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PREVALENCE OF SYMPTOMS RELATED TO DISCOMFORT, HEALTH AND ERGONOMICALLY IMPORTANT FACTORS AMONG SUGAR INDUSTRY WORKERS

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Abstract:

In sugar industry workers health and comfort get affected due to adverse workplace environment. Industrial occupational hazards, stress, lack of safety measures, irregularity of work hours, badly designed work place, unhealthy working environment, and lack of welfare schemes which affects the safety and health of the industrial workers. In the present study priority has been given to study prevalence of symptoms related to discomfort and unergonomically designed workplace. It has been observed that workers complain about discomfort and many musculoskeletal problems.

KEY WORDS:

Sugar industry workers, occupational hazards, stress and ergonomics.

INTRODUCTION

At the sugar industrial workplace a variety of factors influence the level of risk for the working population of sugar industry. They include the extent of exposure to hazards, which in turn is affected by the process design, the safety precautions taken, the extent and quality of support services and their ability to respond rapidly and effectively to injury and disease. The extent to which workers and management alike to understand the industrial process, the control technologies and safety equipment is also important. Estimates based on current occupational injury rates in a number of countries suggest that there are 32.7 million occupational injuries per year and 1,46,000 deaths.

The concept of ergonomics has evolved which is now recognized as the science that deals with impact of work and workplace environment on the efficiency of a worker. While in developed western countries the importance of ergonomics has been the reality for the last few decades in India it still remains an elusive dream. Thus in most industries today, the workplace environment does not meet the criteria of quality working environment.

Although the human factor is very important factor which plays important role in productivity it is often being neglected. Detailed investigation of physiological evaluation of jobs and occupational stresses among sugar industry workers at Walwa. Occupational stresses among sugar industry workers, with a view to provide suitable recommendations for improving health status, efficiency and productivity of workers in sugar industry at Walwa.

Sugar industry is the largest agrobased industry plays a key role in economy of Maharashtra state. Thousands of workers are working in sugar industry, during seasonal work from October to March and off season from April to September. The processing of sugarcane upto the sugar crystallization is carried out in various sections or processing units of sugar industry Viz.

A) Cane yard section-The sugarcane loaded vehicles are unloaded and transported for crushing.

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B) Engineering section – The process of extraction of juice, boiling of juice, production of electricity and removal of bagasse as a waste product is carried out in various sub sections of this section i.e mill, boiler, bagasse baling, power turbine sections. All the machineries are maintained by boiling house engineering work section.

C) Manufacturing section -: The crystallization of juice and production of sugar crystals is carried by removal of molasses and press mud, in various sub sections of manufacturing section viz-a) Boiling house (manufacturing work) section-It includes i) Juice section- The clarification of extracted sugar juice by the process of sulfitation is carried out in this section. ii) Pan section –The clear syrup is produced by removal of press mud and molasses. iii) Centrifugal section-Sugar crystals are produced by seed treatment.

d) Sugar house section -Sugar is packed in bags in sugar house section and sent to the godown for storage.

D) Godown – The packed bags having 50 to 100 kg. are lifted by the workers on their back who arrange them in stacks. At the sugar industrial workplace a variety of risk for the working population

2. MATERIAL AND METHOD

2.1 study Area:

The present study was carried out in sugar industry at Walwa district Sangli, having 4500 tons crushing capacity per 24 hours.

2.2 Selections of subjects.

For the purpose of present study, ten workers from each of the processing unit or section have been assessed for the study of work physiology and stress effects. The assessment method includes interviews with workers standard questionnaire used to collect information from workers. The physiological evaluations of randomly selected ten workers from each section were carried out. The persons working in the office were treated as control subjects (c).

3. RESULT AND DISCUSSION

Sr.No.	Name of Section.	Symptoms
1.	Cane Yard.	Back pains, throat infection, cough fever at the beginning of the seasonal work, eye irritations.
2.	Engineering	
	a. Mill	Back pains, bodily pains, throat infection, fever, cough at the beginning of the seasonal work, eye irritations, pains in hands and legs, frequent accidents, excessive sweating.
	b. Boiler	Back pains, eye irritations, head ache, excessive sweating, suffocation, throat infection, fever cough at the beginning of the seasonal work.

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	c. Bagasse baling	Back pains, pains in hands, eye irritation, throat infection, fever, cough at the beginning of the seasonal work suffocation.
	d. Power Turbine	Whole body pains, head ache, excessive sweating throat infection cough and fever at the beginning of the seasonal work
	e. Boiling House (Engineering work section)	Back pains, head ache, higher rate of accidents, throat infection cough, fever at the beginning of the seasonal work.
3	Manufacturing	
	A) Boiling house (Manufacturing work section)	
	I. Juice	Head ache, body pains, excessive sweating, worker working near sulphur furnace suffers from eye irritation, palpitation, suffocation. Sometimes sulphordioxide gas spreads in the factory due to leakage and causes eye irritation, suffocation to all the workers working in the factory.
	II. Pan section	Back pains, head ache, excessive sweating, impairment in eye sight
	III. Centrifugal section	Back pains, pectoral pains excessive sweating
	B) Sugar house section	Whole body pain suffocation. Low back pain, musculoskeletal defomities, back pain, severe pains in hands, legs and shoulder, stift neck, eye irritations etc,
4.	Godown section	Low back pain, musculoskeletal defomities, back pain, severe pains in hands , legs and shoulder, shift neck.

ERGONOMICALLY IMPORTANT FACTORS

Awkward Postures during Work

Every workplace has its own collection of “ergo stuff” that just didn't work. Ergonomic and medical experts have identified four key physical risk factors associated with complaints of discomfort in the work environment: awkward postures, biochemical stresses, repetition and force. The first risk factor, awkward posture has to do with how the human body is positioned throughout the day.

In the present study it is observed that in sugar industry workers working in all the sections have to perform various types of jobs viz. rotation of valves of machineries at various sections, baling of bagasse, lifting carrying in sugar house and godown involves movement of body in awkward posture. The workers from these section complained of the body ache, pains in hands, feets, neck, shoulder pains, back pains etc.

Fig.I to VIII shows workers working with awkward posture at various sections of sugar industry.



Fig.I



Fig.II



Fig.III



Fig.IV

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Mill section
Note the awkward working posture of the worker

Fig.V



Pan section
Note the awkward working posture of the worker

Fig.VI

Boiling House (Manufacturing Work)
Rotation of valve, Note the awkward working posture of the worker



Fig.VII



Pan section
Worker Observing stature of sugar crystals. Note the stress on eyes.

Fig.VIII

SAFETY DURING WELDING WORK:

The process of arc welding is constantly carried out in sugar industry as per need during seasonal work as well as off season. The questionnaire survey of the welders from sugar industry revealed the following problems and injuries associated with them.

Welders may be injured by flying sparks or particles of hot metal. The ultraviolet radiations and metal fumes produced during welding may seriously harm the welder's health. The welders handle heavy loads and work in uncomfortable postures may cause trauma and in the course of time, back, arm, hand and leg pain. There are dangers of falls during work above ground and in confined spaces. Eye and face injuries may be caused from flying particles, molten metals, chemical gases/ vapours. Workers are exposed to high noise levels from welding equipment. Welder's flash may result in temporary swelling and fluid excretion of the eye, cataracts from chronic exposure to ultraviolet radiation. Exposure to metal fumes causes metal

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fume fever. Occurrence of pulmonary edema due to high concentration of nitrogen dioxide created by welding processes

Lindqvist T, 1944, Norwood et al. 1966). Metal fumes formed during welding can cause fever (Ross, 1974).

The welders complained about the back pain and other musculoskeletal problems resulting from fatigue due to standing for long periods, sprains due to lifting of heavy machinery or metal products and cramping due to working in vertical, horizontal or overhead position. Wrist elbow shoulder joint pain due to repetitive motion while feeding material.

MANUAL MATERIALS HANDLING (LIFTING AND CARRYING)

The human body can endure considerable discomfort and stress for a limited time to perform many awkward and unnatural movements, but continuing this for a prolonged period may exceed the workers physiologic limitations. It is now recognized that many injuries are a result of the cumulative stress of repetitive lifts of heavy or bulky objects. So now lifts are being adjusted to make it less stressful i.e. by bringing the object close to the body, by lifting only between shoulder and knee rather than from floor or by reducing the weight of load to be lifted or by using the hand barrow.

In present study it is observed that workers working in sugar house section and godown section perform lifting and carrying job. Workers from sugar house have to fill up the bags of sugar from sugar grader. After packing the bag workers carrying these bags having weight about 50 kg. and 100 kg. On 2 wheeled cart up to 20 meter distance to arrange them serially. After serial arrangement workers checks the packing's of bags, lift the bags and deep it on a conveniours which carries it to the godown.

The godown workers lift the bags from conveniours and arrange in stacks. The workers from godown section are continuously engaged for lifting and carrying the heavy bags of sugar. The have to arrange the stacks of the bags in godown and also load the trucks with bags continuously. Working hours of godown workers are about eight hours in shift and most frequently they have to continue the lifting and carrying job for additional two hours.

The questionnaire survey of these workers reveals that they suffer from body ache and muscle pain in general and back pain in particular. The musculoskeletal deformities are very common in these workers. They complain for pains in hands and legs, shoulder pains, stiff necks. The occurrences of slipped disc are fairly common among these workers in age 25 to 35 years.

ACCIDENTS

An accident may be defined as an unexpected unplanned occurrence which may involve injury. There is a possibility of accident in every sphere of human life. Accidents result from the combined effect of physical circumstances and hazards engineered out of working system or human factor which can be influenced by training instruction or supervision. Workers may unintentionally make mistakes, be clumsy, lack concentration or even deliberately take risks. Stresses in the physical environment especially temperature, ventilation, noise inadequate space may all increase the risk of accidents.

In sugar industry there is a risk of accident at various sections. In mill section due to the inadequate space, inadequate illumination as well as inadequately protected working platforms results into falls. An accident also takes place due to burning or explosion at boiler section. Impact or collision accidents also happen due to overcrowding of factory premises and workplace at various sections. Uneven and slippery floors and unsuitable footwear at mill, boilers, boiling house, pan and centrifugal section also results into falls. Some of the accidents also happen due to unskilled workers and lack of concentration of workers. Sometime in the sugar factory heavy object fall from inadequately protected elevated working place or badly stacked materials. Electrical accidents are also caused by failure to provide or maintain efficient earthing for portable apparatus and to ensure that circuits are safe before maintenance work is started. In sugar house and godown section due to faulty lifting and carrying of too heavy and too awkward load increases the risk of accidents. Most of the accidents occur in sugar industry due to double shift of the worker of the time of seasonal work.

SHIFT WORK

In present study it is observed that in sugar industry there is seasonal work and the workers work in rotating shifts e.g. 4.00 a.m. to 12.00 p.m. to 8.00 p.m. and 8.00 p.m. to 4.00 a.m. They have to perform the job in three rotating shifts, after completion of one shift for a week there is a gap of one day and then the worker enters into next shift.

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Questionnaire survey of the sugar industry workers in reveals that, forty percent of the workers reported that their job is extremely stressful; they have a reduced amount of sleep. Workers also complained that they have many physiological, psychological as well as social problems during work season due to shift work.

NIGHT SHIFT

In present study it is observed that in sugar industry during seasonal work there is a rotation of shift and workers have to perform night shift also. The stressful environments of the sugar industry and night work affect the health status of the workers. The questionnaire survey of the workers in sugar industry reveals that workers working on a night shift get two or three hours sleep or even sleep less per day sleep is lighter in state causing the worker to feel less rested and uncomfortable. The losses of appetite, indigestion, acidity, piles are very common problems with these workers. The social and familial life of the worker is also affected due to night shift.

RECOMMENDATIONS

In case of industrial operations in sugar factory unnatural body positions are observed which the result of badly designed work places is. The stressful stooping postures adapted in many sections of sugar industry can be avoided by properly designing the height of the working area. It must be such that the work can be clearly seen (Optional visual distance) with comfortable body posture. The hand grips, levers, tools and other implements should be so arranged on the work place that the most frequent movements are performed with the hands close to the body and with elbows fixed. The greatest power (strength) and skill for the hands occur when they are 25-30 cm from the eyes, the elbow being bent to a right angle and close to trunk. The static work in the pan section during observation of nature of sugar crystal can be made comfortable by making provision of supports for the elbows, fore arms and hands. There is additional circulatory stress due to abnormal working posture.

As it is observed in most of these sections of sugar industry during lifting and carrying of heavy metal parts and sugar bags at a distance and even at height the spine curves like an inverted S. In the thorax it is curved with the concavity forward, the thoracic kyphosis. The lumbar spine, on the other hand is curved with the concavity backward, the lumbar lordosis. This shape of the spine enables the body to absorb strain of heavy weight on posture. Within the physiologic limits body can sustain this strain but excessive load and longer duration of work with heavy work load usually found to give rise to back pains and may cause musculoskeletal disorders such as stiff necks, lumbago, sciatica etc. These disorders are fairly common in workers working in sugar house and godown sections.

The concept of maximum load has become more complex, because in addition to weight lifted and carried other factors such as distance it is carried, the slope involved and total workload of the work shift should be considered. Limits for lifting and carrying loads for man again depend upon the age. It is admissible to carry 30 kg. of load more frequently by the workers between age group 19 to 45 years, whereas occasionally the limits are upto 55 kg. Over a proportionally longer distance upto 25 meters. When age of worker is over 45 years the admissible load/ kg decreases more frequently it is 25 kg. and occasionally 45 kg. In India the limit for maximum weight is 100 kg. In nonorganised sector loads as heavy as 115-135 kgs. are carried manually by an individual worker. Several lifting techniques have been recommended. The most common recommendation is to lift with the back straight and knees bent while using the leg muscles.

Stressful work environment as well as over exertion in the various sections of sugar industry accounts for a large number of disabling injuries. Most of these injuries involve the faulty act of manually handling, falls, striking against objects, falling objects, machinery in motion, trapping of body part and electrical accidents. The hazardous situation compounded by human factor is many times basic cause of accidents in sugar industry. In the present study, it was observed that the rate of accidents was high and thus warrants for the notice. Of course there is no record with the industry about details of the accidents as these were considered minor accidents. One of the significant fact about the accidental process, it was noticed that certain workers are more accident prone than others.

It is observed that millions of people in India work in industries with non-standard schedules. In sugar industry 0.5 million people are involved in sugar industrial activities. In the present unit 120 are night workers and about 400 work in rotating shifts that include night work. Shift work is defined as work primarily outside of normal daytime working hours. Because of concerns about productivity, health and safety shift work scheduling is receiving priority attention in India and outside world. The office of Technology Assessment of the U.S. Congress recently completed study of implications of biologic rhythms on work scheduling practices.

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In the present study it has been observed that upto 30% of workers are unable to tolerate working at night. Shift work is found to oppose the workers endogenous biological rhythms and disruptive to the circadian system, resulting in internal desynchronization. Besides the time of day, another factor that affects performance is sleep deprivation. Shift work affects not only sleep length but sleep quality. The sleep problem of night workers are found to have ramifications for shift work performance, safety and health. Sleep is required for restoration. In the present study workers complain of fatigue, sleepiness, anorexia etc. and in many cases these health problems related to work schedule is a common reason for workers leading to accidents or to give up shift work or even job.

In industrial situations, the workers are exposed to various physical and social conditions which have been found to affect their health and efficiency. Investigators in the field of ergonomics and occupational health have centered their attention in studying the effect of different individual factors as well as the effect of different combination of factors such as work environment, level of physical and mental fitness, age, sex, training, nutrition, work load, nature of manufacturing processes etc. It is well established from a number of experimental studies (Brouha, 1960) that, when work is performed the displacement of physiological and psychological functions from resting level to a higher working level requires an additional energy expenditure. The subjects of present study are found to be engaged in the job for 8 hours in a shift and for longer period of years and they are acclimatized to specific working conditions. Because of poor level of education backward socioeconomic conditions the sugar industry workers accept the available working condition as allotted to them. They have no choice but they have to remain contented with that they have.

High level of clay dust, bagasse dust, sugar dust, high intensity noise, temperature, inadequate illumination, sulphur dioxide gas nitrogen oxides, lime are encountered in sugar industry. The respiratory impairments, hematological alterations increased pulse rate, blood pressure and several non-auditory effects such as interference with communication, disturbance, stress, annoyance etc. are found to affect the performance. Recognizing the adverse effects of occupational hazards due to workplace environmental factors, international labour organization has adopted the conventions concerning the protection of industrial workers against occupational hazards in the working environment. The working conditions and work environment is extremely adverse and it is difficult to maintain approximate level of health status.

Based on the observation of present investigation it is recommended that the sugar industry workers should be protected by proper training of ergonomics. Health and safety standard and regulation must be complied with a proper safety programme for which trained staff is responsible to ensure the safety of the workers.

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