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Pharmacological Study of Certain Ayurvedic Herbs WSR to Silicosis

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Abstract: ***This is twenty first century and in this era we all are depends on many kind of industries for our daily requirements and silica is very important ingredient of most of these industries , many workers who works in such kind of industries like mining ,ceramic industry, construction and demolition, sand blasting etc. are with many respiratory problems and silicosis is one of them and one of biggest cause of death in developing countries and till date we all are using many drugs with having a lot of side effects but there are so many ayurvedic herbs which are more effective in silicosis and symptoms associated with silicosis in this article I compiled some ayurvedic herbs effective in silicosis, so we can improve the life span of silicosis affected peoples and improve their quality of life.***

Keywords: Silicosis, silica, respiratory disease, silica, Ayurvedic herbs etc

1. Introduction

Silicosis is the most common occupational lung disease worldwide; it occurs everywhere, but is especially common in developing countries. Silicosis is due to deposition of fine respirable dust (less than 10 micrometers in diameter) containing crystalline silicon dioxide in the form of alpha-quartz, cristobalite, or tridymite.Silica flour is nearly pure silica(SiO_2) finely ground. Silica flour has been used as a polisher or buffer, as well as paint extender, abrasive, and filler for cosmetics. Silica flour has been associated with all types of silicosis, including acute silicosis.

2. Aims and Objectives

Ayurvedic herbal treatment for silicosis is aimed at reducing or reversing the damage to the lungs, which is caused by exposure to crystalline silica. Ayurvedic medicines which reduce inflammation and infection in the lungs form the mainstay of treatment in the management of this condition. Medicines which have a specific action on the lungs and which help to treat and normalise the mucosa lining the lungs and respiratory tract are important in the treatment of this condition.

To improve the life span and quality of life with minimum loss. Ayurvedic herbal medicines which have a specific immunomodulatory effect on the lungs as well as on the entire body are also used in the management of chronic silicosis. These medicines prevent or reduce damage to the lungs and body because of occupational exposure to silica. Depending upon the severity of the condition, individuals affected with silicosis require treatment ranging from 3 to12 months, in order to improve significantly from the after-effects of this condition. Long-term treatment may also significantly reduce the possibility of cancer arising from silicosis. Ayurvedic herbal treatment thus has a significant role to play in the management and treatment of silicosis.

Association for Rural Advancement through Voluntary Action and Local Involvement (ARAVALI) Established by the Rajasthan government, ARAVALI is working in collaboration with the Dang Vikas Sansthan in the livelihood sector.

3. Causes

Silicosis is caused primarily due to a long- term exposure (usually 5-15 years) to silica. But a short-term exposure (for a few weeks or months) can also result in silicosis, which tends to worsen considerably as time progresses, if not diagnosed in its early stages. People who work in the following industries are particularly at risk:

- stone masonry and stone cutting – especially with sandstone
- construction and demolition – as a result of exposure to concrete and paving materials
- pottery, ceramics and glass manufacturing
- mining and quarrying
- Ceramic industry
- sand blasting
- Abrasives manufacturing
- Mining
- Quarrying
- Road and building construction
- Sand blasting

Prevlance

India has a large mining industry, concentrated in the states of Chhattisgarh, Jharkhand, Orissa and West Bengal. In 1999, the Indian Council of Medical Research reported that around 3.0 million workers are at high risk of exposure to silica; of these, 1.7 million work in mining or quarrying activities, 0.6 million in the manufacture of non-metallic products (such as refractory products, structural clay, glass and mica) and 0.7 million in the metals industry. There are also around 5.3 million construction workers at risk of silica exposure.

Rajasthan has 32,000 mines where over two million labourers work and only seven Pneumoconiosis Board centres to diagnose silicosis. Located in seven state-run

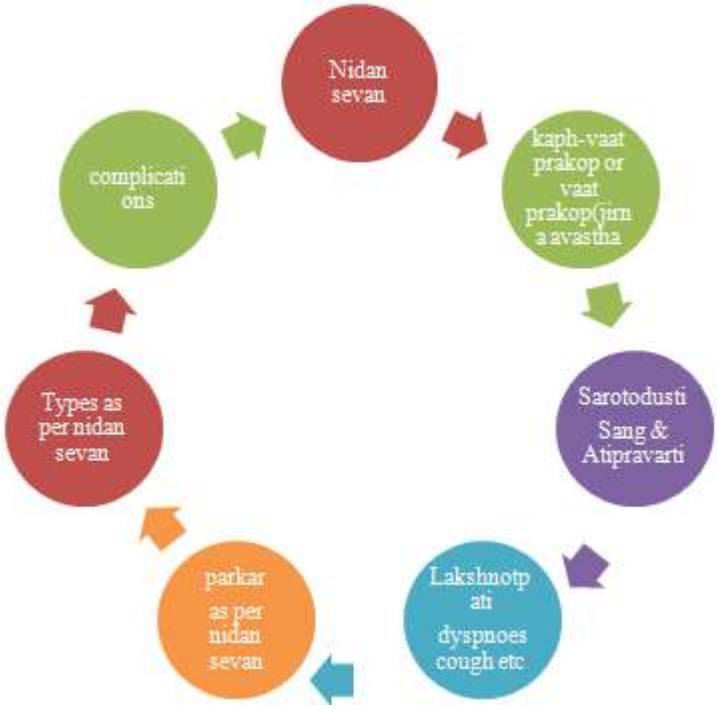
medical colleges, each centre has a team of three doctors who examine the cases only on weekends.

According to TIO it has been reported that karoli , jaipur, kota, jalore, jodhpur,Udaipur etc parts of rajasthan, Khambat in gujrat some areas of Madhyapradesh, Delhi, Karnataka, Haryana, orrisa and west bengol, maharastra,and koderma in Jharkhand , the prevalence rate of silicosis is very high due to large mining industry and badly affected by silicosis.

ICMR has reported about free 30 lacks workers pron to silicosis and around 50 lacks construction workers who are exposed to silica, they are also in risky zone although many Pneumoconiosis boards are examining the silicosis cases at rajasthan state level.

Industry-wise prevalence of silicosis in India- various industries play important role in silicosis for eg. Workers , who are working in stone cutters industries , mica processing , slate and pencil industries they are more affected from silicosis rather then gold mines, magneaze mine and glass factories.

SAMPRAPTI –VIGHTAN AS PER AYURVEDA-



4. Material and Methods

I compiled all classical and modern texts, newspapers, survey reports, blogs, hospitals records and conducted personal interviews regarding to silicosis at various cities of Rajasthan. Related workers may affect from silicosis after few weeks to five years exposure with crystalline silica dust (acute silicosis). After 5-10 years of expouser accelerated silicosis may develop. Chronic simple silicosis usually developes after 10 years or more expouser after that silicosis becomes more complicated like fibrosis, remodeling, lung cancer, certain auto- immune diseases and tuberculosis.

5. Sign and Symptopms

Silicosis is a progressive interstitial lung disease, characterized by Because chronic silicosis is slow to develop, signs and symptoms may not appear until years after exposure.[9] Signs and symptoms include:

- Dyspnea (shortness of breath) exacerbated by exertion & Tachypnea (rapid breathing) which is often labored,
- Persistent cough, & Hoarseness of voice
- Fatigue & Malaise
- Rapid breathing & Shallow breathing

- Sleep problems
- Scarred & Inflamed lungs
- Fever & Chest pain
- Loss of appetite and weight loss
- Gradual darkening of skin (blue skin)
- Gradual dark shallow rifts in nails eventually leading to cracks as protein fibers within nail beds are destroyed.

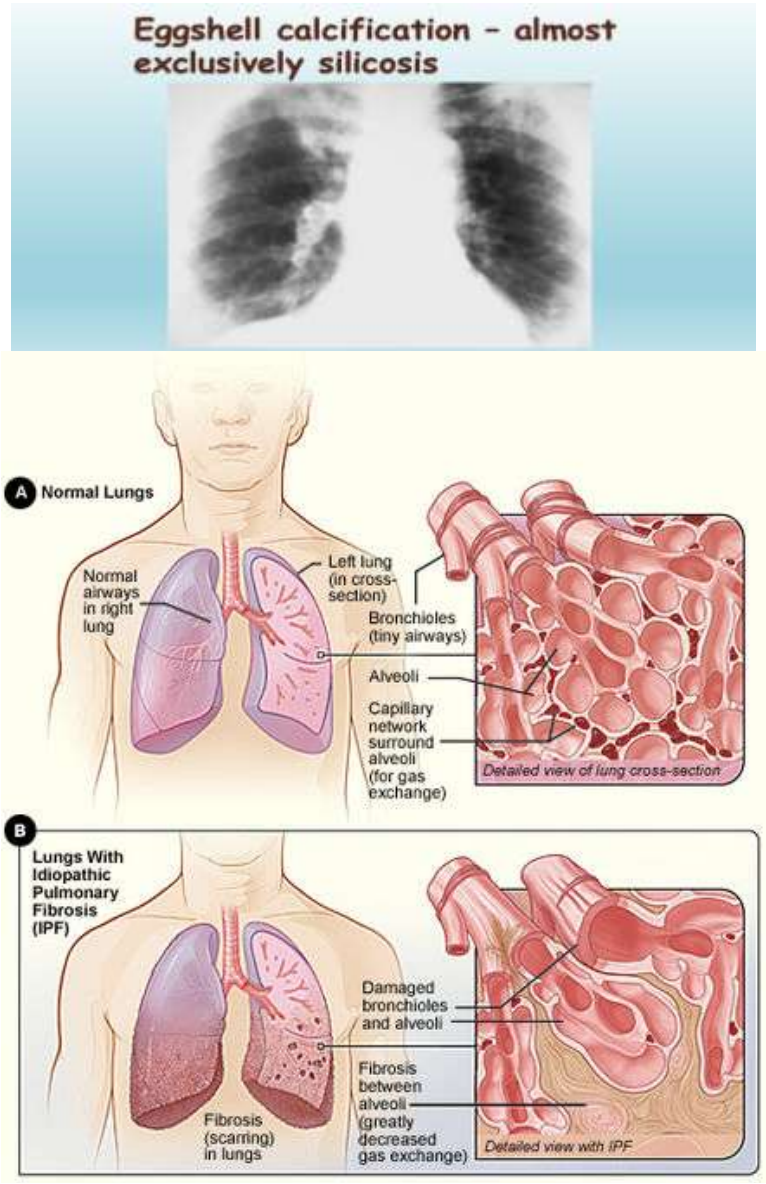
Symptomps in Advanced Stages of Silicosis:

- Cyanosis, pallor along upper parts of body (blue skin)
- Cor pulmonale (right ventricle heart disease)
- Respiratory insufficiency

Patho-Physiology of Silicosis

Figure 1: Silicosis affected lung in autopsy

Lungs: Egg shell Apperance in silicosis-



- When small silica dust particles are inhaled, they can embed themselves deeply into the tiny alveolar sacs and ducts in the lungs, where oxygen and carbon dioxide gases are exchanged. There, the lungs cannot clear out the dust by mucous or coughing.
- When fine particles of crystalline silica dust deposited in the lungs, macrophages that ingest the dust particles will set off an inflammation response by releasing tumor necrosis factors, interleukin-1, leukotriene B4 and other cytokines. In turn, these stimulate fibroblasts to proliferate and produce collagen around the silica particle, thus resulting in fibrosis and the formation of the nodular lesions. The inflammatory effects of crystalline silica are apparently mediated by the NALP3 inflammasome.[12]
- Characteristic lung tissue pathology in nodular silicosis consists of fibrotic nodules with concentric "onion-skinned" arrangement of collagen fibers, central hyalinization, and a cellular peripheral zone, with lightly birefringent particles seen under polarized light. The silicotic nodule represents a specific tissue response to crystalline silica. In acute silicosis, microscopic pathology shows a periodic acid-Schiff positive alveolar exudate (alveolar lipoproteinosis) and a cellular infiltrate of the alveolar walls.

Diagnosis

These are useful pathological tests should be done:-

- Chest X-Ray
- Computed tomography
- Pulmonary function tests
- Purified protein derivative (PPD) skin test (for tuberculosis)
- Serologic tests for connective tissue diseases

Treatment

Silicosis is a permanent disease with no cure. but treatment of silicosis should be started as soon as possible to avoid serious health hazards and complications and sometimes death of the patients. Treatment options currently available focus on alleviating the symptoms and preventing any further progress of the condition. These include:

Experimental treatments include:

- Antibiotics
- Corticosteroid therapy.
- bronchodilators
- palliative therapy

Complications

Patients with silicosis are particularly susceptible to tuberculosis (TB) infection—known as silicotuberculosis. The reason for the increased risk—3 fold increased incidence—is not well understood. It is thought that silica damages pulmonary macrophages, inhibiting their ability to kill mycobacteria. Even workers with prolonged silica exposure, but without silicosis, are at a similarly increased risk for TB.

Pulmonary complications of silicosis also include Chronic Bronchitis and airflow limitation (indistinguishable from that caused by smoking), non-tuberculous Mycobacterium infection, fungal lung infection, compensatory emphysema, and pneumothorax. There are some data revealing an association between silicosis and certain autoimmune diseases, including nephritis, Scleroderma, and Systemic Lupus Erythematosus, especially in acute or accelerated silicosis.

In 1996, the International Agency for Research on Cancer (IARC) reviewed the medical data and classified crystalline silica as "carcinogenic to humans." The risk was best seen in cases with underlying silicosis, with relative risks for lung cancer of 2-4. Numerous subsequent studies have been published confirming this risk. In 2006, Pelucchi et al. concluded, "The silicosis-cancer association is now established, in agreement with other studies and meta-analysis."

Ayurvedic Herbs for Silicosis

There are so many Ayurvedic herbs can be used for the silicosis few of them I am describing in this paper.These drugs can be used according to frequency of exposure and the severity of the patients as per need.

S.N.	*Name*	*Ras*	*Guna*	*Vireeya*	*Vipaka*	*Prabhav*	*Dosh Karma*	*Chemical Composition*
1	PIPPALI	Katu	Laghu, Snigdha, Tikshna	Anushna sheet	Madhur	-	Kaph-Vaat shamak	Piperane,steroids Piplasterol
2	YASTIMADHU	Madhur	Guru Sanigdh	Sheet	Madhur	-	Vaat-Pitta shamak	Glycyrrnizine, Phyto estrogen
3	KANTKARI	Tikta, katu	Laghu Rukash Tikshan	Ushana	Katu	-	Kapha –Vaat shamak	Diosgenin & Kno_3 Solasoonine
4	KARKATA SHRUNGI	Kashya Tikata	Laghu Rukash	Ushana	Katu	-	Kapha – Vaat shamak	Tanin & volatile oil
5	KULINGAN	Katu	Laghu Tikashna Rukash	Ushana	Katu	-	Kapha- Vaat sahamak	Flevanoids & volatile oils
6	BRUHATI	Katu Tikata	Laghu Rukash Tikashna	Ushana	Katu	-	Kaph –Vaat Shamak	Solanine & Solasonine
7	SOME	Kashya	Laghu Rukash	Ushan	Katu	-	Kaph Vaat shamak	Ephedrine
8	DHATURA	Tikat Katu	Laghu Rukash Vvayai Vikashi	Ushan	Katu	Madak	Kaph Vaat Shamak	Scopolamine Hysciamine Atropine
9	VASA	Tikta, Kashya	Laghu Rukash	Sheet	Katu	-	Kaph-pitta shamak	Vasicine & adhatodic acid
10	KUSTHA	Tikta Katu Madhur	Laghu Rukash Tikashna	Ushana	Katu	-	Kapha –Vata shamak	Saussurine & reginoids
11	PUSHKAR MOOL	Tikat Katu	Laghu Tikashna	Ushan	Katu	-	Kaph – Vaat	Alantolactone & inulin

							shamak	
12	SHATAVARI	Madhur Tikata	Guru Sanigdh	Madhur	Sheet	-	Vaat- Piit Shamak	Saponins
13	ASWAGANDHA	Tikat Katu Madhur	Laghu Sanigdh	Madhur	Ushana	-	Kapha- Vaat Shamak	Alkeloids & Glyosides
14	TULSI	Katu Tikta	Lagh Rukash	Katu	Ushana	Krimi ghna	Vaat Kaph Shamak	Volatile oils & Alkeloids Glycosides
15	BHARANGI	Tikt Katu	Laghu Rukash	Katu	Ushan	-	Kaph Vaat Shamak	Phenolic Glycosides Seponin
16	BALA	Madhur	Laghu Sanigdh Pichil	Madhur	Sheet	-	Vaat Pitta Shamak	Alkeloids Steroids Ephadrine Kno_3
17	NAGBALA	Madhur Kashaya	Guru Sanigdh Pichil	Madhur	Sheet	-	Vaat –Pitta Shamak	Gossypol , quinazoline

are given in progressively increasing doses, followed by gradually tapering doses. Repeated such courses are very useful in preventing recurrent infections in the lungs, and help in repairing the damage done to the lungs.

S.N.	NAME	LATIN NAME	FAMILY	USEFUL PART	PREPRATION	DOSE
1	PIPLI	Piper longum	piperaceae	Fruits, root	Ksheer paak	500 mg to 1gm
2	YASTIMADHU	Glycerrhiza glabra	Papilonateae	Root	Ksheer paak	3-5 gm
3	KANTKARI	Solanum xanthocarpum	Solanaceae	Whole plant	Decoction smoke	40 -50 ML
4	KARKATASHRUNGI	Pistichia integerima	Anacardiaceae	Shell	Powder	1-3 gm
5	KULINGAN	Alpimia galangal	Zingiberaceae	Bulbs	Powder Aavleaha	1-3 gm
6	BRUHATI	Solanum indicum	Solenaceae	Root& fruit	Decocation	40-50 ML
7	SOME	Ephedra vulgaris	Gnetaceae	Branches	Powder	1-2 gm
8	DHATURA	Dhatura metel	Solenaceae	Leaves Flower Seeds	Powder smoke	50 -100 mg
9	VASA	Adhatoda vasaka	Acanthaceae	Leaves flowers,root	Swaras, Avleha	10-20 ML 2TSF
10	KUSTHA	Saussurea lappa	Compositae	Root	Powder	250 mg -1gm
11	PUSHKAR MOOL	Inula racemosa	Compositae	Root	Powder	1-3 gm

IMMUNE BOOSTER DRUGS- These drugs can be used to boost the immune status of the body.

S.N.	Name	Latin Name	Family	Useful Part	Perpration	Dose
1	SHATAVARI	Asparagus racemosus	Liliaceae	Roots	Ksheer paak	10-30 ml
2	ASWAGANDHA	Withania somnifera	Solenaceae	Roots	Ksheer paak	10-30 ml
3	TULSI	Ocimum sanctum	Labiatae	Whole plant and leaves	Swaras	10-20 ml
4	BHARANGI	Clerodendrum serratum	Verbinaceae	Roots	Powder	1-3 gm
5	BALA	Sida cordifolia	Malvaceae	Whole plant	Ksheer paak	10-30 ml
6	NAGBALA	Grewia hirsute	Tiliaceae	Whole plant	Ksheer paak	10-30 ml

Prognosis

The prognosis of silicosis depends upon the chronicity and severity of lung damage caused by this condition. Prevention is a very important aspect of the management of this condition. Occupational safety standards need to be implemented rigorously

6. Prevention

- The best way to prevent silicosis is to identify work-place activities that produce respirable crystalline silica dust and then to eliminate or control the dust ("primary prevention"). Water spray is often used where dust emanates. Dust can also be controlled through dry air filtering.
- Keep away all the industries from city area.
- Dense layer plantation around the industrial area to prevent the silica dust.
- Controlling silica dust in the workplace is key to preventing silicosis.
- When dust cannot be controlled, as may be true in the sandblasting industry, workers should wear protective gear, such as hoods that supply clean external air or special masks that efficiently filter out tiny particles. Such protection may not be available to all people working in a dusty area (for example, painters and welders), so whenever possible abrasives other than sand should be used.
- Workers exposed to silica dust should have regular chest x-rays so that problems can be detected early.
- Workers who smoke should be encouraged to stop.
- Other preventive measures include pneumococcal vaccine and an annual influenza vaccination to help protect against infections to which workers may be more vulnerable.
- All workers should be treated with ayurvedic medicicne preprations such like balya rasayana and immune booster drugs.
- Prevent further exposure to silica dust.
- Strongly advise patients to quit smoking and provide help in smoking cessation efforts.

Regulation

In March 2016, OSHA(Occupational safety and health administration) officially mandated that companies must provide certain safety measures for silicosis and who work with or around silica, in order to prevent silicosis, lung cancer, and other silica-related diseases.

Key Provisions

- Reduce the permissible exposure limit (PEL) for respirable crystalline silica to 50 micrograms per cubic meter of air, averaged over an 8-hour shift.
- Use engineering controls (such as water or ventilation) to limit worker exposure to the PEL; provide respirators when engineering controls cannot adequately limit exposure; limit worker access to high exposure areas; develop a written exposure control plan, offer medical exams to highly exposed workers, and train workers on silica risks and how to limit exposures.
- Provide medical exams to monitor highly exposed workers and gives them information about their lung health.
- Provide flexibility to help employers — especially small businesses — protect workers from silica exposure.
- The main challenge of eliminating silicosis in India is in the informal, unregulated sectors of industry which do not fall under the control of statutory tools such as the Factory Act of India (1948).This Act mandates a well ventilated working environment, provisions for protection from dust, reduction of overcrowding and provision of basic occupational health care.
- The National Human Rights Commission of India (NHRC) has directed the governments of the states and union territories of India to provide complete information about all measures taken to prevent and eliminate the problem of silicosis.
- Silicosis is a notified disease under the Mines Act (1952) and the Factories Act (1948). It should also be made a notifiable disease under the Public Health Act (1875), so that reporting becomes mandatory. Awareness campaigns are needed to sensitize workers about their risk of silicosis, personal protective measures and early symptoms.
- Silicosis control programme should be integrated with the existing revised national tuberculosis control programme of India. District tuberculosis officers, in collaboration with the Ministry of Labour, must ensure documentation of workplaces and workers at risk from silica exposure, especially in the informal sector. Occupational history-taking must be mandatory to differentiate silicosis from pulmonary tuberculosis and hence avoid the risk of unnecessary anti-tubercular therapy for the former.
- The national health insurance programme in India for households below the poverty line (called *Rashtriya Swasthiya Bima Yojna*, RSBY) uses an efficient, computerized network for tracking claims and for reimbursements through private health insurance or third-party administrators. The government may consider extending RSBY to poor workers who are at risk of contracting silicosis and to their families. Silicosis is a compensable injury under the Employees' State Insurance Act (1948) and the Workmen's Compensation Act (1923). If silicosis health boards were set up in every state of India they could carry out surveillance for silicosis cases and assessment of disability and loss of earnings resulting from silicosis so as to decide the level of compensation and rehabilitation.

7. Conclusion

Medicinal plants are useful in various aliments like bronchial asthma (tamak swas) Tuberculosis (kashaya) since centuries in rural areas. Now considerable evidences that ayurvedic herbs are very effective in inflammatory diseases. Not only medicinal plants but also jaggery had a preventive action against silicosis. Ayurvedic herbs prevents the lungs damage due to crystalline silica these herbs reduces inflammation and infections in lungs and manages the silicosis conditions, it resulting the normalize the mucosal lining of the lungs and respiratory tract. Ayurvedic immunomodulator herbs are useful in the management of chronic silicosis. Ayurvedic treatment should remains continues from 3 to 12 months, depending upon the severity of silicosis. Long term treatment may also reduces the possibilities of complicated diseases as such cancer arising from silicosis. Thus ayurvedic treatment can play significant role in the prevention and management of silicosis.

8. Interpretation

Ayurvedic drugs stimulates digestion, anti- inflammatory compounds that reduces swelling and pain, phenolic compounds that act as antioxidants and venotonics, antibacterial and antifungal tannins that act as natural antibiotics, diuretic substances that enhance the elimination of waste product and toxins and alkaloids that enhance mood and give a sense of well being. the importance of plants lies on their chemotherapeutic effects but not in their role as a source of model compounds for drug development.