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Quantitative Analysis of Medicinal plants used by the Traditional healers of Karanja block of Wardha district for treating Musculoskeletal disorders

Research Article

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Abstract

Background: 20% to30 % elderly population suffers with Musculoskeletal disorders such as Multiple joint pains, Low back pain, Rheumatoid arthritis, Osteoarthritis. Multiple treatment modalities are in vogue to treat MSDs all over the world but neither provides adequate pain relief nor modifies the disease process. Hence majority of the tribal population prefer traditional healers for treating MSDs as they are safe, effective, inexpensive and easily available. Aim & Objectives: Quantitative analysis of Medicinal plants used by the traditional healers of Karanja block of Wardha district for treating musculoskeletal disorders. Material & Methods: The survey study was carried out through field visits. Questionnaire, personal interviews and discussions with the traditional healers were used for data collection. Specific pharmacological properties of herbal drugs used by the traditional healers to treat MSDs were authenticated by taxonomist and forest range officer and verified through Nighantus and Samhitas. Observations & results: Total 17 traditional healers were interviewed for data collection. Total 23 plant species belonging to 20 families were identified and documented for the treatment of MSDs. Tribal utilized 9 varieties of plant parts from 4 types of habitat and treat the patients of MSDs with 5 types of medicinal preparations through external and internal applications.

Key Words: *Survey, Musculo-skeletal diseases, Traditional healers, Plant species.*

Introduction

Musculoskeletal disorder (MSD) is the term, used to expound the range of states that involve joints, muscles, tendons, ligaments and connective tissues, which are normally progressive and associated with pain(1). The most common musculoskeletal conditions are osteoarthritis, back and neck pain, fractures associated with bone fragility, injury and systemic inflammatory conditions such as rheumatoid arthritis(2). The most common feature of musculoskeletal disease is pain and restricted mobility which weakened people's capability to work. In Ayurveda MSDs are described under the heading of *Vatavyadhi* which involves all types of musculoskeletal disorders and caused by viatiated vata. Ayurved intensely describes various varieties of osteoarthritis as *Sandhivata* and rheumatoid arthritis as *Amavata*. The management of *Vatavyadhis* mainly aims at alleviating *Vata* by inducing drugs with opposite qualities.

Osteoarthritis primarily affects the elderly population. According to the data by WHO, between 20-30% of people across the globe live with a painful musculoskeletal conditions of which 9.6% of men and 18.0% of women aged over 60 years have symptomatic osteoarthritis. 80% of those with osteoarthritis have limitations in movement and 25% cannot perform their major daily activities of life. Thus it is a major cause of disability in older adults worldwide (3). In India, it is prevalent with 22% to 39%, where nearly 45% of women over the age of 65 years suffered with OA (4).

Different treatment modalities are used to treat MSDs all over the world which includes ultrasound treatment, administration of analgesics and Non Steroidal Anti-inflammatory Drugs (NSAIDs), disease modifying anti-rheumatic drugs (DMARDs) but their use neither provides adequate pain relief nor modifies the disease process. In addition, these managements are costlier for the general public and associated with side effects (5,6). Due to this reason, tribal communities prefer alternate herbal therapies to treat MSD disorders (7). Herbal medicines used by traditional healers play an important role to combat Musculoskeletal disorders as they are safe, effective, inexpensive and easily available (8). A study conducted by D. Gupta et al emphasized that nearly 70% of patients suffering with MSDs prefer these alternate herbal therapies (9).Number of tribal communities reside in the villages of Karanja Ghadge block of Wardha district, Maharashtra, India. Most of the tribes have a deep knowledge of medicinal plants and use plants from adjoining forests to treat diseases of local population. Systematic ethno medicinal study of medicinal plants

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used in this region for treating MSDs has not yet been carried out. In this survey study, hence an attempt is made to document the herbal medicinal plants used by the tribal healers to treat the musculoskeletal disorders of Karanja Ghadge block of Wardha district.

Material & Methods

The survey study was carried out in the Karanja block of Wardha district through field visits during October 2018 to March 2019 in different remote villages where the tribal communities live. Traditional healers were indentified with the help of local people and forest department personnel familiar with them. Interviews were arranged with the tribal healers and data regarding treatment of various musculoskeletal disorders was collected using questionnaire and direct discussions with the tribal healers. The questionnaire included the information such as common name, habit, plant parts used, method of preparation and mode of application. The medicinal plant species used by the traditional healers to treat various musculoskeletal disorders of the study area were authenticated by taxonomist and forest range officer. Their specific pharmacological properties were verified through Nighantus and Samhitas. Their anti inflammatory, analgesic or anti arthritic activity were also searched through various preclinical and clinical studies. Descriptive statistic was used to analyze the data.

Observation and Results

Karanja is a tahsil block located 59 Km towards North from District headquarter Wardha. It is a tribal prone block where tribal communities dwell in small groups in different villages and mostly receive herbal medication from traditional healers for their ailments. Total 17 tribal traditional healers commonly known as *Vaidu* were indentified and interviewed. All were treating with herbs available around them and practicing since 5 years to 15 years. All the healers were in the range of 48 to 82 years and most them carrying the family tradition of herbal treatment. All these tribes speak Marathi language for communication, belonged to farming, cattle grazer, shepherds and farm worker category.

Fig 1: Map showing the district of Vidarbha Region Maharashtra.

Fig 2: Map showing the location of Study area of Wardha district.

Table 1: **List of plant species used by the traditional healers to treat musculoskeletal disorders**

S.N.	Botanical name	Family	Local Name	Sanskrit name	Habitat	Part Used	Method of Preparation and Mode of application
1	*Acacia arabica* (Lam) Willd	Leguminoceae	*Babhul*	*Babbul*	Tree	Fruit	Seeds are removed and fruit pulp is made in to fine Powder and given orally twice a day in Knee pain.
2	*Allium satium* (L.)	Liliaceae	*Lasan*	*Rason*	shrub	tuber	Tubers are peeled off and crushed into Paste and applied on swollen joints (*Aamavata*)
3	*Argyreia speciosa* Sweet.	Convolvulaceae	*Vidhara*	*Samudr shosha*	Climber	Seeds, leaves	The seeds are dried and powdered. 2-3 gm with milk in arthritis Paste of leaves applied on swollen joints.
4	*Astercantha longifolia* (L.) Ness	Acanthaceae	*Kolistha*	*Talimkhana Kokilaksha*	Herb	Seeds	The seeds are dried and powdered. 2-3 gm with water in arthralgia
5	*Calotropis gigantea* (L.)	Asclepideaceae	*Rui*	*Arka*	Shrub	Flowers	Flowers are dried and finely powdered. 1 gm powder with warm water in swollen and painful joints.
6	*Celestrus paniculata* Willd.	Celastraceae	*Malkangini*	*Jyotishmati*	Climber	Seeds	Seeds are crushed and boiled in sesame oil till it turns red and filtered. Applied externally on painful joints and stiffness
7	*Cocculus hirsutus* L.	Menispermaceae	*Vasanvel*	*Patalgarudi*	Climber	Leaves	Fine paste of leaves is prepared and applied warm on swollen joints once in a day.

8	*Curcuma amada* Roxb	Zingiberaceae	*Ambehalad*	*Amraharidra*	Herb	Tuber	Fine paste is prepared and applied on sprain and abrasions
9	*Abutilon indicum* Linn	Malvaceae	*Petari*	*Atibala*	Shrub	Whole plant	Whole pant is dried and pound to make fine Powder. 1-2 gm with milk in arthritis in elderly person
10	*Pluchea lanceolata* (DC.) Olive. & Hiern	Asteraceae	*Rasan*	*Rasana*	Shrub	Whole plant	Dried drug is pounded and finely powdered. 1- 2 gm with warm water *Amavata* and *Sandhivata*
11	*Lepidium satium* (Fam.)	Cruciferae	*Aahaliv*	*Chandrashur*	Shrub	Seeds	Seeds are made into fine Paste and applied warm on swollen joints (*Amavata*)
12	Litsea glutinosa (Lour.) C.B.	Lauraceae	*Maidalakdi Lenja*	*Medasak*	Tree	Bark	Fine paste of bark is prepared and applied warm on sprain, abrasions for relieving pain.
13	*Moringa pterygosperma* Gaertn	Moringaceae	*Shevga*	*Shigru*	Tree	Bark, Gum	Fine paste of bark is prepared and applied warm on painful joints. Powder of gum resin is given 1 gm /day to elderly arthritis and low backache
14	*Oroxylum indicum* vent.	Bignoniaceae	*Tentu*	*Shyonak*	Tree	Bark	The bark is coarsely powdered & boiled with 4 times water on low flame and filtered the decoction. Dose- 40 ml twice a day
15	*Phyllanthus urinaria* (L.)	Euphorbiaceae	*Bhuiaavli*	*Bhumyamalki*	*Herb*	Whole plant	Paste of whole plant is prepared and applied as a poultice on knee joint swelling.
16	*Pongamia glabra* (L.)	Leguminoceae	*Karanji*	*Karanj*	Tree	Leaves	Fresh matured leaves are crushed & boiled with 4 times water on low flame and filtered the decoction. 20ml twice.
17	*Premna imtegrefolia* (L.)	Verbenaceae	*Takli*	*Agnimanth*	Tree	Leaves	Leaves are made warm and applied on painful joints. Tender leaves paste is prepared and applied warm on sprain.
18	*Ricinus communis* (L.)	Euphrobiaceae	*Erandi*	*Erand*	Shrub	Leaves	The leaves are cut into small pieces, slightly fried in the oil and made into poultice and used hot fomentation on joint stiffness
19	*Terminalia arjuna* Wight & Arn	Combretaceae	*Aajan saal*	*Arjun*	Tree	Bark	Bark decoction is given orally and fine paste of bark is applied externally on ribs fracture.
20	*Tinospora cordifolia* (Thunb)	Menispermaceae	*Gulvel*	*Guduchi*	Climber	Stem	Fresh stem are cut into small pieces , boiled with water &decoction is filtered . 40 ml BD in gouty arthritis(*Vatarakta*)
21	*Trigonella foenum graecum (Linn.)*	Fabaceae	*Methya*	*Methika*	Herb	Seeds	Seeds are pounded and made into fine Powder. 1-2 gm with warm water in elderly joint pain and back pain

22	*Vitex negundo* (L.)	Laminaceae	*Nirgudi*	*Nirgundi*	Shrub	Leaves	Fresh leaves are washed with water, crushed and boiled with water.Decoction is filtered. 40 ml with 10 ml ginger juice in rheumatism and low backache. Leaves are crushed and make into *pottali* applied warm with oil on swollen joints.
23	*Cisus quandrangularis Wall.*	Vitaceae	*Hathjod*	*Asthisamharaka*	Climber	Stem	Fine paste is applied for healing fractures.

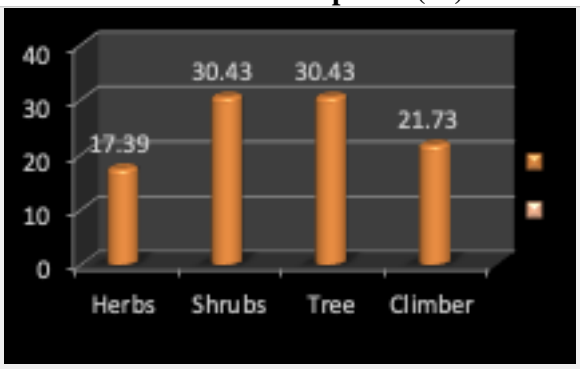
Table 2: Pharmacological properties of the plant species used by the tribes to treat MSDs

S.N.	**Drug name**	**Pharmacological properties**					
		Rasa	***Guna***	***Virya***	***Vipak***	**Effect on *Dosha***	**References**
1	*Acasia arebica* (Lam) Willd	*Madhur, Kashaya*	*Guru, Rukhsa*	*Shita*	*Madhur*	*Pitta vata shamak*	B.P. 6/36-37
2	*Abutilon indicum Linn.*	*Madhura*	*Guru, Snigdha, Pichhil*	*Shita*	*Madhur*	*Vatahara*	C. S. Su.25/40
3	*Allium satium* (L.)	All five *rasas* except *Lavan*	*Snigdh, Tikshna, sara*	*Ushna*	*Katu*	*Shothahar, Vathara*	C.S.Su 27/176
4	*Argyreia speciosa* Sweet.	*Katu, Tikta Kashaya*	*Laghu, Snigdh*	*Ushna*	*Madhur*	*Kaphavatahar*	B.P.3/211-212
5	*Astercantha longifolia* (L.)	*Madhur, Amla, Tikta*	*Pichhil, Snigdha*	*Shita*	*Madhur*	*Vatahara*	B.P.3/224-225
6	*Calotropis gigantea* (L.)	*Katu. Tikta*	*Laghu, Ruksha, Tikshna*	*Ushna*	*Katu*	*Shothar, Kaphavatahar*	B.P.3/67-69
7	*Celestrus paniculata* Willd.	*Katu. Tikta*	*Tikshna, Sara*	*Ushna*	*Katu*	*Vatakaphahar*	B.P.1/171-172
8	*Cocculus hirsutus* (L.)	*Katu*	*Laghu, Snigdha, Pichhila*	*Ushna*	*Katu*	*Vatashamak*	B.P.3/260
9	*Curcuma amada* Roxb	*Tikta, Katu*	*Ruksha, Laghu*	*Shita*	*Katu*	*Vatakar*	B.P.1/198-199
10	*Inula recemosa* (Hook,f.)	*Tikta, Katu*	*Laghu, Tikshna*	*Ushna*	*Katu*	*Vatakaphahar*	B.P.1/165
11	*Lepidium satium* (Fam.)	*Katu, Tikta*	*Laghu, Snigdha, Pichhila*	*Ushna*	*Katu*	*Vatakaphahar*	B.P.1/96-97
12	*Litsea glutinosa* (Lour.)C.B.	*Katu, Tikta, Kashaya*	*Laghu, Snigdha*	*Ushna*	*Katu*	*Kaphavatshamak*	B.P.app 1/92
13	*Moringa pterygosperma* Gaertn	*Katu, Madhur*	*Laghu, Tikshna*	*Ushna*	*Katu*	*Kaphavatshamak*	B..P 3/105
14	*Oroxylum indicum* vent.	*Tikta, Kashaya*	*Laghu, Ruksha*	*Shita*	*Katu*	*Tridoshahara*	B.P.3/25
15	*Phyllanthus urinaria* (L).	*Tikta, Kashaya, Madhur*	*Laghu, Ruksha*	*Shita*	*Madhur*	*Kaphapitta shamak*	K.N.*Aushadhi varga* / 247
16	*Pongamia glabra* (L.)	*Tikta, Katu, Kashaya*	*Laghu. Tikshna*	*Ushna*	*Katu*	*Kaphavat shamak*	K.N.*Aushadhi varga*/ 664
17	*Premna imtegrefolia* (L.)	*Tikta, Katu, Madhur*	*Laghu, Ruksha*	*Ushna*	*Katu*	*Kaphavathar*	B.P.3/23-24
18	*Ricinus communis* (L.)	*Madhur, Katu, Kashaya*	*Laghu, Ruksha*	*Ushna*	*Madhur*	*Vatahara*	B.P. 3/64-66

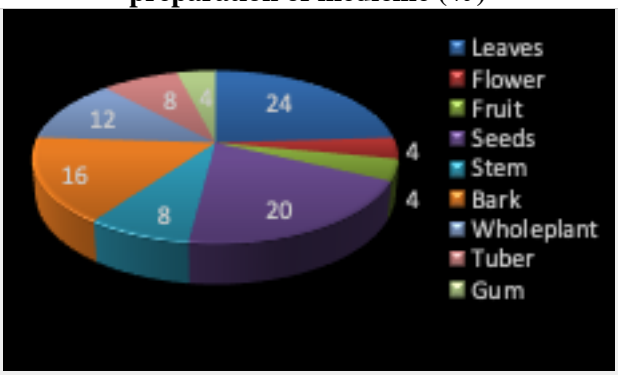
19	*Terminalia arjuna* Wight & Arn	*Kashaya*	*Laghu, Ruksha*	*Sheet*	*Katu*	*Kaphapitta shamak*	B.P.5/26-27
20	*Tinospora cordifolia* (Thunb)	*Katu, Tikta*	*Laghu, Snigdha*	*Ushna*	*Madhur*	*Vatahara*	B.P. 3/1-10
21	*Trigonella foenum graecum (Linn.)*	*Katu*	*Laghu, Ruksha*	*Ushna*	*Katu*	*Vatashaman*	B.P.1/93/95
22	*Vitex negundo* (L.)	*Katu,Tikta, Kashaya*	*Laghu, Ruksha*	*Ushna*	*Katu*	*Kaphavathara*	R.N.*Shatavhadi varga* /152
23	*Vitis quandrangularis Wall.*	*Madhur*	*Laghu*	*Ushna*	*Katu*	*Vatakaphahar*	B.P.3/226-227

BP- Bhavprakash, C.S.- Charaka Samhita, Su.-Sutrasthana, K.N.- Keydev Nighantu, R.N.- Raj Nighantu

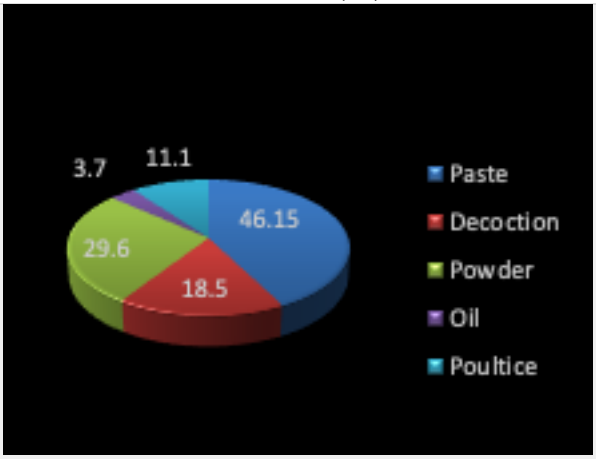
Graph 1: Habitat wise analysis of documented Ethno-medicinal plants (%)



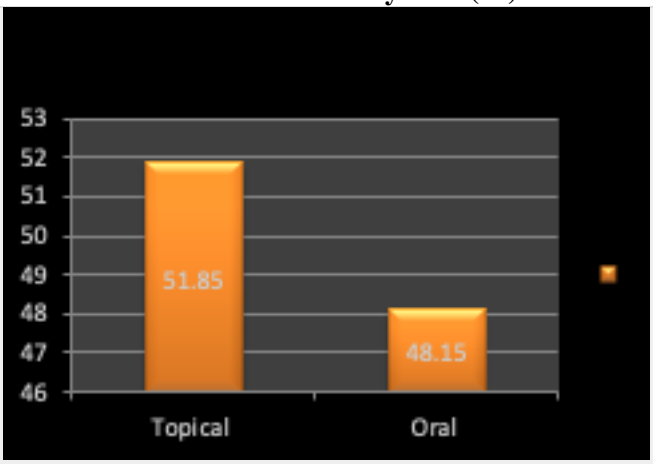
Graph 2: Percentage of Plants parts used for the preparation of medicine (%)



Graph 3: Percentage of herbal preparations in the treatment(%)



Graph 4: Root of administration of prepared medicine in the study area(%)



Discussion

In the present study total 23 plant species belonging to 20 families were identified and documented for the treatment of musculoskeletal disorders as depicted in Table no 1. Total 4 types of habitat were recognized out of the 23 medicinal plant species identified. They were herbs (4 species), Shrubs and trees (7 species each) climbers (5 species) as depicted in Graph 1. This classification revealed that shrubs and trees (30.43%) were the most commonly used plant habitat by the traditional healers for treating the musculoskeletal disorders in the study area. This could be due to availability of shrubs and trees in large quantity throughout the year and its utility by the traditional healers in the study area. The most appearing family were Leguminoceae, Menispermaceae and Euphrobiaceae with two species each while Acanthaceae, Liliaceae, Convovulaceae, Asclepideaceae, Combretaceae, Celastraceae Fabaceae, Laminaceae, Zingiberaceae, Tiliaceae, Compositeae, Cruciferae, Lauraceae, Moringaceae, Bignoniaceae, Verbenaceae, Vitaceae were with one species each.

Although all the plant parts are utilized for medicinal purpose, conversely it is observed in the

present study that leaves of the plant species were the most frequently utilized plant part with

24 % applications in patients followed by seeds (20 %) stem bark (16 %), whole plant (12 %), stem and tuber (8 % each) and flower, fruit and gum (4% each) as depicted in graph 2. Khafsa Malik et al also reported that leaves were the most frequently used herbal plant part for medicinal purpose (10). Most of the musculoskeletal diseases were treated with external (51.85%) as well as internal (48.15%) administration of the drugs. Powder (29.6%) and decoction (18.5%) were the choice of preparations for internal administration where as *Lepa* (a method of treatment in which medicines are used topically/external application in the form of a semi-solid medicament or paste) 37%, oil application (3.7%) and Poultice (11.1%) were used as external application on painful joints. In Ayurveda Poultice is a kind of preparation prepared by substances which are unctuous, heavy, and hot in properties, helps to pacify the vitiated *vata*. Generally it is used for external application (11). In Sushruta Samhita *Upanaha* is described as a type of sudation therapy for treating *Sandhigatavata* (12). According to the Benson HA, lipid medium is highly suitable for penetration of the drug molecule through stratum corneum (13). On this basis, it can be understood that the oil used in *Nirgundipatra Upanaha* and *Erandpatra upanaha* serves as a lipoidal medium for penetration of the drug molecules of *Nirgundi* and *Erand* and exerts an immediate anti-inflammatory analgesic effect (14).

In the present survey study *Sandhivata* (Multiple joint pain), *Katishool* (Low back pain), *Amavata* (Rheumatoid arthritis), *Sandhishotha* (Swelling on joints due to vitiated *vata*) were reported the most common musculoskeletal conditions treated by local traditional healers and the prevalence was more in elderly patients. Atchison JW et al also reported chronic joint pain and low back pain as the frequently occurring musculoskeletal ailment (15). This survey study accounted wide use of *Ricinus communis, Vitex nigundo, Cisus quandrangularis* and *Oroxylum indicum* for treating common musculoskeletal related ailments, pain and stiffness of joints and fractures.

Most of drugs used by the traditional healers to treat musculoskeletal diseases possess *Tikta Katu, Kashaya Rasa, Ushna Virya* (potency), *Madhura*, *Katu Vipaka* and *vatakaphahara* [Table 2] *In Sandhigata Vata* vitiated *Vata* gets lodged in *Sandhis* (joints) hence Acharya Charaka emphasized to select those drugs having *Tikta* rasa to treat *Vata* and *Asthi* disorders (16). Moreover, *Tikta rasa* possesses *Deepana (*promoting digestion*) Pachana (*Digestive*)* and *Rochana* (Insaspissated bile) properties. Thus the general condition of the patient gets improved and reinforces the whole body as well as joints. *Tikta Rasa* also show *Lekhana (*Substances that reduce excess body tissues) property, which helps in the weight reduction of the patients and facilitate the management of Osteoarthritis. It is also showing anti inflammatory action due to its *Jvarhara* and *Daha shamana* properties and thus helps to reduce pain and swelling of the joints (17). *Katu* rasa and *Ushna veeerya* acts as a *Deepan* and also helps to pacify aggravated *vata* which is the major causative factor for MSDs (18).

Table no 4: Showing the Pharmacological actions of the drugs

S.N.	Name of drug	Sanskrit name	Action	References
1	*Allium satium* (L.)	*Rason*	Anti-Inflammatory, Analgesic	Jayanthi MK et al (19) Suresh V et al (20)
2	*Argyreia speciosa* Sweet.	*Samudrshosha*	Anti-Inflammatory, Analgesic	Bachhav RS et al (21)
3	*Astercantha longifolia* (L.)	*Talimkhana Kokilaksha*	Antirheumatic	Doss A et al (22) Malrajan P et al (23)
4	Calotropis gigantea (L.)	*Arka*	Anti-inflammatory	Das S et al (24)
5	*Celestrus paniculata* Willd.	*Jyotishmati*	Anti-Inflammatory, Analgesic	Kulkarni Y et al (25) Parimala S et al (26)
6	*Cocculus hirsutus* (L.)	*Patalgarudi*	Analgesic, Anti-Inflammatory	Sarvankumar G (27)
7	*Curcuma amada Roxb*	*Amraharidra*	Anti inflammatory	Mujumdar AM (28)
8	*Abutilon indicum Linn*	*Atibala*	Anti-Inflammatory, Analgesic, Antiarthritic	Rajurkar et al (29) Bhajipale NS et al (30)
9	*Pluchea lanceolata* (DC.) Olive & Heirn	*Rasna*	Anti-Inflammatory, Analgesic	Pandey S et al (31) Pandey PS et al (32)
10	*Lepidium satium* (Fam.)	*Chandrashur*	Analgesic, Anti-Inflammatory	Raval N et al (33) Raval N et al (34)
11	*Litsea glutinosa* (Lour.) C.B.	*Medasak*	Analgesic, Antipyretic, And Anti-Inflammatory	Bhowmick R etal (35)
12	*Moringa pterygosperma* Gaertn	*Shigru*	Analgesic, Antipyretic, And Anti-Inflammatory	Bhattacharya A et al (36)
13	*Oroxylum indicum* vent.	*Shyonak*	Anti-inflammatory	Lalrinzuali K et al (37)
14	*Phyllanthus urinaria* (L).	*Bhumyamalki*	Anti inflammatory	Fang SH et al (38)

15	*Pongamia glabra* (L.)	*Karanj*	Anti-inflammatory, Analgesic	Ganesh M (39)
16	*Premna imtegrefolia* (L.)	*Agnimanth*	Anti-inflammatory, Analgesic	Gokani RH et al (40) Khatun H et al (41)
17	*Ricinus communis* (L.)	*Erand*	Anti-Inflammatory, Analgesic Antiarthritic	Ilavarasan R et al (42) Sapan BJ et al (43)
18	*Terminalia arjuna* Wight & Arn	*Arjun*	Analgesic	Gupta A (44)
19	*Tinospora cordifolia* (Thunb)	*Guduchi*	Anti-Inflammatory, Antipyretic	Sumanlata et al (45) Hussain L et al (46)
20	*Trigonella foenum graecum (Linn.)*	*Methika*	Anti-Inflammatory, Analgesic	Vyas S et al (47)
21	*Vitex negundo* (L.)	*Nirgundi*	Anti-Inflammatory, Analgesic	Subramani J et al (48) Telang RS et al (49)
22	*Cisus quandrangularis Wall.*	*Asthisamharaka*	Anti-Inflammatory, Analgesic	Bhujade A et al (50)

Out of the 23 herbal drugs identified in the study area, various pre-clinical and clinical scientific studies carried out on 21 single herbal drugs revealed its anti-inflammatory, analgesic, Anti arthritic and anti-rheumatic activities and have shown remarkable effects in various concentrations.(Table 4). The anti-inflammatory and analgesic activities may be due to the presence of flavonoids and other polyphenols, however further studies are required to understand molecular mechanisms of action against inflammation (51).

Conclusion

Present study concluded that the majority of the elderly tribal population of Karanja Ghadge block is suffering from Multiple joint pain, Low back pain, Rheumatoid arthritis, osteoarthritis etc. MSDs and dependent on traditional healers for their treatment. The changing life style, environmental circumstances and dietetic habits may be the chief contributing factors for the onset of the disease. Pharmacological properties and experimental studies conducted on plant species treating MSDs proved tribal peoples in depth knowledge of herbal drugs growing around them treating musculoskeletal diseases. Due to easy availability, simple method of preparation and administration, tribal people prefer herbal drugs for their treatment. If further such studies are to be designed for screening and isolating novel drugs with analgesic, anti inflammatory, anti arthritic potential from these identified plant drugs from the study area, it will be boon to MSD patients to reduce ache or inflammation with minimum or no side effects.

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