

# Health Effect of Prolonged Standing at Work & Its Control Measures: A Review

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**Abstract** – Many nations significantly depend upon manufacturing industries. Manufacturing Industries depends upon their employees. Ergonomics at work is now became essential part of day-to-day work which directly / indirectly depend upon quality & quantity of work done by any person. Pain is a very common and disabling condition among industrial workers. Most of the industrial workers lost productive time due to pain which reduced performance of the worker. The use of ergonomic is considered a critical means to alleviate the pain associated with standing work and, as a result increase in quality & quantity of productivity. This paper is a review of person working in manufacturing industries. This type of study is important that concern the shop floor worker working in a prolonged standing position on a regular basis. Prolonged standing can cause sore feet, swelling of the legs, varicose veins, general muscular fatigue, and low back pain, stiffness in the neck and shoulders, and other health problems.

**Keywords** – Ergonomics, Prolonged Standing, Kinesiology, Health effect of Prolonged Standing, Control Measure to reduce health hazard of Prolonged Standing, Engineering Control to reduce health hazard of Prolonged Standing, Administrative Control to reduce health hazard of Prolonged Standing.

## 1 INTRODUCTION

Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance. [09]

Standing position is most suitable position among industrial workers at work. Most kind of job in manufacturing industry does not permit the worker to perform the job in sitting position. While performing or working, workers need adequate degree of freedom especially operating large machine and huge workpieces, reaching of materials and tools, and pushing and pulling of excessive loads.

Working in standing can be considered as most suitable & natural position because the mobility of legs having large degree of freedom. However, when workers spent prolonged time in standing position throughout their working hours (more than 50% of total working hours), they might feel discomfort and experienced muscle fatigue at the end of workday, it will vital contributor to decrease workers performance in industry. Prolonged standing posture can cause many temporary as well as permanent health effect which include but not limited to sore feet, swelling of the legs, varicose veins, general muscular fatigue, and low back pain, stiffness in the neck and shoulders, and other health problems.

## 2 HEALTH EFFECT

Millions of workers in the India have suffered from injuries due to prolonged standing, and resulted billion days sick leave a year. Worker who performs processes jobs in prolonged standing posture can cause many temporary as well as permanent health effect which include but not limited to discomfort in the legs, sore feet, swelling of the legs, varicose veins, general muscular fatigue, and low back pain, stiffness in the neck and shoulders, and other health problems.

### 2.1 WORK-RELATED MUSCULOSKELETAL DISORDERS (WMSD)

Work related musculoskeletal disorder (WMSD) is a common health problem throughout the industrialized world and a major cause of

disability. WMSD are conditions of the nerves, tendons, muscles, and supporting structures of the musculoskeletal system that can result in fatigue, discomfort, pain, local swelling, numbness, tingling, joint compression, etc... WMSD usually develop from accumulative impairment resulting from prolonged exposure to excessive levels of physical as well as psychosocial strain at work. The major risk factors for WMSD in the workplace include but not limited to: Heavy manual handling; Repetitive and forceful actions; Vibration; Awkward static postures that arise from badly designed workstations, tools, equipment, working methods; Poor work organization. [04] [05] [10] [11] [12] [13]

## **2.2 POSTURAL KYPHOSIS**

Proper posture is often referred to as a "neutral spine", Postural kyphosis is improper posture or a "non-neutral spine". Postural kyphosis is the most common type, normally attributed to slouching, can occur in both the old and the young. In the young, it can be called 'slouching' and is reversible by correcting muscular imbalances. Often prolonged working with improper posture with non-neutral spine regularly can cause Slouching in workers. [10]

## **2.3 VARICOSE VEINS**

Veins that have become enlarged and twisted, especially within the legs, ankles and feet of an effected individual called Varicose Veins. Varicose veins have also been associated with chronic heart and circulatory disorders and hypertension as well as complications related to pregnancy. Among the working age population one out of five hospitalizations from varicose veins are as a result of prolonged standing. Prolonged standing leads to impeded blood flow and stasis in the veins in the lower limbs, which can cause varicose veins. [06] [10]

## **2.4 CAROTID ATHEROSCLEROSIS**

Standing for prolonged periods can lead to certain cardiovascular disorders. Prolonged standing at work significantly associated with the progression of carotid atherosclerosis in men. Prolonged standing can change the distribution of blood in the extremities. This in turn causes the blood to pool and reduces the circulating blood plasma volume leading to hemodynamic changes that impact the body and it can influence the progressions of carotid atherosclerosis. Atherosclerosis can lead to coronary artery disease, carotid artery disease, peripheral artery disease, and aneurysms. [03] [06] [07] [08] [10] [15]

## **2.5 JOINT COMPRESSION**

Prolonged Standing places significant pressure on the joint of the hips, knees, ankle and feet but without any significant movement of it. This reduces the normal lubrication and cushioning of synovial joints, causing them to wear and tear. [10]

## **2.6 MUSCLE FATIGUE**

Muscle Fatigue is the most disabling condition (around 1/3rd of all worker injury and illness as per OSHA) among workers. Muscles kept in a constant stress position quickly become exhausted and can result in pain and swelling in the lower back, legs, ankles and feet. Prolonged standing experiences muscle fatigue which persists short period of time at end, this might differ person to person. [02] [10]

## **2.7 PREGNANCY**

Prolonged standing increase risk for high blood pressure, spontaneous abortion, preterm birth, low birth weight among working pregnancy women. [01] [12] [10]

## **3 CONTROL MEASURES**

Researcher use many control measure to reduce health hazard due to prolonged standing. These control measures can broadly classified in Engineering Control & Administrative Control. These ergonomic practices not fully but somehow found to be effective to reduce health hazard due to prolonged standing. Prevention is better than cure. Control the Hazard of prolonged standing need to be treated as a priority so that related injuries can be eliminated or minimized further prevent permanent injury. [07][08][13][14][15]

### **3.1 ENGINEERING CONTROLS**

Control of Hazard of Prolonged standing using engineering technique is called Engineering Control. Engineering Control includes, but not limited to, providing Ergonomic Flooring, Ergonomic Footwear & Ergonomic Workstation. Research shows these techniques are effective but unable to fully eliminate Hazard of Prolonged Standing. [07][08][13][14][15]

### 3.2 ADMINISTRATIVE CONTROLS

Where Engineering Control difficult to be implementing, Administrative Controls are used to minimize the Hazard of Prolonged Standing. Administrative Control includes, but not limited to, work-rest scheduling, arrange work such as worker could not adopt one posture long time, providing rest intervals, Training & Education about Good body posture & Ergonomic way to acquiescent fatigue etc... Experts suggest to move around and change positions throughout the day. It is best not to sit in one position for more than 20 minutes, or to stand in one position for more than 8 minutes. Research shows that Administrative Control is more effective than Engineering Control, to control the hazard of prolonged standing. [07][08][13][14][15]

### CONCLUSION

Based on review of the literature, it can be concluded that performing jobs in prolonged standing has contributed numerous health effects such as Work-related Musculoskeletal Disorders (WMSD), chronic venous insufficiency, Postural Kyphosis, Varicose Veins, Joint-Compression, Muscle Fatigue, Problem in Pregnancy, Preterm Birth, Spontaneous Abortion, and Carotid Atherosclerosis. However, those injuries can be minimized through application of engineering and administrative controls. Developed Nations more concern on Ergonomic at work than developing nations. Ergonomically design work spaces are more prevalent in Europe & America Region. Developed Nations have work spaces design anthropomorphically for their region but not such case in developing nation. Developing nation's industrial workers lack ergonomic knowledge & good body posture during working

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