Summary and Conclusion

India has a long heritage of culture. Ancient Indian culture dates back to almost 5000 years from this time, when Aryans invaded from the North-West along the banks of river Sindhu. It is during this time the Vedās have originated. In India Veda are considered as religious shrine which do not have prophet. It is believed to have descended from Lord Brahmā and laid the foundation of the codes to the humanity, for their survival, for their well being, for their conduct. Among the four Vedās, Rgveda and the Atharveda preached how to lead good healthy life, with the help of nature's gift of plant around. The latter preached two tenates of science - one, the Tantravidyā which is basically metaphysical in nature, the second is Āyurveda which taught people about their health, body metabolism, functions of organs, their makeup, the coordination in them and eventually how the basic elements such as Prthvi, Āpa, Teja, Vāyu, and Ākasa contributed for the formation of body, how they are mutually correlated in their functions and what is the principle of good health and how to maintain a good health. With intensive contemplation by the Āyurvedacāryās and Rishi Munis of the time immemorial, it has been arrived at a conclusion that a physiology of the human body is mainly controlled by Tridosha i.e. Vāta, Pitta, Kapha.

From the time of great ancient Āyurvedacāryā, Carak, the clinical methods have evolved, where the diagnosis of the human ailment was based on Tridosha and the treatment of the disease and ailment is based
on the active principles of the plants. The Ancient Indian medical science, Ayurveda, has developed and blossomed on the above principles where the dichotomy of diagnostic principle is based on Tridosha. The efficacies of the Ayurvedic medicine therefore depended upon the correct diagnosis of the ailment and combination of active principles of plants to derive curative effect. It is necessary to point out here that in Ayurveda, there is no principle as one ailment and one medicinal plant, but several principles are to be derived from various parts of the plants.

The experimental science has originated in the West, where the chemistry is one field of science. The western scientist developed synthetic chemistry as well as analytical chemistry. Application of chemical principles in extraction of active ingredients of plants which have medicinal properties slowly developed since the time of discovery of quinine. Its application in curing diseases such as Malaria laid the foundation for the origin and development of pharmacology. Eventually the western scientist have characterised several active principles of plants and also have become successful in synthesizing similar compounds substituting the natural ones. Although ancient Indian medical science, Ayurveda has moved to China and far East and eventually to the West it lacked the research to base it on the concept of modern science so that it is made more effective. Besides the rapid progress in alchemy and pharmacology in the West, that has all purvasive because of their quick effect in curing the diseases, albeit its side effects was a setback to the progress of Ayurvedic science. Today it is appreciated even by the western medical science that what is required is more effective and lasting drug with a least side effect rather than transitory and apparent cure of the
disease (Chopra and Chopra, 1955). Therefore, the entire world today looks towards Ayurveda as a treasure of knowledge which can come as a solace for the lasting effect with the least side effects.

In this respect investigations have started. One more point to be emphasized here is that the world has come closer because of the mobility of the man and often therefore, man's greed increases in making good of the time available. To cope with such anxiety, efficacies of the Ayurvedic medicines have to be increased, so that it is able to work on the patients of different walks of life. For example, we find there are many physiological disorders such as spondylosis which is unabatedly increasing in wide ranges of human beings with different walks of life both in India as well as abroad. This ailment is concerned with the spine and hence it concerns with the nature of work carried out by individual, the style of living, the habit and so on. Hitherto there are no medicines in allopathy which could permanently cure the ailment. All treatments are based on symptomatic relief. Orthopaedically it is diagnosed as cervical/lumbar syndrome meaning thereby a complicated ailment where the wearing of the disc occurs in between the vertebrae, formation of osteophytes, muscle spasm and so on. One is recommended to wear a cervical collar or lumbar belt so that the vertebrae are held under tension and thereby restrict the movement so that they do not pinch. This causes to a large extent a sort of uneasiness, because of which the patient becomes restless and is not able to concentrate on his/her work; and again such recommendations are temporary in nature.

In Ayurveda it is believed that any physiological disorders have their roots elsewhere and based on these principles the treatments are
depended. Unlike in the western medical science, it is believed in the Ayurveda that it is possible to achieve to certain extent the regeneration of worn part by using the plant chemical principles, which promote recovery and regeneration.

In the present problem based on the above principle, an Ayurvedic recipes have been prepared by the name Swadaṁstrādi guggul and Padmak kitta yog. It was an experience that these preparations could effectively reduce the pains in the neck and lumbar region, by acting symptomatically. Large number of patients both men and women of different walks of life have undergone the treatment and have experienced great relief from this ailment.

In the present investigation therefore an humble effort has been made to treat clinically, number of patients with the above Ayurvedic preparations and examine them periodically with the help of X-Rays in coordination with orthopaedic surgeon, as how the drugs are able to act upon this ailment. The entire thesis is based on this research and divided into two sections. The section I deals with the clinical approach to the problem, where 152 cases have been clinically tried. It also includes the method of concoction of recipe by using different plants and plant organs. The Section II deals with the analysis of active principles of plants contributing for the formation of the recipies. Following are the methods of approach and findings -

Section I - Clinical Method:

For the study 152 patients have been chosen which have been diagnosed as proven sufferer from spondylitis by orthopaedic surgeon.
Out of 152, case papers of 152 patients have been maintained as an OPD, out of which 112 have completed the course. In each case paper the diagnostic symptoms confirming the spondylitis recorded are (1) pains in the neck region (2) stiffness of the neck (3) numbness of the fingers (4) loss of power and (5) giddiness. The radiological diagnosis seen were (i) narrowing of intervertebral spaces (ii) degenerative changes and marginal osteophytes (iii) straightening of spine and loss of normal lordosis. While administrating the medicine Swadarseradi guggul was given in the dose of 60 mg twice a day with plain water on empty stomach and Padmak kitta yog was given in the 60 mg dose after food with plain water. The patients were examined every week and the gradual symptomatic relief has been recorded. Likewise the treatment was continued upto 24 weeks to achieve full effect. After this treatment followup of the cases have also been maintained from 6 months to three years. Amazingly in 102 out of 112 patients there was no relapse. However 10 patients presumed to have no relapse as they did not report for the followup study. In order to know primarily whether the ailment has any causal relation with sex, age, occupation, weight the number of patients treated were classified accordingly. This provided a fairly good knowledge about the relationship of ailment with above factors.

About the Preparation of the recipe:

The plants and their organs that have been incorporated in the recipe [1] Swadamsradi guggul are Gokhru (Pedalium murex), Yavasā (Fagonia cretica), Pashanbheda (Bergenia ligulata, Saxifraga ligulata), Sunthi (Zingiber officinale), Miri (Piper nigrum), Pimpali (Piper longum), Nāgarmothā (Cyperus rotundus), Haritaki (Terminalia chebula), Bibhitak
(Terminalia belerica), Āmalaki (Emblica officinalis [Phyllanthus officinalis])
Guggul (Commiphora mukul [Balşmodendran mukul]), [2] Padmak Kitta Yog
(Prunum cerasoides [Prunus puccum]) and mandoora.

**Preparation of recipe:**

Guggul is purified by the standard methods described in the texts. Now it has a state of solution in decoction of triphala which is called Shuddha guggul. In this condensed solution of Shuddha guggul, the powders of Triphala, Trikātu, Gākhru, Lākḍīpāśhān, Nagarmothā and Dhamāśā are added and mixed vigorously. It soon solidifies, which are kneaded into discs and dried. It is powdered and used.

**Preparation of Mandoora Bhasma:**

Mandoor is first heated in the blacksmith's oven till it is red hot and then immediately dipped into the mixture of Gomutra (cow's urine) and Triphala decoction. It was repeated for seven times. After that, the mandoora in the mixture was allowed to settle. The upper mixture was decanted. The settled mandoora at the bottom was washed with hot water and it was dried. Again this dried mandoora was treated with the mixture of gomutra and triphala decoction ywaćत is called the process of giving 'Bhāvana'. It was again dried and taken in the earthen saucers sealed with Gopichandana and fired. This process is called giving 'puta'. This total procedure was repeated for seven times. Now the mandoora Bhasma is ready for use.
Section - II - Analysis of Active Principles

As mentioned earlier, section II deals with the analysis of active principles that have curative effect on spondylosis. It is known that the recipe is prepared using different organs of widely different plants, but used to treat one ailment. It is known fact, that plants have wide ranges of organic compounds. They not only vary plantwise but also organwise. While preparing the Swadamstradi guggul different organs of 11 plants are used and eventually one recipe is concocted. Therefore, it is essential to know what chemical compounds dominated the recipe which has such a high efficacy. Therefore, the concocted recipes' IR spectra was studied so that the analytical study could be concentrated on those groups of organic compounds which are efficacious. This study has revealed that flavonoids are the dominant ingredients of the recipe, and therefore, the study was concentrated only on this group of compounds.

Methods of analysis of flavonoids:

Voluminous literature explaining the methodology of analysing the flavonoid compounds is available. The basic analytical technique applied is TLC and they were further studied by HPTLC.

Extraction method:

The flavonoids were extracted as per Stahl (1969). The dry samples of the plants were extracted in five solvents (1) Petroleum ether (2) Chloroform (3) Ether (4) Acetone (5) Methanol.

10 gm dry powdered sample in 25 ml of each of the above extraction medium was crushed in a mortar with the help of pestle and filtered
through Whatmann filter paper No.1. The extract was then condensed to 1 ml. The same is used for chromatographic separation.

**Thin Layer Chromatography:**

The thin layer chromatographic technique for separation of flavonoid was essentially followed that of Stahl (1969). The plates used were of Merk Darmstadt (Germany). 5 ml extract each of the plant sample was auto-loaded with the help of nanometer Camag (Switzerland) and they were run in different solvent systems in TLC chamber.

**Preparation of solvents:**


After running the plate in the chamber the plates were dried in an oven at 80°C for 5 minutes and then the spots were identified by the auto scanner.

**Identification:**

The flavonoids thus separated in different solvent systems were variously examined under U.V. radiation and the spots were marked to work out the Rf values. After working out the Rf values they were autoscanned with the help of HPTLC under Camag scanner (Switzerland).
Conclusions:

Clinical:

1) In this study the number of patients treated, were classified sexwise, age wise, occupationwise, weightwise and also based on whether the disorder is in the cervical or lumbar i.e. positionwise.

2) Out of 152 patients, registered in the case paper, 112 have completed the treatment and among these 112, 76 i.e. 67.86% are female and 36 i.e. 32.14% were males. In other words the number of female patients suffering from spondylosis are more than the male.

3) When the patients who completed the treatment are classified age wise with the gap of 10 years between the two classes, the age group 41-50 suffering from spondylosis is maximum followed by 31-40. Among the age group again the females are in large number than the males.

4) When the patients are classified occupationwise, the housewives suffering from this ailment are the largest i.e. almost 50% of the patients examined, followed by those having sedentary habits.

5) When the patients are classified weightwise, with increase in the weight, the probability of suffering has also increased.

6) Among the patients individuals suffering from the cervical syndrome are in very large number i.e. 83% and those suffering from lumbar syndrome are in small number i.e. about 17%. Again females suffering from these syndromes are more than the males i.e. number of females suffering from cervical disc syndrome are double the males while four times are the number suffering from lumbar disc syndrome.

7) The ailment spondylosis is predominantly seen in females possibly because of the body physiology, the nature of work they carry out,
especially the domestic work, cooking, washing the utensils etc., whereby the stress on the spine is unusual and more for a protracted period. In addition, their regular menstrual cycle and child bearing leads to the depletion of essential elements and changes the body posture. This thereby increases pressure on the disc which leads to ailment.

8) Agewise classification has revealed that the individuals suffering from 41-50 is highest followed by the class 31-40. Yet again female sufferers are more than males in general. This is possibly because 41-50 age group is on declining side of the life span and has maximum activities such as mobility, fast life for meeting the family requirements, anxiety and stress, especially after crossing the period of youth. This is also a period when body weight increases and hence the above reasons presumed to be making individual more prone to this ailment.

9) The housewives showing this ailment are more followed by sedentary habit. It is inferred that in the Indian context housewives spend more time in domestic life especially cooking in the standing posture. The kitchen activities in the standing posture tremendously increases the load on the spine. Besides it is also inferred that the type of maternity care with essentially lacking balanced wholesome food, presumed to be a causitive reason as to why housewives in India are more prone to this ailment. There are evidences in the literature, that in the West individuals suffering from this ailments are more or less same in proportion to sex. Next largest class here is of sedentary habits which is mainly contributed by the posture in the sedentary work.

10) When patients are classified weightwise the incidence is linearly proportional to increase in the weight. This believed to contribute excessive load on the spine. Coupled to this individuals with the
high body weight tend to spend more time in sedentary life, aggravating the situation.

11) Classification of the patients based on the position of the syndrome revealed that cervical disc syndrome is seen maximum compared to those of lumbar disc syndrome. Again among them the females are more than the males. It is directly inferred that the nature of work, the style and position at the time of work in the kitchen, especially in the Indian context makes the females to suffer more from cervical disc syndrome, rather than lumbar disc syndrome. Among the males again, it is the posture or walking style or driving position gives more stress over the cervical discs than the lumbar by way of giving rattling movement, jerk and many other vibrations.

12) The primary symptoms of spondylosis are pain, stiffness, loss of power, giddiness and tingling sensation. Among them pain is almost invariably seen in the individuals suffering from the ailment followed by stiffness and giddiness. Tingling sensation and loss of power are not as frequently seen.

13) The radiological findings revealed reduction in the intervertebral spaces, marginal osteophytes, loss of normal lordosis and muscle spasm in the patients.

14) Following the treatment of Swadāmāstrādi guggul the pains in the neck followed by the stiffness has disappeared in all the patients indicating the sign of recovery. While other symptomatic relief which are secondary in nature are varied.

15) Radiological examination has indicated that the majority of the patients who have undergone treatment has showed the degenerative changes of which 36% of them showed the straightening of the spine.
16) Following the treatment radiological examinations were carried out. This indicated reduction in the osteophytes and widening of the intervertebral spaces in large number of patients. Muscle spasm was also relieved and lordosis was maintained.

17) Orthopedically the cause of spondylosis is either due to disc prolapse or due to pinching of the intervertebral disc and thereby causing the wearing of the disc. This has been indicated in the X-rays of the patients.

18) The drugs possibly is active in reducing the pressure inside the disc followed by the reduction in oedema of the nerves and nerve roots. It reduces the pain and spasm of the muscle leading to the recovery of the lordosis and thereby maintaining the intervertebral spaces; and this helps in recovering from prolapse of the disc.

19) Orthopedically disc is considered as a semipermeable membrane and therefore there is a continuous diffusion of fluid inside the disc during when very smaller molecules are transported. When this is disturbed due to excessive pressure and the dehydration of the disc, the osmotic mechanism of the disc collapses and thereby prolapse of the disc occurs or wearing of the disc starts.

20) The fact that Ayurvedic recipes administered here i.e. Shwadanshtradi guggul and Padmak Kitta Yog help in restoring the original state where the former has large number of flavonoid compounds with sugar moiety attached or with a chelating property, they are able to transport ions such as calcium and the latter helps in regeneration of the body fluid. The present Ayurvedic preparations thus works a miracle in recovering the spondylosis.

21) The disc is a living tissue. Its tissue cells known to contain lysozome and produce enzymes. The flavonoids that are found in the preparation are known to act as catalysts in tissue mechanism. They are known to have antioxidant properties besides chelation of metal.
ions and reduction of free radicals. All these possibly contribute for the recovery of the disc.

22) According to Ayurveda, Manyāstambha and Asthikshya are considered as the two causes of cervical syndrome. In the present context it is inferred that the former is the effect while the latter i.e. Asthiksaya is a cause.

23) As per the Ayurvedic principle (1) Asthyāvṛitta Vāta, (2) Kaphavṛitta Prana (3) Kaphavṛitta Udana (4) Kaphavṛitta Vyāna are the conditions which are purely based on the disturbance in function of Vāta. When movements of vata are inhibited due to Asthi or Kapha the essential movements of Vāta are restricted. This causes the lack of essential communication within the Pañchamahābhuta required for metabolic activity.

24) According to Ayurveda it is inferred, that the disturbance in the coordination of the above entities eventually leads to disturbance in the movement of fluid in kurchā i.e. disc which is identified as a part of Asthi. Asthi is considered as Prthvi. In this respect disc, or Kurchā is considered as a part of Asthi, but in a plasmatic state.

25) As per the modern science, to maintain its consistency of hydration state of fluid, flow is essential.

26) As per Ayurveda, the three major entities Vāta, Pitta, Kapha, must be in full co-ordination for proper metabolic state. When one is disturbed, other two are affected.

27) According to Ayurveda the causative reason of spondylosis is Apana dushti which is seen first below Nābhi. This subsequently affects Samāna, Udāna, Prāṇa and Vyāna. This eventually affects Asthi Dhātu.
28) The Sthansamsraya of the Dosas occur where there is Kha-vaigunya. Due to excessive movements of the śphūta, there is Kha-vaigunya and hence the organ is prone for wearing.

29) The present recipe Swadamśrādi guggul is prepared by addition of two more components of the plants Yavāsā and Pashānbheda which have additional property of reducing the Khavaigunya.

30) This recipe of Swadamśrādi guggul therefore is known to do Anulomana of Apana i.e. restoration of the free movements of Vāyus and thereby reduces the localised undesirable effects.

31) Mondoora Bhasma is a known potent blood rejuvenater. Administering mandoor bhasma leads to increase in blood and the body fluid and thereby increase the hydration required to restore the Kurchā.

32) Āyurveda believes in treating the root cause of the ailment. Often the ailment of one organ has roots elsewhere. So here mandoora Bhasma acts on liver which is a key organ in regeneration of the blood.

33) Along with the Mandoora Bhasma, Padmakāshtha is also given mixed. Āyurvedically it is known as painkiller. It facilitates regeneration of the bones or discs. Āyurvedically it is regarded as sugandhi i.e. Pārthīva and hence it is known to promote pārthīva gunadharmā of body.

Analytical:

34) Primary screening of organic compounds by IR spectrascopy in recipe and all the plant organs used in the preparation of Ayurvedic recipes revealed that the dominant ones are flavonoids.

35) Based on the above analysis of flavonoids by TLC and HPTLC in the plant material used, plus the cencenated recipe are made.
36) Among the known flavonoids found in plants and also in recipe predominantly over Gallic acid, Afzelin 4-Phenyl Coumarin acetate, Veratric acid, Benzoquinone, Menadione, Quercituron Q-3 gluc, Equisetrum glycoside, Syringic acid, 4-hydroxy 3,5 OCH$_3$ gallic acid, Caffeic acid, Myricetin, Luteolin and Rutin. Besides these there are 12 unknown flavonoid compounds detected.

37) Interestingly in the recipe Beta coumarin acetate, Benzoquinone, Menadione, Syringic acid, Morin, Gallic acid, Caffeic acid, Myricetin, Luteolin and Rutin have appeared.

38) Among the 11 plant samples used to concoct the recipe in Swadamsfradi guggul, the shuddha guggul i.e. Comephora mukul gum after processing, is the one which predominantly contributed.

39) In guggul hydroxy Beta coumaric acid, Veratric acid, Pinoresinol dimethyl ether, Khellin, Quercetin 5,7,3,4 tetramethyl ether, Benzoquinone, Dimethoxy cinnamic acid, Ferulic acid, Catechin pentacetate, Kaempferol tetraacetate, Myricetin tetracetate, Quercetin pentaacetate, Aesculetin, Myricetin, Isorhominetin, Umbelliferon, Galangin, Phloroglucinol, Sinapic acid, Apigenin, Morin, Syringic acid, Quercituron Q-3 gluc, Cosmosin, Coumarin have also been detected. Besides them 31 unknown compounds are also there on the TLC plate.

40) Among the above listed compounds veratric acid, Dimethoxy Cinnamic acid, Myricetin hexaacetate, Quercetin pentaacetate, Aesculetin and Querceturone have appeared in the recipe from the guggul and among the 31 unknown compounds 20 have appeared in the recipe.

41) Out of these flavonoids one is water soluble, some are acid soluble and many are glycosidic flavonoids.
Flavonoids are known to get transformed easily by changing their conformation or shifting their groups or radicals from one position to the other and thereby change their properties. They often get attached to sugar, lipid, proteins etc. and are easily carried away in the body.

Because of the above property possibly they are able to transport sugar, proteins or lipids to the required site. They also are known to possess chelating property, and thereby help transporting metal ions.

It is envisaged therefore that, these properties of flavonoids greatly contribute to maintain the fluid flow, sugar transport and metal ion transport in the disc and also help maintain requisite osmotic pressure.

They are known antioxidants and scavengers of free radicals and therefore they have significant role to play in the metabolism.

Flavonoid compounds are known to prevent oxidation of vitamins and thereby maintain the active form of vitamins to act to supplement and regenerate.

Because of these properties these two recipes are able to act at the root of the ailment giving a lasting therapeutic effect of care and cure of spondylosis.

To assess the efficacy of the drug the number of marks, based on the criteria of the ailment, has been given. Those who showed recovery in all symptomatic and radiological criteria used to assess the patient, have been categorised as best, and next to that as very good and the third as good.
49) From the above point of view, the number of patients recovered are assessed. 92 out of 112 i.e. 84.82 per cent have fallen in best and rest of them in very good.

50) It is concluded that when the drug acted upon the ailment it has acted fully helping in recovery from all symptomatic and radiological changes, and hence it should be regarded as best remedy for this ailment.
Table 7.1: Table showing symptomatic and radiological state of the patients before treatment and after treatment.

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Table 7.2: Showing different flavonoids on different plates and solvent systems.

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### Ethyl acetate

**Buchnera \( \text{Acetone}: 50 + 10 \)**

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### Silica Gel

**Buchnera \( \text{Water + 30 + 10 + 10} \)**

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Toucau Chloroform Acétone : 40 ° 25 ° 35
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| 5) Equinut glycoside K-3 rhgul-7  
glu Hellebros glycoside K-3 |     |     |     |     |     |     |     |     |     | +   |     |     |
| 6) Pyrogalol 1,2,3 -OH |     | +   |     |     |     |     |     |     |     |     |     |     |
| 7) Morin 3,5,7,3'-OH | +   | +   | +   | +   | +   |     |     |     |     |     |     |     |
| 8) Myricetin 3,5,7,3', 4', 5' -OH | +   | +   | +   | +   | +   | +   | +   | +   | +   |     |     |
| 9) Myricetin rutinoside My-3 rhgul | +   |     |     |     |     |     |     |     |     |     |     |     |
| 10) (+) Catechins 3,5,7, 3'4' -OH | +   |     |     |     |     |     |     |     |     |     |     |     |
| 11) Paeonoside K-3 glu -7 glue |     |     |     |     |     |     |     |     |     |     |     |     |
| 12) Quercetin 3,5,7, 4' -OH | +   | +   | +   | +   | +   | +   | +   | +   | +   |     |     |     |
| 13) Isorhamnetin 3,5,7,4' -OH | +   |     |     |     |     |     |     |     |     |     |     |     |
| 14) Kaempferol 3,5,7,4' -OH | +   | +   | +   | +   | +   | +   | +   | +   | +   |     |     |     |
| 15) Rutin Q3 rhgul | +   |     |     |     |     |     |     |     |     |     |     |     |
| 16) Quercitrin Q-3 green | +   | +   | +   | +   | +   | +   | +   | +   | +   |     |     |     |
| 17) Quercitrin Q-3 - rh | +   |     |     |     |     |     |     |     |     |     |     |     |
| 18) Unknown (84) | +   |     |     |     |     |     |     |     |     |     |     |     |
| 19) Unknown (9) | +   |     |     |     |     |     |     |     |     |     |     |     |
| 20) Unknown (1) | +   |     |     |     |     |     |     |     |     |     |     |     |

**Cellulose BAW (Partridge's Mixture)**

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PLATES SHOWING
SOME PRE & POST TREATMENT
ORTHOPAEDIC X-RAYS