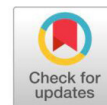


A review on Occupational Health Problems in Carpet Weaving

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Abstract

Plastics have become ubiquitous ever since their introduction into our environment in the 1950s. It is currently extensively used in our day-to-day life. Various properties of plastic, its functionality, and relatively low cost make them a preferred choice for the creation of a wide range of products. Today it is very difficult to imagine life without the use of plastic products in one or the other form. Even agriculture cannot be excluded from the use of plastic products. Various modern agricultural practices employ a wide range of plastic products like mulches, irrigation pipes, etc., to help improve productivity. Although initially the use of plastic was intended to make life easy for humans but gradually due to its extensive use it has started becoming a problem for the environment. The properties that make plastics so useful, concomitantly create problems for the environment when they reach the end of their intended lives. Due to the use of diverse polymers and additives blended into plastic sorting and recycling becomes more difficult also being a man-made polymer, it can only be degraded by very few microorganisms. This results in plastic remaining persistent in the environment for many decades once they enter it. As the world's demand for plastics increases, leakage into the environment also increases thereby hindering efforts to mitigate environmental contamination. Once they enter the environment plastic can cause harm in several different ways. The adverse effect of large plastic polymers is very well documented in various studies conducted on the marine environment but when these large polymers degrade their impact becomes more adverse as it starts not only individuals at the cellular level but also potentially the entire ecosystem. Thus the current review is intended to stimulate a discussion on making use of plastic products in agriculture only where they are very essentially required keeping in mind their hazardous effect on human health as well as the environment. It also aims at transforming the agricultural production system and achieving sustainable food security without compromising the health of the ecosystem.

Keywords: Plastic, agriculture waste, microplastic, ecosystem, health hazard.

Introduction

Carpet weaving is a sedentary [1] long-winded profession and requires long hours of static work [2]. It is also a high-risk occupation for developing MSDs as awkward posture, repetitive movements, contact stress, long working time and no rest pauses are common [3]. McCann [4] divides health hazards in the carpet industry into two categories, namely ergonomic risk factors and toxic chemicals.

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In order to produce a carpet, one or more weavers work on a loom. In fact, the number of required workers depends on the size of the carpet. A loom is a frame within which the carpet is made, and also the warp is tightened. Looms are applied to hold the warp threads under tension so as to facilitate the interweaving of the weft threads [5]. Looms are the most important element of the weaving operation. They are divided into two types: horizontal and vertical [3]. Pit loom weaving weavers have to sit continuously on a hard floor without any support and there was not enough depth for free leg movement in the pit, which leads to work in fixed postures for a longer duration which causes discomfort and stress in leg muscles and also in lower body parts. In the entire weaving process, weavers have to use their hands repetitively without breaks for throwing shuttles and moving reed frames. This repetitive movement of the hand increases the

risk of musculoskeletal problems of the neck, upper arm and shoulders, as they operate heavy reed frames continuously without taking adequate breaks. During this process, weavers worked in awkward and constrained postures with cervical vertebrae in forward flexion and which leads to long-term health hazards[6].

Vertical looms are recognized as being safer than horizontal ones [3], but there are more ergonomic defects in many parts of vertical looms [7]. While working on Vertical looms weavers have to sit on the ground or on a piece of lumber [1]. Repetitive work engagement for a long time would increase the intensity of pain and would lead to repetitive strain injury [8]. With this background, a review study was conducted to have an insight into the occupational health problems experienced by the workers in carpet weaving.

Methodology

Data was collected completely from secondary sources of data. Various articles have been reviewed from J-gate, and Research gate from Google. Keywords were used to identify the appropriate literature.

Results and Discussion

Occupational health problems of carpet weavers

Environmental hazards: Carpet weavers are exposed to extreme environmental conditions which is having an impact on their health [9].

Inadequate lighting

Carpet weaving operation is considered as precision work, for the knots are very fine and close together, and color recognition is of vital importance. Such operations require adequate lighting both qualitatively and quantitatively. In many weaving workshops, lighting is not adequate, which results in considerable eyestrain. Inadequate lighting and eye strain cause eyesight disorders among weavers [10]. Choobineh [1] measured the average illumination level in 1,020 weaving workstations. He found inadequate illumination with an average of 286 lx ($SD = 290.7$) in the weaving workshops studied. Besides eyestrain, insufficient lighting results in an awkward posture, for weavers incline their heads, necks and backs to be able to look closer at their work.

Contaminated ambient air

Weavers are constantly exposed to fine cotton, wool, and other fiber dust generated from the weaving unit. Lack of fresh air in the weaving workshop and the presence of wool fibers together with bioaerosols in the ambient air can result in various lung diseases and a reduction in respiratory vital capacity. Inhalation of this dust compromises their lung function greatly. Occupational exposure to cotton dust has been a great threat to respiratory function. Cotton weaving causes excessive development of fine dust of cotton. Continuous exposure to this fine dust over years has caused a threat to lung function. Reduction in lung function is directly proportional to years of exposure to cotton dust. Rajsri et al. [11] concluded that cotton dust inhalation accounts for a substantial decrease for lung function.

Goel and Tyagi [6] mentioned that weavers won't clean their rooms and looms/machines regularly, therefore lots of fiber dust was accumulated in the loom and parts of the looms i.e. reed, heddle frames, wires etc. Also they observed that in some of the houses ventilators were made but due to lack of cleaning they were choked with dust and fibers. Therefore lack of proper ventilation in their working area exposed the weavers and their family members to the contaminated fibers with biological agents (bacteria fungus). It may result in respiratory exposure of these contaminants and skin infections.

Physical Hazards: These are caused by having contact with any object or element in the workplace. It can be related to hot or cold stress, ergonomic hazards etc.

Awkward posture

Awkward postures refer to positions of the body (limbs, joints, back) that deviate significantly from the neutral position while job tasks are being performed. Chantaramanee et al., [12] reported that the average RULA score of each weaving type was found equal to the average RULA score of all weaving types: $6.80+0.41$ points, with the minimum score at 6 points and the maximum at 7 points, which explains the high risk that should be carefully analyzed to improve the workstations immediately. All three weaving (traditional, teen chok and kikatook weaving) types with awkward postures included shoulder abduction, shoulder flexion, wrist flexion; bent and twisted, neck flexion; twisted, and lateral bending, trunk twisting, and static or dynamic posture, caused pain as a result

of weaving. Due to poor design of hand tools, weaving workstations and looms, postures of the neck, back, shoulder, upper and lower arms, wrists and knees are deviated from a neutral position and are harmful. Muscle fatigue analysis, assessed by Vijaya Lakshmi et al., [13] revealed that both left and right regions of the body are at risk due to the prolonged static postures while performing various activities related to weaving.

Contact stress

Contact stress results from occasional, repeated or continuous contact between soft body tissue and a hard or sharp object, such as workstation edges, tools, machinery, products or the floor. Contact stress commonly affects the soft tissue on the fingers, palms, forearms, thighs, shins and feet. This contact may create pressure over a small area of the body, such as the wrist or forearm, that can inhibit blood flow, tendon and muscle movement, and nerve function.

Contact stress may lead to musculoskeletal disorders (MSDs) when tendons that are being used or nerves or blood vessels in vulnerable locations are compressed. Contact stress can restrict the movement of the tendon, which will then require greater effort and could result in inflammation of the tendon and surrounding tissues. Contact stress that pushes sharply into deeper tissues may also reduce blood flow and result in early muscle fatigue. Tissue that is compressed for prolonged periods of time may be damaged. Nerves that are exposed to contact stress in multiple sites are especially vulnerable. The problem becomes worse with extended or repeated exposure and when tasks require forceful exertion [14]. In carpet weaving, weaver's hands and fingers has bear contact stress because of poor design of hand tools and inappropriate material used in their structures and which may cause injury of hand soft tissues[3].

Lack of rest-pause

Daily working time in the carpet industry is not usually fixed: it varies depending on the situation and workload. Motivation towards earning more money causes weavers to work longer. Weavers not having scheduled working time, and usually, weavers work continuously for a long time without rest pauses. This causes prolonged exposure to occupational risk factors and increases risk of disorders.

Toxic hazards

Some dyestuffs used in wool preparation are toxic (e.g., chromate-based chemicals). Skin exposure to such toxic chemicals causes skin diseases and dermatitis. Biological agents such as anthrax bacillus can enter the body and produce infectious skin diseases, as well.

Choobineh et al., [3] also reported that an awkward leg posture could be a reason for injury, swelling, and pain in the weavers' lower extremities. Further, they analyzed that musculoskeletal symptoms in thighs, knees and legs were significantly more prevalent among those who worked in those non-neutral or dangling leg postures as compared to those with well-supported legs. In addition, insufficient legroom causes weavers to be in a constrained position without the possibility to move and results in posture fixation. Posture fixation causes the worker not to be able to vary posture and reduce fatigue and can be very uncomfortable and fatiguing [15] [16].

Wrist, hand and finger pain are the other prevalent WMSDs among weavers. Mazloomi [17] declared that the prevalence of skeletal pain among weavers was 36.5 percent. Most and the fewest complaints were related to the back and neck, respectively. Alamanos et al., [18] showed that there was a statistically significant association between the intensity of symptoms from the extremities and the shoulder-neck region and the number of years of working at the loom. In this study, the prevalence of musculoskeletal symptoms among women weavers were 46 percent for the back, 33 percent for upper extremities and 24 percent for lower extremities. Das et al., [19] also reported ergonomic problems such as back pain and joint pain among Indian weavers. Hand-made carpet weavers were exposed to varying degrees of repetitive and forceful hand and wrist motions and they appeared to be at increased risk for the development of the hand and arm musculoskeletal symptoms and carpal tunnel syndrome (CTS) [20].

The number of studies conducted on work-related musculoskeletal disorders (WMSDs) in the carpet industry in comparison to other areas is relatively high. According to Nazari et al., [7] Chantaramanee [12] and Sarkar [21], the most prevalent musculoskeletal disorders among handloom weavers are knee pain, back pain and joint pains due to prolonged sitting and poor sitting postures. Safety measures were not practiced by the weavers. However, no gender

difference was found in terms of health issues faced. Handloom weavers had adopted different sitting postures such as forward flexed, uprights and side bending etc., while performing the weaving activity. Poor working postures, type of handloom, rest and daily working hours were directly associated with the prevalence of musculoskeletal disorders among weavers. Ill-designed weaving workstation was the most important factor which causes musculoskeletal disorders [22].

Conclusion

Based on the studies conducted on this area, it can be stated that carpet hand-weaving is a high-risk occupation as it develops various types of occupational health problems, respiratory disorders and their complications. Poor environmental conditions coupled with unhygienic conditions have been found the reasons for developing such types of disorders. Lack of awareness among the weavers deteriorates already existing problems in the carpet industry. Most of these diseases and health problems found in the carpet industry can be avoided by proper precautions and care. There must be some provision of protective equipment e.g. face masks, first aid facility, gloves and proper uniforms for the protection of workers. The ergonomic shortcomings can be overcome by proper workstation design and ergonomically designed hand tools. Hence further research has to be focused on designing and developing interventions for weavers to reduce occupational health hazards.

Conflict of interest: Nil

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