, Local name: Bathhaii, Fruit juice is to beconsumed.
- *Citrus lanatus*/Indian squash melon. Family: Cucurbitaceae, Puchhakaya, Juice of fruit pulp along with seeds is to consumeddaily.
- *Spinacia oleracea*/ spinach, Family: Chenopodiaceae. Leaves are made into curry and taken.
- *Basella alba* / Basellarubra, Bachhali, Family: Basellaceae, Leaves are made in to curry and eaten daily for cartilage development.
- *Lycopersicon esculentum*/Tometo, Family: solanaceae. local name :Tometo.
- *Daucascarota*/carrot, Family: Apiaceae
- *Beeta vulgaris* /Beet root, Family: Chenopodiaceae
- The above 3 items each weighing 100 grams each are to be made into juice byadding adequate water and to be taken orally everyday
- *Moringaolefera*/ drumstick leaves, Family: Moringaceae
- *Cajanus cajan* / Red gram seed, Family: Fabaceae
- The Above two items are to be cooked and consumed along with Jowarroti. Intake of Rice and other curries are to be avoided completely. Optimum quantities of the above mentioned qualitative food is to be taken.
- *Cocunucifera* / coconut, Family: Arecaceae. Coconut water is to be consumed profusely everyday.
- *Amaranthusviridis*/ Thotakura / Family: Amaranthaceae is to be made it to curry and to be consumedwith jowar roti

## 5. Conclusion

In the present survey A total of 77 species belonging to 66 genera and 49 species have been recorded which are being potentially exploited by the tribal and non-tribal groups in treating osteoporosis. Pharmacognostic studies are to be conducted for ascertaining the active ingredients, alkaloids, flavonoids for the species which are not yet covered hitherto.

## 6. Acknowledgements

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