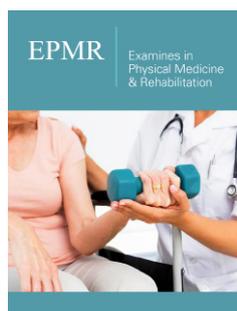


Agrarian Population's Occupational Health Risks and After Effects

Ajay Pal Natt*, Ramanjit Kaur, Amandeep Singh and Paramvir Singh

Department of Sports Science, India

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*Corresponding author: Ajay Pal Natt,
Department of Sports Science, India

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Abstract

Agriculture is the prime occupation in India and many other developing countries. In the modern era, agricultural workers are confronted with many hazards include chemical hazards, biological hazards, ergonomic hazards, psychosocial hazards and physical hazards. Hence, the agriculture sector is associated with a variety of occupational injuries and illnesses. Compared with some other industries, agricultural workers are relatively facing higher risk of accidents than other workers. This sector of activity being most unorganized, suffer from certain specific health hazards due to extensive use of fertilizers, insecticides and pesticides and mechanization [1]. The method used in this study was a review and analysis of past data. The study classified the number and rate of occupational fatalities for workers in the agriculture sector. This paper presents the results of a literature review undertaken to determine [2] the health risks faced by the agrarian population worldwide and their aftereffects. It was concluded that the negligence toward health hazards of the farmers is costing their quality of life, which they are totally unaware, and it is the need of an hour to give proper training to farmers from time to time so that they are properly educated about the components of their work and that would further prevent the precarious effects on their health in future.

Keywords: Farmers; Agriculture; Occupational health hazards; Pesticide exposure

Introduction

India is primarily an agrarian economy as farming is one of the most important occupations in the country [3]. Agriculture is the basic strength of Indian economy and maximum of population depends for their livelihood on agriculture only [4]. In the context of occupational safety and health, the term 'agriculture' is generally used in a broad sense including all activities directly related to cultivating, growing, harvesting and primary processing of agricultural products, animal and livestock breeding including aquaculture, and agroforestry. Agricultural work is dangerous; workers in this industry have among the highest rates of fatalities (BLS, 2014 and Liabman et al. 2013) [5]. It is one of the most precarious sector in regard to health worldwide, hence possesses various attributes that causes risk for health. These are:

- A. Exposure to the weather.
- B. Close contact with animals and plants.
- C. Extensive use of chemical and biological products.
- D. Difficult working postures and lengthy hours .
- E. Use of hazardous agricultural tools and machinery [6].
- F. The hazardous working conditions in agriculture can increase the risk of occupational accidents adapted from (Forastieri [7]), include open air work, seasonal work, a variety of tasks, variation in working postures, contact with animals and plants, contact with chemicals, utilization of machines, isolated work, limited provision of emergency services, home embedded in the farm, etc.
- G. Machineries used in in agriculture, such as tractors and harvesters have the highest frequency and fatality rates of injury (Yiha and Kumie 2010).
- H. On the other hand, exposure to pesticides and other agrochemicals can cause poisoning and in certain cases, lead to work-related cancer and death.

I. Besides, there are also other hazards caused by multiple contacts with poisonous and wild animals, plants and biological agents which may give rise to allergies, respiratory disorders stress and psychological disorders [8].

Occupational risk factors include increased morbidity and mortality from accidents, zoonoses, climatic exposure, respiratory disease caused by dust and organic matter, chemical toxicity and ergonomic hazards [9]. The commercialization of agriculture in Punjab through the Green Revolution led to the effects, which were far-reaching and irreversible. The Green Revolution replaced indigenous agriculture with modern agriculture that led to the use of high yielding seed varieties leading to a loss of indigenous varieties of various crops; the contamination of soils and water systems from the use of pesticides, chemical fertilizers, modern irrigation systems and dependency on modern machinery and technology [10].

Methodology

This study aimed at compiling all long-term reports on the risk filled working conditions in agriculture and the occupational health hazards inculcated in them available through different literature databases. In that impact, we performed a search on the online web of literature database using keywords (agriculture), (occupational health hazards), (pesticide exposure) and (farmers) which resulted in plethora of publications. Some experimental and survey-based literature were selected that included all the issues faced by farmers worldwide. The review covered 15 articles on occupational health hazards, use of pesticides and their health impact on farmers all over the world.

Farmworker health factsheets [11]

Pesticide exposure:

A. Today, farmworkers are exposed to “nonpersistent” pesticides which are metabolized by the body within days. They may enter the body through ingestion and inhalation, but they are primarily absorbed through the skin.

B. During the daily work, farmworkers are often exposed to pesticides, which include substances that prevent, destroy or repel pests. Because some pests have systems similar to the human system, some pesticides also can harm or kill humans. The term pesticide also encompasses herbicides, fungicides, and various other substances used to control pests.

C. Farmworkers frequently encounter pesticides through direct contact with the chemicals, contact with pesticide residue on treated crops or equipment, and drift of pesticides into untreated areas.10© NCFH, March 2013

D. Several studies also prove that entire families are at risk to pesticide exposure because of drift from nearby areas, not providing enough hand-washing or bathroom facilities, and bringing home clothes that have been contaminated.

E. The Pesticide Safety Education Program out of Cornell University states that mild symptoms of poisoning include headache, fatigue, dizziness, nervousness, perspiration, loss

of appetite, thirst, eye irritation and irritation of the nose and throat. Severe poisoning symptoms include fever, intense thirst, vomiting, muscle twitches, convulsions, inability to breathe and unconsciousness.

F. The Florida Department of Health webpage lists several chronic effects from long-term exposure to pesticides:

G. Birth defects

H. Cancers

I. Blood disorders

J. Neurological problems

K. Reproductive effects

L. Exposure to large doses of a pesticide can lead to severe effects such as loss of consciousness, coma and even death.

M. Pesticide Safety regulations that exist include:

1. The Worker Protection Standard, which states that field workers must be trained on pesticide use, and

2. The Occupation Safety and Health Act, which requires employers with 11 or more employees to provide drinking, toilet and washing facilities for farmworkers while they work in the fields.

N. A study conducted in eastern North Carolina polled 300 farmworkers regarding pesticide safety and training. They reported the following:

1. 75.3% had water available for hand-washing, but only 44.3% were provided soap,

2. 51.3% were told when it was safe to enter fields after applying,

3. 51% were told when pesticides were applied,

4. 34.8% reported being provided pesticide safety instruction by a supervisor,

5. 28% per cent worked in areas adjacent to fields where pesticides were being applied,

6. 25.2% were asked to enter fields before it was safe to do so,

7. 16% worked in fields while pesticides were being applied, and

8. 14.8% were provided with pesticide safety equipment.

O. Another pesticide danger for farmworkers is the limited information they are provided about the pesticides they are being exposed to. They are not told what types of pesticides are being used at any given time, they have little control over exposure, and they are often live-in grower-provided housing and do not know the severity of exposure in these dwellings.

P. One other challenge is that growers rarely speak the same languages as workers. Growers often do not recognize or understand how linguistic, cultural and power differences create barriers for farmworker pesticide safety.

Hazardous tools and machinery

In this modern era, agriculture sector had evolved to the level that farmers use heavy machinery and dangerous tools in fields rather than working manually. Hence, where these equipment and machinery had assisted the farmers in their work, they had also affected them adversely. Physical activity has reduced as majorly work is done by machines and tools, there are risks of mis happenings and accidents while using such hazardous equipment which could even prove to be fatal [12-14].

According to the Bureau of Labour Statistic 2011 data, the following was reported of fatalities within the industry of crop production:

- A. 132 fatal incidents involving transportation, which includes injuries resulting from being struck by a vehicle, and
- B. 45 fatal incidents from contact with objects and equipment.
- C. As for non-fatal injuries in agriculture, machinery was the leading source, with 99,402 reported injuries. In 2011 there were:
- D. 41,777 injuries from hand tools, and
- E. 24,590 injuries from tractors.

Infectious diseases

Infectious diseases among the farmworker population are caused by poor sanitation and crowded conditions at work and housing sites, including inadequate washing and drinking water [15].

- A. A study conducted in 2010 in assessed the water quality of 181 farmworker camps. Thirty-four (34) per cent of samples were found unsafe for human consumption.
- B. A 2006 study of farmworkers in North Carolina found that 46 per cent of farmworkers lived in very crowded and unsanitary conditions. Conditions such as these increase farmworkers' exposure to environmental toxins and communicable diseases

Although recent figures do not exist for tuberculosis rates, one study determined that 44 per cent of migrants had a positive PPD (tuberculin) skin test.

Musculoskeletal injuries

Because farm labour consists of constant bending, twisting, carrying heavy items, and repetitive motions during long work hours, farmworkers often experience musculoskeletal injuries. Furthermore, workers are often paid piece-rate, which provides an incentive to work at high speed and to skip recommended breaks. One study that interviewed 150 farmworkers reported that musculoskeletal injuries were very common as a result of the nature of farm work [16-18]. The following is a breakdown of the frequency of injuries that resulted:

- A. Backache occurred in 46 incidents © NCFH, March 2013.
- B. Shoulder pain occurred in 11 incidents.
- C. Sprains occurred in 9 incidents.
- D. Fractures occurred in 5 incidents and
- E. Pain/numbness of the hand occurred in 4 incidents.

A 2008 report recorded that about 20 per cent of farmworkers suffer from musculoskeletal injuries.

Respiratory illnesses

Because agricultural work takes place in rural areas, farmworkers are exposed to organic and mineral dusts, animal and plant dusts, toxic gases, mould and other respiratory irritants. All of these have been associated with respiratory illnesses, such as asthma and chronic bronchitis. Another chronic respiratory illness of concern is Farmer's Lung, a non-infectious allergic disease caused by inhaling mould spores. These mould spores accumulate and settle in the lower lungs, which interferes with their ability to exchange gas. As a last defence, the body develops an allergic reaction that causes cold or pneumonia symptoms. Farmworkers have a significantly higher death rate for a number of respiratory conditions, including hypersensitivity pneumonitis (proportionate mortality more than 10 times higher than expected), asthma, bronchitis, histoplasmosis, tuberculosis, pneumonia, and influenza [19-22].

Farmworkers who work in the following tasks are at increased risk of respiratory illnesses:

- A. Dusty fields and buildings.
- B. Handling of hay.
- C. Feeding or working with feedstuffs.
- D. Working in corn silage.
- E. Cleaning silos or grain bins.
- F. Working around bird droppings or dust from animal hair, fur, or feathers.
- G. Working around fishmeal and
- H. Applying agricultural chemicals such as fertilizers and pesticides.

Skin disorders

Farmworkers are exposed to many occupational and environmental risk factors that result in skin disease: weather, mechanical devices, chemicals, plants, organic and inorganic dust and fungi. A study conducted in North Carolina which interviewed 304 Latino farmworkers on skin conditions concluded that although skin conditions were observed, farmworkers turn to self-treatment as opposed to health care visits. The study reported that 63 percent used non-prescription preparations, 9 percent used prescription products and 6 percent used home remedies to cure skin ailments.

Another study conducted in North Carolina recorded the most commonly occurring skin problems and symptoms. The following, along with their frequency, was reported:

- A. Skin fungus had a rate of 58.6 percent.
- B. Sunburn had a rate of 58.6 percent.
- C. Bumps, pimples, or acne had a rate of 48.4 percent.
- D. Calluses had a rate of 48.4 percent.
- E. Itching had a rate of 46.1 percent.
- F. Rash had a rate of 42.8 percent.

Eye injuries

Agricultural work, by its nature, poses specific risks for eye injury. Some of these include different chemicals (pesticides, growth enhancers and fertilizers, tools and machinery. Likewise, environmental factors also pose a risk due to exposure to hazards such as ultraviolet light, airborne soil, particulates, pollen, humidity and plant components. These environmental objects are known to cause infections, allergic reactions, eye irritations, and corneal and other eye trauma. Chronic irritation and sun can cause cataracts, a clouding of the eye lens, and pterygium, a growth that obstructs the cornea. Agricultural workers experience eye injuries and illness at a rate of 8.7 per 10,000 workers. This is more than two times higher than the rate of 3.8 per 10,000 for general workers in the U.S.

Heat and sun exposure

Farmworkers are at increased risk for heat injury and illness due to the nature of farm work: they work outdoors in direct sunlight, humidity levels are often higher in the fields, they generate large amounts of body heat, and they often use heavy work clothing and equipment. Heat stress occurs when body heat builds up from both external and internal sources. This condition can lead to dehydration, electrolyte imbalance, neurological impairment, multi-organ failure, and death. According to the Centre for Disease Control and Prevention, the signs and symptoms of heat exhaustion include heavy sweating, cold/pale/clammy skin, a fast, weak pulse, nausea and vomiting and fainting. Meanwhile signs of stroke include a high body temperature above 103 degrees F, hot, red, dry or moist skin, rapid and strong pulse and sometimes unconsciousness. Heat stroke is considered a medical emergency. A study published in 2008 found that in the previous 15-year period, 423 workers in agriculture and non-agricultural industries died from heat exposure. Results indicated that 67 per cent of those fatalities were crop workers employed in the crop production or support activities for crop production sectors. In a study conducted with 300 farmworkers in North Carolina, 94 per cent of respondents reported that they work in extreme heat, and 40 per cent reported having had symptoms of heat illness. An added danger for farmworkers is that pesticides are absorbed through hot, sweaty skin more quickly than through cool skin (Table 1).

Table 1:

Occupational Health hazards in Agricultural work		
Exposure	Health effect	Specificity to Agriculture
Pesticides	Acute poisonings, chronic effects such as neurotoxicity, reproductive effects, and cancer	More hazardous products are used in developing countries with minimal personal protective equipment (PPE)
Weather, Climate	Dehydration, heat cramps, heat exhaustion, heat stroke, skin cancer	Most agricultural operations are performed outdoors
Snakes, Insects	Fatal or injurious bites and stings	Proximity results in high incidence
Sharp tools, Farm equipment	Injuries ranging from cuts to fatalities; hearing impairment from loud machinery	Most farm situations require a wide variety of skill levels for which workers have little Formal training, and there are few hazard controls on tools and equipment
Physical labour, Carrying loads	Numerous types of (largely unreported) musculoskeletal disorders, particularly soft-tissue disorders, e.g., back pain	Agricultural work involves awkward and uncomfortable conditions and sustained carrying of excessive loads
Dust, fumes, gases, particulates	Irritation of the eyes and respiratory tract, allergic reactions, respiratory diseases such as asthma, chronic obstructive pulmonary disease, and hypersensitivity pneumonitis	Agricultural workers are exposed to a wide range of dusts and gases from decomposition of organic materials in environments with few exposure controls and limited use of PPE use in hot climates.

Biological agents and vectors of disease	Skin diseases such as fungal infections, allergic reactions, and dermatoses	Workers are in direct contact with environmental pathogens, fungi, infected animals, and allergenic plants
	Parasitic diseases such as schistosomiasis, malaria, sleeping sickness, leishmaniasis, ascariasis, and hookworm	Workers have intimate contact with parasites in soil, wastewater/sewage, dirty tools, and rudimentary housing
	Animal-related diseases or zoonoses such as anthrax, bovine tuberculosis, and rabies (at least 40 of the 250 zoonoses are occupational diseases in agriculture)	Workers have ongoing, close contact with animals through raising, sheltering, and slaughtering
	Cancers, such as bladder cancer caused by urinary bilharzia contracted through working in flooded areas in North and Sub-Saharan Africa	Agricultural workers are exposed to a mix of biological agents, pesticides, and diesel fumes, all linked with cancer

Discussion

The present study is the predictive call for the farmers worldwide about the crisis that they are going to face in the upcoming years especially by the future generations due to the occupational health hazards and excessive use of chemical pesticides. Data from the studies appear to suggest a considerable burden of morbidity and a high prevalence of risk factors for chronic illness and disability among farm workers in the region. Alcohol abuse, head injury and chronic under-nutrition, animal attacks stand out as the most striking of the findings, although a wide range of adverse health states were identified [8]. The highest frequency and fatality rates of injury or mortality caused by farm machinery or non-chemical occupational accidents have still been rising in the industrialized and developing countries (ILO, 2002). There are many risks to health present in agriculture sector. Statistics from SOCSO shows 2,997 reported cases of occupational diseases in 2014 in Malaysia. The main cause agents of occupational disease are physical

agents with 1,277 cases (43%) and occupational Musculo-skeletal disorders with 675 cases (23%). Disability due to musculoskeletal injuries and diseases incurred during their working years affect the workforce in agriculture sector more frequently and more severely than any other safety and health problem during the rest of their working years [4].

Another aspect is increased incidence of work-related skin neoplasia in agricultural workers as well as several conditions that affect their ability to work, specifically MSD, asthma, allergic alveolitis and infections specific to farming. In contrast, there is a reduced incidence of work-related mental ill-health. Last but not the least, the use of pesticides inappropriately, without the knowledge of the procedure, the amount and the precautions related to the usage, had lead the agrarian population towards the health hazards that prove to be fatal to them as well as to the environment on the whole (Figure 1).

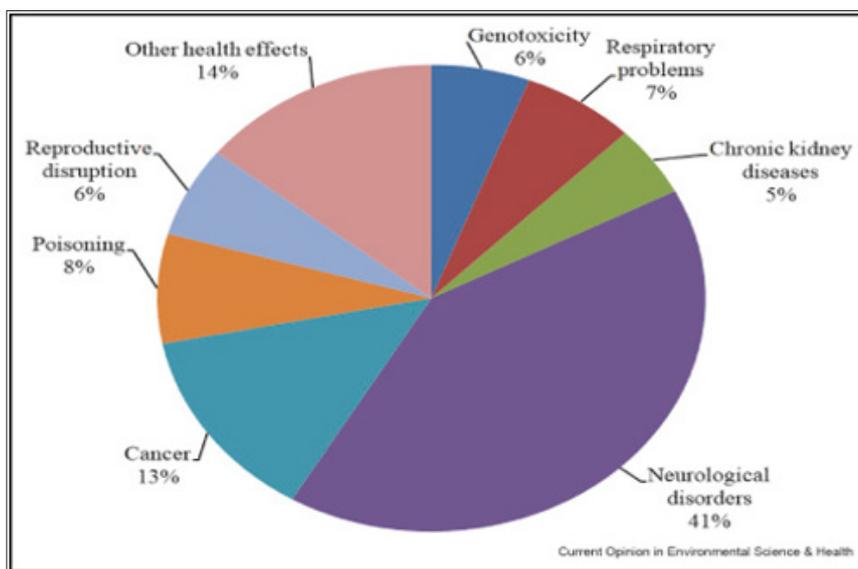


Figure 1:

Conclusion

Farming is done in every part of the world, and farmers work tirelessly irrespective of time and weather which further affects their health hazardously. They use more and more pesticides, heavy machinery today to do farming, due to which their body is affected and at the same time it also affects the environment like air, water, land. On one hand it becomes very important for the farmers to be aware of the occupational health hazards they encounter during their work and how to manage them and get rid of them effectively. They need to know about how to handle pesticides with their minimal adverse effects on them and use of the safety equipment to protect themselves. On the other hand, it becomes the responsibility of the governing bodies to analyze the causes and effects of agricultural hazards and the steps to be taken to counter them. By reviewing literature can be concluded that the farmers are not conscious of the toll that their occupation is taking on their health in the current scenario as they do not follow appropriate procedures and safety precautions. It is need of an hour to give proper training to farmers from time to time so that they are properly educated about the components of their work and that would further prevent the precarious effects on their health in future. Farmers needs to be encouraged to reduce, if not eliminate, the use of pesticides, with the introduction of incentives to help them shift from synthetic pesticides to bio-pesticides and organic farming and the major part of this change could be brought by the governments by making laws and rules that safeguard the rights and interests of the farmers to the best of their capacity, to take measures to educate the farmers so that safety precautions could be undertaken in any work that would prove hazardous or even fatal.

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