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ANALYSIS OF WORK RELATED MUSCULOSKELETAL DISORDERS WITH *MADHYAMA ROGAMARGA* IN *AYURVEDIC* LITERATURE

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ABSTRACT

Introduction: Work related Musculoskeletal disorders (MSDs) are injuries or disorders of musculoskeletal system resulting from repeated exposure to various hazards or risk factors in the work place. The musculoskeletal system includes all muscles, bones, tendons, sheaths, ligaments, bursa, blood vessels, joints, intervertebral discs etc. According to *Ayurveda* the musculoskeletal system comprises *Asthi* (bones), *Peshi* (muscles), *kandara* (tendons), *Snayu* (ligaments), *Sandhi* (joints), *Sira* (veins), *Dhamani*(arteries) and *Nadi* (nerves). The disorders occurring in the musculoskeletal system coincides with Madhyama *Rogamarga*. **Methods:** literature Review. **Discussion:** The study tries to analyze work related musculoskeletal disorders and its relevance with *Madhyama rogamarga* in *Ayurvedic* literature.

KEYWORDS: Musculoskeletal system, *Madyama Rogamarga, Asthi, Sandi, Snayu, Kandara.*

1. INTRODUCTION

Health is the balanced condition of the living organism in which the integral, harmonious performance of the vital functions tends to the preservation of the organism and the normal development of the individual.[1] Ever since man appeared on earth, he remained occupied to provide for his basic needs. The nature of his occupation that was initially simple and crude changed with the growing needs and skills of man. History bears testimony to the fact that as centuries passed by, occupations became more and more demanding. Vocational health refers to personal fulfillment from jobs or chosen career fields while still maintaining balance in lives. It depends on one's desire to contribute in career so as to make a positive impact on organizations and in society as a whole. Occupational disorders are important because they affect a large no of workers. The health of the workers has several determinants, including risk factors at the workplace leading to cancers, accidents, musculoskeletal diseases, respiratory diseases, hearing loss, circulatory diseases, stress related disorders and communicable diseases and others. Work related musculoskeletal disorders are impairments of body structures such as muscles, joints, tendons, ligaments, nerves, bones or a localized blood circulatory system caused or aggravated primarily by the performance of work and by the effects of the immediate environment where the work is carried out.[2] Ayurveda defines health as the state of *Dhathusatmya a* balanced state of body elements, resulting in a sense of wellbeing. Disease is a state of *Dhathuvaishamya* imbalance of body elements, resulting in disorders. Ayurveda has given prime importance to this aspect in each and every branch, which can be collectively viewed under the purview of Ayurvedic *Swasthavritta*.

2. AIMS AND OBJECTIVES

Reviewing the information of work related musculoskeletal disorders in relation *with Madhyama rogamarga* in *Ayurvedic* literature.

3. MATERIALS & METHODS

This study is carried out by literature search and critical review of the obtained facts. The various medical research data basis like PubMed, Google scholar and other national research data basis. Manual search was made by going through the reference list of retrieved articles to identify relevant additional study.

4. REVIEW OF LITERATURE

4.1 Work related Musculoskeletal disorders

Work related Musculoskeletal disorders (MSDs) are injuries or disorders of musculoskeletal system resulting from repeated exposure to various hazards or risk factors in the work place the musculoskeletal system includes all muscles, bones, tendons, sheaths, ligaments, bursa, blood vessels, joints, intervertebral discs *etc.*, Other terms used to describe MSDs include.[3]

- Repetitive Strain Injury
- Reparative motion injuries
- Cumulative trauma disorders
- Soft tissue disorders
- Regional musculoskeletal disorders
- Occupational Overuse Syndrome, or Strain or Sprain.

Many common locomotor problems are short lived and self-limiting or settle with a course of analgesia or physical treatment, *e.g.*, physiotherapy or osteopathy nonetheless, they represent 20%-30% of the workload of the primary care physician. Most of the musculoskeletal diseases are seen worldwide, although the prevalence of individual condition varies.

Individuals with musculoskeletal complaints should be evaluated with through history, comprehensive physical and musculoskeletal examination and if possible an appropriate laboratory testing

The initial encounter should determine whether the musculoskeletal complaint signals a red flag condition. There are several urgent conditions that must be diagnosed promptly to avoid significant morbid or mortal sequel. These "red flag" diagnoses include septic arthritis, acute crystal-induced arthritis (*e.g.*, gout), and fracture. Each may be suspected by its acute onset and mono articular or focal musculoskeletal pain.[4]

Musculoskeletal disorder hazards

Generally classified into three categories:[3]

A. Biochemical hazards
B. Additional hazards
C. Individual hazards

1. Biochemical hazards

This is also referred to as the primary risk factors. Biochemical risk factors are those which place a load upon structures of musculoskeletal system. There are three biochemical risk factors: high force, awkward posture and repetition. Any one of those may lead to a musculoskeletal disorder by themselves, however when two or more hazards combine together the risk for musculoskeletal disorder increases substantially.

- **High force**

Greater the force that is required, greater the level of stress on the musculoskeletal system. Some activities that can result in forces being applied include lifting, lowering, pushing, pulling, carrying, gripping and pinching. Some of the factors that need to be considered with regards to force are that posture being used while applying the force, how often the force is applied, the weight of the object being handled, and the speed of the movement.

- **Awkward Posture**

An awkward posture is any fixed or constrained body position that overloads muscles, tendons or joints. In general, the further away a joint gets from a relaxed, or neutral position, the greater the risk for a musculoskeletal disorder. Generally, towards the end of a joint's range of motion muscles become either too short or too long and the ability to generate force is reduced. If muscles are repeatedly placed in these positions or held for prolonged periods of time they begin to fatigue and surrounding tissues become stressed, making them more susceptible to a musculoskeletal disorder.

- **Repetition**

A task is repetitive when similar exertions, actions, or movements are done often during a specific period of time. During repetitive tasks, the musculoskeletal system can begin to fatigue, if enough recovery time is not provided. As the musculoskeletal system begins to fatigue, it cannot tolerate as much stress. Even though the amount of force applied may not change during the tasks, a musculoskeletal disorder may occur If he musculoskeletal system is too fatigued to handle the stress.

2. Additional Hazards

Additional hazards for musculoskeletal disorder include:

- **Vibration**

There are primarily two types of vibration, whole body and segmental. Whole body vibration is typically transmitted through the feet or buttocks to the rest of the body. Segmental vibration, also referred to as local vibration, occurs when a particular segment of the body is exposed to vibration, such as the hands when holding a power tool.

- **Temperature**

Working in either very cold or very hot environments can increase the risk for musculoskeletal disorder.

- **Contact Stress**

Contact stress occurs when a part of the body comes in contact with hard, sharp surfaces or objects. The point of contact places a stress on the musculoskeletal system. Repeated or prolonged contact could result in inflamed tendons, obstructed blood flow and muscle fatigue.

- **Work Methods**

Work needs to be appropriately taught, monitored and enforced for the protection of workers as a means to reduce exposure to hazards. Factors negatively affecting work method can include poor physical and mental

status, the lack of proper training in safe operating procedures or safe work practices, poor feedback given to workers etc.

3. Individual Hazards

Certain attributes about an individual may also lead to an MSD. These can include age, body size, previous injuries, and genetic predisposition *etc.*

4.2 Characteristics of WMSD

Work-related musculoskeletal injuries can take different forms. The onset and development of these injuries is still not well known. Many theories, some complimentary and some contradictory have attempted to explain the phenomenon, and it is clear that the issue is still not fully understood.

Despite the diversity of afflictions and mechanisms involved. WMSD show a certain number of similar characteristics.

- **WMSD result from overuse**

Although the onset mechanism is not clearly established, it is generally agreed that the injuries result from overuse, beyond the body's recovery capacity. WMSD occur because a structure is abused repetitively and is made to endure a work load that it cannot tolerate without negative consequences.

- **WMSD develop gradually**

WMSD develop over time, the process evolves gradually with repeated overuse and insufficient recovery. The process may very well set in surreptitiously, with no apparent symptoms, only to one day appear suddenly and develop rapidly more often, slight discomforts are felt, which worsen gradually until they lead to work stoppage. The disorder can only take a few days to develop, but more often, it stretches out for weeks, months or even years. The gradual appearance of WMSD can also be disadvantage because, not being forewarned means not being forearmed against symptoms that appear very gradually. The body gets used to the pain, which can be blamed on age or other causes. It became a normal presence and the feeling is that the discomfort will go away. This increases the risk of the situation getting worse, to the point where the complete recovery becomes impossible.

- **WMSD have multiple causes**

The starting point of WMSD is overuse. But the overload generally stems from a combination of factors and not from a single cause. Be it repetition, posture or effort, no single risk factor is essential in and of itself. A very demanding effort made in a particularly bad posture can suffice to create musculoskeletal problems, even if the rate of repetition is very low. Conversely, a less demanding task performed in a more or less adequate posture can cause damage if it is repeated thousands of times per day. Because of these multiple causes, prevention must often relay on combination of solutions based on good knowledge of the situation. And because the situations can be so diverse a universal solution is impossible.

The different WMSD have similar symptoms the overload region is often painful and sensitive when touched. Certain movements or efforts may cause pain which in the most serious case is felt even when the region is at rest. There is very often a swelling and sometimes numbness. Mobility may be limited by the swelling or the pain.[5]

4.3 *Ayurvedic* perspective of musculoskeletal system disorders

The *madhyama rogamarga* or the second *rogamarga* is the pathway that nurtures the diseases that affect the following structures:[6]

- The *Marmas*, mainly *Moordha, Hridaya* and *Vasthi*
- The *Sandhi*
- The *Asthis*
- The *Snayus*, *Siras* and *Kandaras* that holds the *Asthisandhis*

The structures coming under *Madyma rogamarga* according to different *Acharyas* are tabulated below in Table no 1

Table No 1: Structures of madhyama rogamarga.

Structures	Astanga Samgraha	Astanga Hridaya	Caraka Samhitha
1. *Moordha*	+	+	+
2. *Hridaya*	+	+	+
3. *Vasthi*	+	+	+
4. *Asthi sandhi*	+	+	+
5. *Snayu*	+	+	+
6. *Sira*	+	+	-
7. *Kandara*	+	+	+
8. *Asthi samyoga*	-	-	+

The structures of *madyama rogamarga* are not closely linked with each other anatomically. *Marmas* are considered as the vital points of the body where aforesaid individual structures like *mamsa*, *sira*, *snayu* etc, conjoint. The vital force resides in *marma.* Damage to any of these *marmas* can cause variety of consequences

ranging from pain to death. (*Rujakara, Vaikalyakara, Visalyaghana, Kalantharapranahara and Sadhyapranahara*)[7]

Any physiological or anatomical abnormalities happening in these structures will definitely results in musculoskeletal disorders. As per various *Ayurvedic* literatures all such conditions fall under *madhyama rogamarga*. In short, *madhyama rogamarga* serve the musculoskeletal ailments.

Musculoskeletal parts and numbers according to different *Acharyas* (Table no 2)

Table No :2 Musculoskeletal structures and numbers as per different Acharyas.

Parts	Charaka	Ashtanga Hridayam	Susrutha
Mamsa/Peshi	400	500 (male) 520 (female)	500 (male)
Asthi	360	360	300
Sandhi	200	200	210
Sanyu	900	900	900
Sira	700	700	700
Kandara		16	16

***PESHI* (Muscular Structures)**

According to *Susrutha*, the Muscular structures of body carry veins, arteries and nerves. There are five hundred *Peshis* in our body, out of which four hundred *Peshis* are in upper and low extremities, sixty-six *Peshis* are in middle part of the body and thirty-four *Peshis* are in head and neck. In females there are extra 20 peshis.[8] Considering *Angapratyanganirmana* of Susrutha *pesi* is evolved from *Pisita* with the influence of *Vayu* and *Ooshma*.[9]

***KANDARA* (Tendons)**

These are tendons of the body, which are responsible for movements like extension, contraction *etc*., They are sixteen in number out of which eight are in extremities, four in the neck and remaining four in the back.

***SNAYU* (Ligaments)**

These may be compared with ligament and bursae, which connect the joints and muscles together. These *Snayus* are of four types *Sushira* (porous), *Pruthu* (broad), *Pratanvati* (stretched) and *Vrutta* (circular). *Aamashaya* and *Pakvashaya* have *Sushira snayus*, Chest, back and brain have *Pruthu Snayus*. Legs and hands have *Pratamvati* and *Vrutta Snayas*. There are nine hundred *Snayus* in our body, out of which six hundred are situated in the extremities, two hundred and thirty in the trunk region and seventy in the neck region.[8] As per *Susrutha snayu* is developed as a result of *kharapaka* to *meda sneha* with the involvement of *vayu* and *pitha ooshma*.[9]

DHAMANI (Arteries)

There are different opinions about *Siras* and *Dhamanis*. It is considered that origin of both *Siras* and *Dhamanis* are from Umbilicus. There are twenty-four *Dhamanis* in the human body.[10] According to Susrutha, *Dhamanis* are different from *Siras* by virtue of continuous pulsatory movement (*Dhmanath Damani*). According to *Charaka* there are two hundred *Dhamanis* in the body.[11]

***SIRA* (Veins)**

Siras are those vessels which tend to take *Doshas* (impurities) along with them. The movement of *Doshas* in them is like a smooth flow (*Saranath Sira*). There are seven hundred *Siras* in the body and that can be compared to blood vessels or lymph vessels. *Mridhupaka* of *Medasneha* along with *Pitha Ooshma* and *vayu* are the responsible factors for origin of *sira*[9]

5. DISCUSSION

Musculoskeletal disorders are the painful conditions affecting the musculoskeletal system, which includes muscles, bones, tendons, sheaths, ligaments, bursa, blood vessels, joints, intervertebral discs etc. These structures can be well correlated with *marma asthi sandhi vyadhis* which comes under the purview of *madhyama rogamarga*. It is important to understand the *Ayurvedic* pathology of musculoskeletal disorders. Musculoskeletal disorders include typical ailments like cervical spondylosis, osteoarthritis, low back pathology like IVDP and other repetitive strain injuries like Iliotibial band syndrome, carpel tunnel syndrome, olecranon bursitis, retro calcaneal bursitis etc. As per the *Ayurvedic* literature, the main culprit which leads to the pathogenesis of musculoskeletal disorders is *Vata*. Musculoskeletal disorders are considered as *Kashta Sadhya Vyadhi* as they include *Marma, Asthi, Sandhi*. All the disorders that occur in the *Madhyama Rogamarga* are said to be *Kashta Sadhya* or *Yaapya.* The causes for work related musculoskeletal disorders have been mentioned above. it is interesting to know that the etiology which has been mentioned for the causation of Musculoskeletal disorders can be traced from *Vatavyadhi nidana's*. *Abhighata, Dukkha/Vishama Sayasana, Vishama Upachara, Ati Adhwa, Ati Vyayama* are some of the major causes for *Vata dushti*.

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