Journal of Ergonomics

Kim, J Ergonomics 2016, 6:3
DOI: 10.4172/2165-7556.1000e153

Editorial Open Access

Accidents and Accident Prevention in the Agricultural Industry: Ergonomic Engagement

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Received date: April 28, 2016; **Accepted date:** May 18, 2016; **Published date:** May 20, 2016

Introduction

The agricultural industry is known to be one of the most important sectors worldwide, in terms of not only supplying foods but also employing a number of workers [1]. However, the agricultural business is considered as one of the most hazardous sectors in both developing and developed countries with high rates of accidental deaths, injuries, and work-related illnesses [1,2]. Agriculture is a physically demanding and places farmers and farmworkers at potential risks of musculoskeletal disorders (MSDs). For example, lifting and carrying heavy loads; working with periodic trunk bending, risking from trips and/or falls on slippery and/or uneven walkways, exposing of accidents due to volatile actions of livestock, and uncovering to whole-body vibrations from farm vehicles and hand-transmitted vibrations from chain saws and powered hand tools are amongst the many physical hazards and stressors reported in the agricultural industry safety and health issues [3].

The physical circumstances of agricultural profession leave farm growers potentially vulnerable to MSDs such as osteoarthritis of the hip and knee, low back pain, upper limb disorders, and hand-arm vibration syndrome, as well as to the consequences of trauma such as sprains, fractures, and dislocations [4,5]. In addition, there is evidence to suggest that farmers and farmworkers may be more susceptible to other rheumatic diseases such as rheumatoid arthritis.

However, gradual inception or intermittent time course may difficult to identify attribution of the symptoms in the individual case, leading to potentially under- or over-estimate the number of work-related MSD (WMSD) cases. Epidemiological evidence also signifies that working in the agricultural and farm industries causes or aggravates WMSDs and estimates the likely scale of risks amongst farmers and farmworkers. Therefore, it is essential to concern the application of practical actions in the agricultural settings to reduce and prevent work-related accidents, injuries, and illness, and WMSDs in particular.

Injuries in Agricultural Industry and Ergonomic Intervention

Working in agriculture workplaces

Agricultural works have not much changed in their job styles over the long years [6]. For example, farm works generally involve intensive physical activities such as crop planting and harvesting, animal husbandry and insect raising, basic processing of farming and animal products as well as handling and maintaining appliances, equipment, machinery, tools, and farming installations, which are conventionally related to agricultural productions [6].

Ground works are still conducted by awkward positions such as bending, curving, and twisting. Farmers and farmworkers carry heavy weights, frequently go down their knees, and work with their arms above the shoulder level, or move their hands and wrists repetitively. These postures certainly result in fatigues, illness, and accidents.

The whole body is also irregularly subjected to vibrations from farm machinery and tools. As a result, farmers and farmworkers suffer backaches and pains in their shoulders, arms, and hands more than any other health problem. One-third of the injuries that cause farmers and farmworkers to miss their farm works are sprains and strains, and a quarter is back injuries [7]. These injuries are also the most common causes of disabilities amongst the farmers and farmworkers.

Work-related disorders, especially low back pains, and musculoskeletal problems are prevalent amongst farmers and farmworkers [8]. However, many employees in the agricultural industry may believe that these kinds of tasks are normal and the resulting injuries such as sprains, strains, and back pains are just an unavoidable part of their farm works. However, such injuries and accidents from the agricultural workplaces are largely preventable and can be significantly reduced by the development of safety programs and intervention systems.

Musculoskeletal disorders in agricultural industry

The literature has reported that there are numerous types of WMSDs in the agriculture industry. These include illnesses of the back and neck, epicondylitis, nerve entrapment syndromes, peritendinitis, tendinitis, tenosynovitis, and non-specific muscle and forearm tenderness [9]. However, the majority of musculoskeletal problems from the farmers and farmworkers is non-specific and lacks a well-defined clinical diagnosis [10]. The occurrence of specific disorders and syndromes are not accurately known because many of these conditions are difficult to classify from epidemiologic studies [9]. This may be due to inconsistent case definitions. As a result, many WMSDs are difficult to determine using conventional medical diagnostic tools. Although quantitative laboratory studies are available for nerve entrapment syndromes, it is challenged to objectively measure the presence or severity of disease and functional deficits in muscular or tendon disorders [9].

Another issue to consider is that WMSDs are developed slowly over months and years of repeated stresses [11-13]. The risk factors for WMSDs are pervasively found in most occupations. If they are untreated, MSDs can cause to permanent pain and disability. With growing understanding on WMSDs, detections and analyses have confronted to make them the most frequent and the most costly of work-related injuries in most industries. Despite rising urgency amongst the occupational safety and health professionals and

practitioners, the issue of WMSDs has largely escaped from recognition, prevention, and control in most agricultural safety programs.

WMSDs are so common amongst experienced farmers and farmworkers. So, they usually perceive MSDs as usual and inevitable consequences of farming labors. However, even when limited to the poor sources of data currently available on the extent of these injuries in agricultural workplaces, there is an evident reason for high priority concerns, because disabilities due to musculoskeletal injuries and diseases incurred during their working times affect the production of agriculture workforce more frequently and more severely than any other safety and health problem.

Ergonomic intervention to reduce MSDs in agricultural works

Ergonomics is the multidisciplinary science that concerns with the understanding of interactions amongst 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 [14,15]. It contributes to the design and evaluation of tasks, jobs, products, environments, and systems to make them compatible with the needs, abilities and limitations of people [15].

Ergonomics is also the study of work involving the environment in which it is performed (the workplace) and those who perform it (workers). This means that ergonomics can be applied to determine how the industry is designed or improved to avoid a range of safety and health problems and to increase the job efficiency for fitting the worker [16].

As discussed in the above, farmers and farmworkers have faced serious ergonomic problems such as WMSDs, appliance and equipment-related accidents and injuries, work-rest balanced scheduling, and lack of safety training. Despite ongoing changes in the scales of agricultural operations and types of machinery involved, very little improvement in back injuries and MSDs has occurred in farming tasks performed by most farmers and farmworkers. Field jobs such as harvesting, weeding, irrigating, and cultural practices still remain as demanding physical challenges, involving stooped postures, lifting and carrying heavy objects, and conducting repetitive hand jobs.

Dealing with such bodily confronted agricultural works requires continuous improvements from the conventionally available intervention programs and systems that are both acceptable to farmers and farmworkers. Hence, designing of equipment and tools and work processes with due consideration of ergonomic features are urgently required to prevent WMSDs in the farming workplaces. Therefore, following key aspects are suggested to improve WMSDs and work-related safety issues in the agricultural industry:

- Establish supportive partnerships with involved farmers and farmworkers throughout intervention programs and trials.
- Design commodity or crop specific tasks and devices with ergonomic guidance.
- Develop evaluation tools and reviewing systems for farming safety and health issues.
- Promote safety and health programs and encourage farmers and farmworkers to adopt work safety systems and minimize worker displacements.

In this respect, it can be expected that efficient assessments and developments of ergonomically-endorsed intervention programs and reviewing systems may significantly contribute to not only prevent the WMSDs and injuries, but also reduce accidents and risk factors amongst farmers and farmworkers.

Conclusion

Agricultural workers are endangered to a variety of physical hazards through farming jobs. They are frequently exposed to accidental injury risks and certain categories of WMSDs. The strongest evidence of excess injury risks exists for osteoarthritis of the hip and knee, low back pain, upper limb disorders, and hand-arm vibration syndrome, as well as for the public health burden arising from the agricultural industry.

Emerging researches show that WMSDs have been a dominant problem in the farming business for more than a decade. Identification of occupational hazards and injury causes in the agricultural industry is quite crucial for the safety of farmers and farmworkers. Ergonomic engagements are beneficial to evaluate, intervene, and decrease musculoskeletal risk factors and resulting disorders. Unfortunately, there has been limited application of researches related to ergonomics and MSDs, although farmers and farmworkers commonly report musculoskeletal signs and symptoms [17].

Awareness of the farmers' occupational safety and health (OSH) issues is growing amongst safety professionals. In particular, ergonomic interventions for the OSH concerns have a global pledge in the agricultural industry. The agricultural profession requires better information on their safety and health risks and should be defined to change the existing conditions to the safer ones. Active participations and cooperative involvements would be beneficial for the improvement of OSH problems to the agricultural industry. Indeed for ergonomic interventions through design improvements, development of new task analysis methods, and contemporaneous research activities should be undertaken.

Ergonomic involvement is strongly recommended to improve safety and health issues in the agriculture business. Advanced ergonomic engagements may considerably contribute to allocate a harmful effect on load patterns to the musculoskeletal system in relation to farming works. Therefore, it is projected that ergonomic approaches would be particularly indispensable to prevent agricultural injury risks and accordingly recuperate farm productivities.

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