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The effect of *Anal Sevana* (exposure to heat) on *Raktavaha srotas:* A Case Control Study

Research Article

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Abstract

Background: Occupational hazard is any workplace condition that causes a risk to employee health. In recent era, a lot of research work is being done on occupational hazards of which continuous exposure to heat is one of the major factors affecting occupational health. A human being has been exposed to heat through various sources like chemicals, forging works etc. Industrial heat when combined with manual work may often make adverse effects on health of the workers and mostly it affects the *Raktvaha Srotas* according to *Ayurved*. In this study, attempt had been made to find out what is the percentage of predominance of symptoms of *Raktavaha Srotodushti* in individuals having continuous exposure to heat. Method: A case control study was carried out in 150 workers from leading manufacturer of Upset forgings and Drop forgings in Pune industrial zone to find out association between exposure to heat and *Raktavaha srotodushti* symptoms, study group 100 workers (direct exposure to heat), control group 50 workers and filled a questionnaire consisting of symptoms related to *raktavaha srotas* vititation due to heat exposure. Result: Number of symptoms present in the study group were more than that present in control group. Redness of eyes (100%), thirst (100%), sweating (100%), mental irritation (69%) etc. other *Raktavaha srotodushti lakshanas* were also observed. Conclusion: Exposure to heat is one of the major causative factors of vitiation of *Raktavaha Srotas*. *Raktavaha srotodushti lakshanas* like *mukhpaka*, *shirarshul*, *santapa*, *raktapitta* observed moderately and *vidradhi*, *pidaka* were observed very rarely. To prevent the effects of continuous exposure to heat, the individuals should take preventive majors as prescribed in *Ayurveda.*

Key Words: Exposure to heat, *Raktavaha Srotodushti,* Occupational health hazards.

Introduction

Human being is a complex and intelligent creativity of creator, has been exposed to various factors which affects health of human being. Ayurveda the eternal science of life has emphasized on wellbeing of mankind. The working environment of foundries is hazardous and characterized by multiple simultaneous chemicals, physical and mechanical hazards exposure, which would lead to injuries of foundry workers (1). Workers exposed to heavy manual material handling (MMH) in a hot working environment succumb to severe physical stress and psychological stress (2). Previously some work has been done on coal mine labours in Bihar (3), physiology and importance of *Rakta dhatu* (4) . Study has not been done on how the vitiation of *raktadhatu* affect the health of workers who exposed to heat continuously. Along with nutritional depletion, vast industrial growth is cause of more stressful life. All these factors lead to vitiation of *srotas*. Out of all *srotas Raktavaha Srotas* which is considered to be the lifeline of human being is seen to be vitiated most frequently. *Rakta* is *Panchabhautik* in nature with predominance of *Agni mahabhuta* which is basically of *Ushna tatva* (5). Hence extensive exposure to *ushna tatva* obviously leads to vitiation of *rakta dhatu* and hence *Raktavaha srotas*. The main causative factors for vitiation of *raktavaha srotas* mentioned in *Ayurveda* are to take hot, spicy & liquid food products in diet and continuous exposure to Sun and exposure to heat (6).

Among these causes to find out association between *Anal sevan* i.e. exposure to heat as a causative factor of *Raktavaha srotodushti* and its symptoms this study has been carried out. *Anal sevan* can be defined as higher exposure to heat directly or indirectly.

Exposure to heat is prevalent in many industries like iron, steel, glass, ceramic units, foundries, mines and many other industries. Some processes such as steel melting, forging, casting etc. inherently exhibits a very high temperature, as a part of process itself. Industrial heat when combined with manual heat may often make adverse effect on health of the workers. Preliminary evidence shows that high heat exposures and heavy workload adversely affect the workers health and

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reduce their work capacities (7). In this study attempt had been made to find out what is the percentage of predominance of symptoms of *Raktavaha srotodushti* in individuals having continuous exposure to heat. It will also help to instill awareness to minimize these effects. Consequently, it will help to increase the efficiency and productivity of the workers by maintaining their health.

Aim of Study

To study the association of *Anal sevan* (exposure to heat) with symptoms of *Raktavaha srotodushti*.

Materials and Methods

The occupations, where people exposed to heat for a long period were observed.

To avoid the variables, the population sample, working in the same foundry of same rank workers, of same socio-economic strata were selected. Foundry workers of the age group 18 years to 60 years, irrespective of sex, colour, cast, and same shift were selected. Sample Size 150, in which 100 workers for study group and 50 workers for control group were selected.

In study group, the workers working near the furnace for minimum 4 to 5 hours daily from at least one year were selected. And those were not working near the furnace were excluded and they were included in control group.

Survey methods

a. A suitable questionnaire containing symptoms of *Raktavaha srotodusthi* was prepared. Before final application of questionnaire on subjects, it was tested in pilot study.
b. The most observed symptoms related to *Raktavaha srotodushti* in pilot study, were included in the final questionnaire.
c. From survey study, effects of *anala sevana* related to *raktavaha srotodushti* were compared with the effects of *anala sevana* described in *Ayurvedic* Literature.
d. The study protocol was reviewed and approved by Institutional Ethics Committiee.

Details of Industry

The industry selected for survey study was one of the leading manufacturer of Upset forgings and Drop forgings in Pune industrial zone. The forging capabilities include a wide array of components in material like Plain carbon Alloy, Chrome Alloys, Stainless Steel.

Job Description

Forging work involve heating of the iron ingots in the furnace at a fixed temperature between 1000 to 1200 degree for a definite period of time, depending upon the size of iron ingots and the type of forging required (Room temperature between 42 to 44 degree). These ingots are then forged on the hammer. Forging work consists of several manual and semi manual operators such as –

- Loading of raw material into the furnace.
- Removal of red-hot pieces from the furnace and delivering them to the hammer.
- Hammering of the red-hot metal on the die and hammer.
- Taking off the forged metal from the hammer and feeding the trimmer and putting them in the strong area.

Results

Table no. 1: Age, weight & Height Distribution of subjects.

Group		Age	Weight	Height
Study (n=100)	Mean	26.65	59.15	5.409
	Standard deviation	3.930	5.764	0.2431
Control (n=50)	Mean	24.94	61.18	5.424
	Standard deviation	3.106	5.992	0.3411

Average mean age in study group was 26.65 years and 24.94 in control group, while average weight in study group was 59.15 kg and average height was 5.40 ft, average weight in control group was 61.18 kg and 5.42 ft height.

Table no. 2: Total Number of Symptoms observed in study and control group.

Symptoms (Total Number)	Study	Control	Total
< = 5	10	46	56
> 5	90	4	94
Total	100	50	150

Chi Square = 95.8 p = 0.0000 significant

Number of symptoms more than 5 are present is 90% of the study group whereas only 8% in control group. This is statistically highly significant.

In the study group, correlation coefficient between years of work and total number of symptoms is 'r' = 0.433 and p = 0.000 significant. i.e.there is significant positive correlation between these two variables. Which means; as number of years in the service increases symptoms are also increasing.

Graph 2: Total Number of Symptoms observed in study and control group.

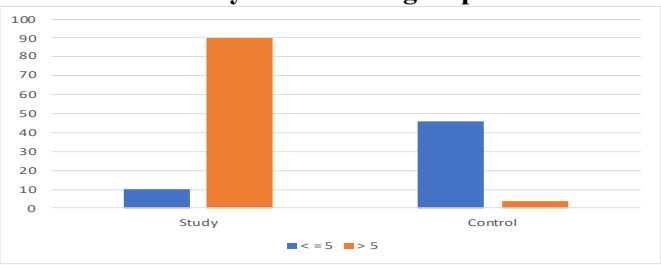

Table no. 3: Number of years of subjects working in foundry.

Years of work	Study	Control	Total
< = 2	30	10	40
2.1 – 4	51	32	83
> 4	19	8	27
Total	100	50	150

Chi – square = 2.435 and p = 0.296 NS. i.e.years of work in study and control is comparable.

Table no. 4: Percentage prevalence of *Raktavaha srotodushti* symptoms in the study and control group.

Sr.No.	Symptoms	Study	Control	Chi square	P value
1	*Mukhpaka* (mouth ulcer)	74	24	9.9	0.001
2	*Shirashoola* (headache)	72	30	2.19	0.138
3	*Vidaha Annapanasya* (burning sensation after meal)	60	5	33.7	0.0001
4	*Tiktalmodgara* (bitter and pungent eructation)	36	2	17.9	0.0001
5	*Raktapitta* (bleeding disorder)	48	0	14.2	0.0001
6	*Akshiraga* (redness of eyes)	100	4	115.9	0.0001
7	*Tamasoti-darshana* (feeling of darkness)	42	4	18.0	0.0001
8	*Kshudha-mandya* (decreased digestive fire)	3	0	1.52	0.218
9	*Trishna* (thurst)	100	46	8.16	0.004
10	*Santaapa* (increased body heat and mental irritation)	69	0	63.5	0.0001
11	*Klama*(lassitude)	20	0	11.5	0.0001
12	*Vidradhi* (abscess)	1	0	0.5	0.479
13	*Pidaka* (boil)	8	0	9.8	0.058
14	*Krodha* (excessive anger)	100	30	107.5	0.0001
15	*Sweda* (sweating)	100	47	6.08	0.03
16	*Kandu* (itching)	26	0	15.6	0.0001

Graph 4: Percentage prevalence of *Raktavaha srotodushti* symptoms in the study and control group

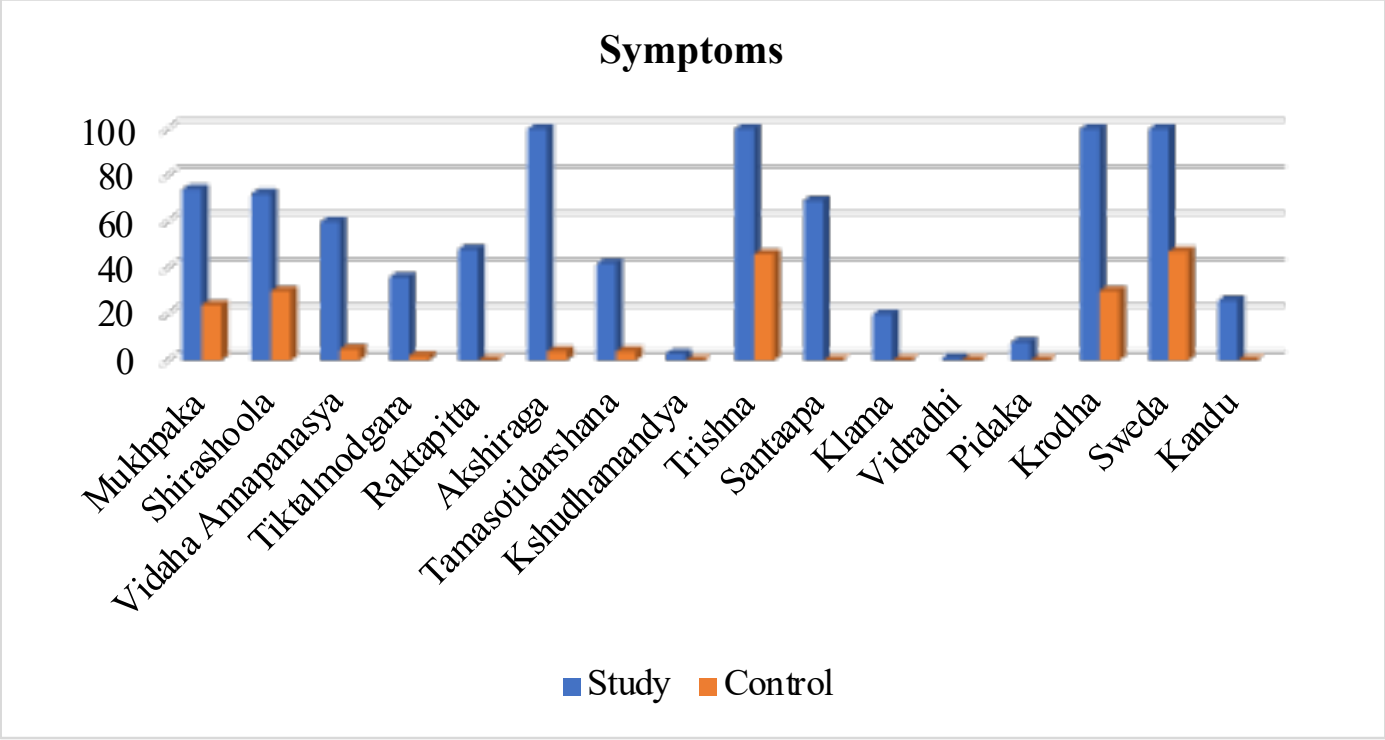

Table 5: Prakruti distribution in subjects

			GRP		Total
			Study	Control	
PRAKRUTI	***Pitta khapha***	Count	16	21	37
		% within GRP	16.00%	42.00%	24.67%
	Pitta Vata	Count	76	26	102
		%within GRP	76.00%	52.00%	68.00%
	Vata Pitta	Count	8	3	11
		% within GRP	8.00%	6.00%	7.33
Total		Count	100	50	150

Discussion

Exposure to heat is one of the major causative factors of vitiation of *Raktava Srotas.* There is a significant association found between *anal sevan* and symptoms of *raktavaha srotodusti. Pitta dosh* and *Rakta dhatu* have mutual interdepence relation in our body, so whenever *pitta dosha* increases *rakta dhatu* also gets vitiated.

In this survey total valid entries of study group were 100 and control group were 50. The maximum population was from age group 18-30 yrs. All the workers working in the selected foundry were of male category.

The maximum affected *prakruti* in this study was *pitta vata* and second one was *pitta kapha*.

All the workers were working for 12 hrs daily, in two shifts; at furnace temperature between 1000 to 1200 degree and room temperature between 42 to 44 degrees. Whereas room temperature where workers of control group were working was between 30-35 degree.

- 100% of study group were observed symptoms like redness of eyes (*Akshiraag*), thurst (*trishna*), excessive anger (*krodha*), sweating (*sweda)*. It was observed that although the workers were using goggle, still they were facing the problem of redness of eyes. This happened due to continuous exposure to heat for about 10 – 12 hrs per day. Thurst might be seen due to higher exposure to heat which absorbs "*Udaka dhatu"* from *Kloma, Talu, Jivha. Krodha* symptom may be observed due to heat stress which aggravates *pitta*. The most workers were complaining about sweating with bad odour may be observed due to increased *vistra guna* of *pitta.*
- Symptoms like mouth ulcer (*mukhpaka* 74%), increased body heat, mental irritation (*santap* 69%) and burning sensation after meal (*vidaha annapanasya* 60%) were observed moderately in workers. Reason behind this may be increased *ushna* and *tikshna guna* of *pitta dosha.*
- Headache (*shirashoola* 72% in study group and 30 % in control group) symptom is observed in both groups may be because of various reasons like night duties, extra stress or environmental heat impact.
- 24% of study group workers were complaining that they suffer from epistaxis this particular symptom i.e., *Raktapitta* (bleeding disorder) mostly occurs in summer season and most common complaint was *Nasagata Raktapitta*(epistaxis). This may be due to *ushna guna* of *agni* which result in *Raktapitta.*
- Symptoms like feeling of darkness (*tamaso atidarshan* 42%), bitter and pungent eruction (*tikt amlodgaar* 36%), itching (*kandu* 26 %) lassitude (*klam* 20%) were observed in very few workers. Due to inceased *drav gun* of *pitta* in workers leads to bitter and pungent eruction. Feeling of darkness may be due to vitiation of *pitta* in association with *vata dosha*. The most workers were complaining about excessive sweating with bad odor due to increased *vistra guna* of *pitta* which leads to *kandu.* Workers as exposure to heat causes "*Sanshoshana*" (absorption) of *saumya dhatu* which result in *Klama.*
- There is no such enough evidances seen in symptoms like boils (*pidak* 8%), decreased digestive fire (*kshudamandya* 3%), abscess (*vidhradhi* 1%) symptoms.
- The individuals having addiction were observed in both study and control group. The percentage of addiction of tobacco chewing was more in this particular sample.
- The symptoms like *upkusha*, *aruchi*, *twakvaivarnya* and *vatarkta* were not observed in particular sample.
- During the course of this study, it was observed that most of the workers leave their job after expenditure of 4 to 5 years in the foundry so symptoms which are quite chronic in nature could not be found in this particular sample. Another reason for incurrence of the symptoms, might be a small size of sample. There is hope to perform such studies in larger sample size which will give a very true picture of the society.
- During the course of this study, it was found that the workers in the studied foraging plant were exposed to high degree of heat stress resulted in vitiation of *Raktavaha srotas* , which showed in the form of symptoms like redness of eyes, epistaxis / bleeding disorder, mouth ulcer etc. which in turn affects the *'swasthya'* of the workers involved. It is therefore necessary to make recommendations in order to prevent effects of continuous exposure to heat. The first aim should be to reduce the heat load of the workers. The maximum heat load is felt by furnace workers particularly when the doors of the furnace are wide open, during loading and unloading. The operators should be advised to keep the door opened for very short period of time while loading and unloading of furnace. Furnace doors should also be covered by appropriate materials to conserve heat in the furnace. Duty hours of the workers should be minimized. It would be beneficial if are divided into 3 instead of 2 sessions. It would minimize the effects of continuous exposure to heat as working hours of the workers near the furnace are reduced.

Conclusion

- Exposure to heat is one of the major causative factors of vitiation of *Raktava Srotas*. There is a significant association found between *anal sevan* and symptoms of *raktavaha srotodusti*.
- As time span (years of work near the furnace) of the exposure to heat increases, occurrence of symptoms of *raktavaha srotodushti* also increases.
- Mostly affected *prakruti* was found *pitta vata prakruti*.
- Among observed symptoms, the mainly developed symptoms in the particular sample were redness of eyes, thirst, sweating and excessive anger.
- The symptoms like mouth ulcer, headache, increased body heat and mental irritation, burning sensation after meal, bleeding disorder observed moderately.
- The symptoms like abscess, boils were observed very rarely.
- In order to prevent the effects of continuous exposure to heat, the individual is recommended to have diet which is *madhur, snigdha* and *sheeta* in nature as well

as water boiled with *Chandana*, *Ushira* etc. or only cooled boiled water. These are the essential prerequisites.

- The individual is also advised to avoid hot and spicy food, excessive anger, having cold and hot *karma* at a time, habits like tobacco chewing and the things which add to increase the effects of exposure to heat etc.

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