“ERGONOMIC SURVEY IN GARMENT MANUFACTURING INDUSTRIES”

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ABSTRACT

India has a very large hub of garment manufacturing industry. Several reports reveal that the garment industry in India is one of the largest manufacturing sectors. There is continuous upgradation in this sector. Still, several workers like sewing machinists from garment industry suffer various health problems. One of the main problems is musculoskeletal disorder of the neck and shoulder. It has been observed that the working posture and repetitive hand and arm movements are some of the main reasons for these health issues. These causes increase in leave periods of workers, which also cause mental disturbances in workers in turn decreases productivity. This can be dealt with by modifying the workstations in garment industry, which may help in improving workers posture. To improve or modify the workstations of garment industry, a thorough study of this workstation as well as a study of ergonomic issues are very important. Hence the investigation of ergonomic issues becomes a need in a sewing machine workstation of garment manufacturing industries. The purpose of this paper is to describe some of the key areas that influences machinists suffering from several health disorders, includes problems in studying cumulative trauma in garment manufacturing industry. This paper presents findings of the previous research work and various methods for investigating worker's problems. It also discusses some of the possible solutions which suggests ergonomic controls and preventive measures for these issues. This may be very useful for improving the operator's working postures, which may help to reduce the incidence of musculoskeletal disorders by eliminating or reducing exposure to the associated risk factors.

KEYWORDS: Sewing machine, Garment industry, Musculoskeletal disorders, Ergonomic Issues, Working postures.

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I INTRODUCTION

In India, there is a huge scale production of Garments as per population requirements. Textile industries rapidly growing and developed in the past 10 years. In industries, sewing machine operators plays important role in the manufacturing of garments. There are several repetitive work postures in this field. Due to the postures consistency, operators suffer from various health problems resulting in low efficiency in work, increment in sick leaves, unsatisfactory environment during working, increment in cheat breaks during working, altogether resulting in low productivity. Therefore it is necessary to reduce the fatigue of workers while working by investigating their problems regarding workplace, working postures, working environment health issues etc. Expel them from the unsatisfactory environmental traumas by counseling them as per the requirement, need to encourage them for working in a pleasant environment, need to give the comfort zone in which they could be work. Relative to this, the paper gives the review of research work on sewing machinists, their postures, and their problems, musculoskeletal disorders that they suffer from, probable remedies and the outcomes by using remedial techniques.

For the development of new buildings and plants factors like Ergonomics factors, social and environmental considerations are very necessary [1]. In previous days the sewing machine operator's work was more monotonous and intensive than seamstresses because it was divided into two short work cycles [2]. Workplace exposure facilitates the identification of high stressful work elements. It is also an important tool for the epidemiologic study of occupational musculoskeletal disorders and their risk factors [3]. A hydraulically adjustable chair was developed to evaluate comfort and biomechanical factors relevant to the design of a chair for industrial sewing operations [4]. A newly developed work seat was compared with a traditional sewing work seat to evaluate the effectiveness of design features for industrial sewing operations by considering a user comfort and acceptance experiment which compared the initial psychophysical responses of 50 industrial sewers when introduced to the new seat, a backrest usage experiment which compared the duration of backrest use among 10 industrial sewers and a follow-up experiment to evaluate chair preference after extended use of the new seat [5]. Ergonomic redesign of sewing machines is indeed to address knee and upper-back movements, the arm, wrist, and finger movements [6]. The symptoms may be resolved completely if the relevant work conditions are altered appropriately or the affected one avoids repetitive work for a brief period. Due to continued exposure, the condition may arise to an intermediate stage where recurrent pain may occur throughout the day which may persist after work also. Because of this working capability may be reduced [7]. The Nordic Ministry Questionnaire directs the neck-shoulder complaints which showed a prevalence rate of last 12 months of 75% and the last seven days a rate of 51%. It also shows that daily problems experienced were 26%. And some 27% had problems with restraints in work time and 37% in leisure time. Diagnoses were made according to specific criteria [8]. It is recognized that workers with Repetitive work tasks, or those maintaining fixed postures for long periods, have more problems. Most of these studies have been focused on the detrimental health effects of the work situations, whereas little attention has been given to the considerable heterogeneity in response to the work strain [9]. Guidelines are available for practitioners who want to examine the profitability of ergonomic solutions or to increase the reliability of investment appraisal with respect to ergonomics in the workplace [10]. The study deals with a clinical investigation of random samples of sewing machine operators and nurses and home helpers [11]. Also from the study, it describes that shoulder pain syndrome may be experienced by employees across a broad spectrum [12]. More relevant information on the neck upper extremity status of a working female population can be obtained by the questionnaire approach [13]. Some authors present the range of musculoskeletal disorders in a sample involving highly repetitive work as a precursor which determines relationships between work exposure and musculoskeletal health of female workers in industries [14].

A cross-sectional study of the neck and upper limbs were conducted in which 82 currently working female from industry with exposure to repetitive work tasks were examined physically [15]. It is also evident that sewing machinists always suffer from musculoskeletal problems, which have been attributed to poor working postures as well as to repetitive hand and arm movements. Their posture is constrained by both the visual and the manual aspects of the task [16]. The study examined the risk potentials and pattern of accidents amongst the shift workers and permanent night workers in textile industries [17]. Musculoskeletal disorders are the most common illness in the UK, while upper limb disorders ranking second only to back complaints [18]. Human responses to the environment are much known, it is only with the development of ergonomics as a discipline that the unique features of environmental ergonomics are beginning to emerge [19]. Ergonomics is defined as a discipline in its own right, as the theoretical and fundamental understanding of human behavior and performance in purposeful interacting socio-technical systems [20]. Ergonomics is the science or study of work, and as such it must accurately reflect what type of work to be done [21]. Nowadays, researcher proposes an

alternative IP integer programming models for solving the layout problem in the fashion industry [22]. The current understanding of work-related neck and upper limb musculoskeletal disorders (WRULDs) within European Member states, the coherence of the literature on the mechanisms of WRULDS Nelly, the strategies available to prevent these disorders [23]. Sewing machine operators commonly experience problems in their necks, shoulders, hands, arms, backs and knees. The various studies showed that symptoms may be minimized by modifying the workstation surface [24]. At a traditional sewing machine workstation, operators worked at ten different combined adjustments of table height, desk slope, and pedal position [25]. The musculoskeletal disorder may be reduced economically by improving materials handling and workstations [26-28]. Ergonomics has played important role in the technical cooperation activities of the International Labor Organization (ILO) in occupational safety and health in industrially developing countries [29]. Also, some researchers studied ergonomic aspects in an export garment manufacturing plant in South East Asia to evaluate the working conditions of the plant from an ergonomics/human factors perspective and to suggest possible solutions to management for implementation [30]. It is also important to note that, the workers work in a seated position for 7 to 10 hours per day and to ease their work an adjustable chair is also designed [31]. It is also very important to note that the study shows that musculoskeletal pain in the neck/shoulder region for some workers was 24% and for distal upper extremity it was 16%. Elevated prevalence of upper body pain was associated with age less than 30 years [32]. MSD in workers affects a significant portion of the workforce [33].

II PROBLEM STATEMENT

Literature survey shows the garment manufacturing industry workers suffer from multiple types of disorders due to improper posture and repetitive body motions during working. Due to that, there is a work dissatisfaction between the workers. The disorders are of the following categories.

- A. Mental trauma
- B. Headache
- C. Neck and shoulder pain
- D. Upper limb disorder
- E. Wrist pain
- F. Back pain
- G. Knee pain
- H. Ankle pain
- I. Elbow pain
- J. Joint swelling

There are some reviews from different literature on the types of disorders are as follows:

Neck or shoulder and lower limb disorder complaints [2]. Arms pain found in several workers [3]. Knee pain, neck and back pain, joint ache, back injury, joint swelling, and joint pain variables all suggest the presence of the healthy worker effect, based on internal comparisons of years [6]. Muscle problems of the neck and legs; problems of the tendons and tendon sheaths of the fingers, thumb, forearm, elbow, and shoulder; muscle strain of the neck; nerve entrapment

disorders of the median, ulnar, or radial nerves at the level of the wrist, forearm, or elbow; and nerve entrapment at the level of shoulder/brachial plexus or cervical nerve root were found [7]. People between the ages 35 to 55 have consistent complaints of neck and shoulder pains which are common with increased muscular tension and mental symptoms [8]. The shop floor workers found more symptom cases of muscular pains -than the mob with more wide-ranging work tasks for the upper body but not for the low back, hips, and legs [9]. Neckline and collar bone pain, particularly about severe muscle symptoms found [11]. Cumulative trauma illness, Shoulder pain, Tendon-related disorders were observed [12]. Neck, shoulders, elbows and hands pain complaints were reported [13]. Workers are found with Continuing upper arm musculoskeletal disorders and repetitive stress damages [14]. Muscle pain in the different parts of the body causes work incapacity between operators [15]. Due to consistently seating in one position for work, machine operators experience musculoskeletal problems [16]. In textile industries, it found that there are common risk factors and repetitive hazards to the workers who had shift work [17]. In the twentieth century, work-related diseases have become the swearword in the UK, musculoskeletal problems being the most common self-reported occupational and the most recurrent form of industrial illness [18]. A wide range of industrial musculoskeletal conditions and progressive diseases observed. These conditions result in pain and efficient damage and may affect, other parts of the body like upper arms, neck, shoulders, elbows, forearms [23]. The Garment industry workers consistently experience difficulties in their necks, shoulders, arms, hands, and backs and at the same time, in the lower legs like knees [24]. Workers reported symptoms of neck, ankle, feet and wrist pain [27]. The frequency of job-related musculoskeletal disorders has been high due to sewing machine work [30]. Work station design of seating arrangement affects the postural pain of the operators in garment industries [31]. A study reported that the nature of the job, amount of work, time and frequency of assignments in work organization contribute to work-related musculoskeletal disorders (WMSDs)[32]. Study shows that work capacity affected by muscle problems and continues a big form professional ill health [33]. A survey found that severe musculoskeletal pain in the upper body portion [34].

III WORK METHOD

To collect the necessary data regarding various disorders that workers were suffering from, the authors apply various evaluative tools that sewing machine operators could feel free to talk as well as perform the work during task analysis.

The working survey was done by random sampling with questionnaire[2]. Work analysis was done by using the count of population, measures of postures, measures of repetitiveness, Biomechanical work analysis[3]. Dependent and independent variables were found out for the preventive solution[4]. Some surveys contain different comparative studies associated with seating as (1) When new seating arrangements are introduced, acceptance and comfort of user compared with initial psychological responses of industrial workers (2) Few industrial sewers compared with a backrest usage experiment for different durations (3) a follow- up experiments were there for found out the seat preference after beneficial use of the new chair [5]. Analysis is done by questionnaire, population, controls and statistical methods [6]. Review of the previous studies and validity of assessment studies [7]. Exhaustive poll about segment, professional, clinical and psychosocial information collected for the different 224 sewing machine operators [8]. Analysis is done with questionnaire related to work task variables, Health related and background variables[9]. 107 members went through the assessment comprising of (1) an overall wellbeing assessment; (2) a complete study of the neck, shoulder and arm; (3) investigation about wellbeing and work history; (4) a second assessment of the neck and the upper appendage; (5) a research facility assessment, including routine blood test and evaluation for thyroid and chronic infections; (6) standard radiographs of the

cervical spine and the shoulders; and (7) a mental assessment containing organized investigation [11]. Different types of shoulder disorders were studied by literature review [12]. During the clinical examinations, sewing machine operators reported some complaints in the questionnaire [13]. Clinical examination was done with ergonomic evaluation [14]. The examination remembered visits to the working environment for request to get to know the distinctive work circumstances. A tape recording of the work performed was made of the modern (electric get together) working ladies [15]. Estimations were made of workers while they worked at the updated sewing machine under various conditions of sewing machine orientation [16]. The questionnaire was on work accidents included information on the organization [17]. Wealth of information, as working environment reviews, contextual analyses, physiological demonstrating and narrative proof that point the way towards which components may add to which problems [18]. feasible sewing machine changes were created from surveys of existing records, just as interaction with sewing machine makers and wholesalers, association delegates, and businesses [24]. In the research center ten arrangements of trial conditions were tried. Working position and workers skills were estimated [25]. Upgrades in materials taking care of and workstations attempted inside a Work Improvement in Small Enterprises (WISE) project [26]. Data collected by questionnaire, interviews, and observer [27]. The survey was done by an interview and by studies and measurements in the workstation [30]. In the investigation, the specialists assessed the successful work of the uniquely designed seat in contrast with two more conventional seats - movable tallness, level seat dish seat, and a fixed-size, level small seat ordinarily utilized by sewing workers [31]. Interviews conducted on muscle pain symptoms, personal factors; and work-station contents including physical and psychological strain people [32]. Minimum 250 workers were interviewed for neck/shoulder pain in a 4-month for musculoskeletal disorders [34]. Cross-sectional study was conducted, work environment evaluated, work station observed and information was collected about work culture, age, education, chronic illness [35]. Analysis of factory workers MSD problems by observations and Questionnaire [36]. The stockroom, quality control, fabric cutting and production departments were studied and these departments were evaluated by taking their photos [39]. In Sri Lanka, sampling study was carried out for some female sewing machine operators with discomfort analysis by Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) and also the Rapid Entire Body Assessment (REBA). [40]. The study shows repetitive work-related musculoskeletal disorders (WMSDs) symptoms spread among the sewing machine workers and female candidates was more affected [41].

IV PREVENTIVE MEASURES

To prevent cumulative trauma disorders, different strategies are required which helps in reducing such disease and its effects. To prevent this, some measures may be ergonomics design changes (particularly related to tools), changes in workplace practices, and the development of measurement methods to quantify the risk potential of different activities. These three areas are discussed further.

Design of an experimental chair having adjustment of the following features: height of the seat, seat angle, seat rocking, seat swivel, back-rest distance, back-rest height and back-rest angle [4].

The new seat may be designed such that it will have a special seat-pan and backrest which may accommodate the musculoskeletal geometry of a low sit-stand posture. 15° downward angle, resulting in a 105° trunk- thigh angle can be the better choice to avoid the above problems.

The backrest of lumbar support preserves the lumbar lordosis and thoracic support. This may support the upper back during backward leaning [5]. Modification of the sewing workstation is one of the best ways for improving the operator's comfort [16]. Preparation of the principles, methods and models used for environmental ergonomics is provided

in terms of the effects of heat and cold, vibration, noise and light on the health, comfort and performance of people [19]. Understanding ergonomics and its use in the system is very important [20].

On a traditional adjustable sewing machine workstation, the operators performed their normal sewing task in with fixed time followed by breaks of 15min [25]. Reduced continuous task time, reduction in muscular activities were found [26]. Ergonomically designed workstation provides the balance between worker's capabilities and work requirements which the worker's productivity also [28]. Solutions on MSD can be provided mainly by using chairs with backrests, floor mats, adjustable (which may tilt) worktables, implementing safety awareness programs for workers, and creating a happy environment with background music [30]. Also, a chair with adjustable height having a forward sloped seat pan which helps in reducing pain and loss of trained workers due to impaired health [31]. Preliminary analysis, diagnostics steps, solution development steps are introduced [33].

Observations are noted by RULA (Rapid upper limb assessment) method [35]. Ergonomic evaluation can be done by gathering data and information which can help in identifying and reducing the risks factors [37]. Ergonomic up-gradation can be done by adopting the (GVC) global value chain [38]. Adjustable tools are always recommended. Height of the chair or working table should be adjusted according to the anthropometric dimensions of the employee. To avoid tiredness and illness of human, Sutton systems should be designed. Thus, importance should be given to design the work stations and systems correctly and for ergonomically effectivity. Working positions like standing and sitting positions should be changed frequently [39].

V CONCLUSIONS

The review from the several studies in Garments manufacturing industries sewing machine operators that suffers from Musculoskeletal disorders (MSD) and related diseases due to repetitive tasks as well as the improper workplace design. The risk factors remained similarly important when the data were adjusted for age. The large variety of tactics such as questionnaire, talks, visual analysis, job analysis, anthropometric data, and various software's are used to collect necessary results. Also decoding this material into a requirement of other workplace plans. The previous design information combines with various tools to generate some parameters for redesigned the workplace. Resulting in that the Workers get good seating arrangements at the workplace and that the seated workers feel relaxed at their jobs.

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