

Morbidity Patterns among Agro-industrial Workers - A Review

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ABSTRACT: Agro-industries provides a large numbers of employment in the country and globally also. Now-a-days, these agro-industries almost mechanized, workers still engaged in carrying of objects in awkward postures, repetitive work and also carrying heavy loads and workplace also unhygienic, excessive noise, grain dust in rice/pulses mills and welding smog and glare at welding workshop. So, with the objective of identify morbidity pattern among selected agro-industries, the present work is to review the literature. The selected five major agro-industries are: rice mill, sugar industry, vegetable oil mill, pulses milling industry and agricultural implement/machinery manufacturing industry. After reviewed research paper from the scientific journals, selected agro-industries' workers are exposed to dust, adverse microclimatic conditions, excessive noise, and insufficient light. Skin, eye and affected and many musculoskeletal disorders found among agro-industrial's workers. Musculoskeletal disorder (low backache and joint pain), allergic rhinitis, cold, cough, tightness in the chest, difficulty in breathing, periodic cough and phlegm were also observed among workers in rice and pulses milling industry. The study concluded that respiratory morbidity and musculoskeletal disorders are quite high among agro-industrial workers. These conditions can be prevented by health and safety programs in industries, provision of personal protective equipment (PPE) need to be provided and their appropriate usage, and further studies are recommended on the selected topic.

Keywords: Agro-industries, workplace, respiratory system, musculoskeletal disorders, allergic rhinitis.

INTRODUCTION

According to the International Labour Organization (ILO) 'improper mitigation of occupational hazards has significant negative effects not only on workers and their families, but also on society at large which given the massive costs that it generates; particularly, in terms of loss of productivity and indebting of social security systems,' (Anonymous, 2013). As per ILO, occupational accidents or work-related diseases leads human injury as well mortality. Exposure to 19 key occupational risk factors was estimated to be responsible for nearly 1.9 million deaths and 90 million disability-adjusted life years each year all over the world. In addition, each year, nearly 360 million non-fatal workplace accidents occur, resulting in more than four days of missed work (Anonymous, 2021). In fact, it is also estimated that each year in India, 17 million nonfatal occupational injuries (17 percent of world total) and 45,000 fatal injuries (45 percent of world

total deaths due to occupational injuries) occur (Wagner *et al.*, 2005). India accounts for 1.9 million (17%) of the world's 11 million incidents of occupational diseases, and 0.12 million (17%) of the world's 0.7 million deaths (Wagner *et al.*, 2005). Musculoskeletal disorders (MSDs) are main causes of occupational injury and disability in the industrially developing as well as developed countries (Shahnavaz, 1987; Genaidy *et al.*, 1993). MSDs are currently one of the most common issues that ergonomists deal in the workplace around the world. India's industries are becoming increasingly mechanized and automated these days, yet millions of tonnes of products and materials are still handled and lifted by hand. Surprisingly, mechanized/automated workstations may not erase the need for manual material handling (MMH) operations; rather, they may change the nature of the needs and maybe bring new activities (Mohammadi *et al.*, 2013). MMH causes unique issues for many workers all over the world. It is

defined as the unassisted movement of items, which is frequently accompanied with twisting and awkward postures, and which contributes to musculoskeletal ailments and diseases (Sharma *et al.*, 2017). The expenditures of (work-related musculoskeletal disorders) WMSDs are difficult to measure, however Piedrahita in the year 2006 projected as 171.7 million USD in developing countries, or 0.2% of gross domestic product (GDP). Musculoskeletal disorders (MSDs) are one of the leading causes of occupational absenteeism, and they cost the public health system a lot of money Anonymous (2004). They are the most common health problem at work, causing disability and long-term downtime (Punnett *et al.*, 2005; Kahraman *et al.*, 2016), accounting for almost 33% of all worker accidents and illnesses in 2013 which affect the overall production of industry (Anonymous, 2017).

The agricultural industry has been recognized as one of the most significant sectors in the world, not only in terms of providing food but also in terms of employment a large number of people (Naeini *et al.*, 2014). Agricultural industries are one of the most risky sectors in both developing and developed nations, with high incidence of accidental deaths, accidents, and work-related disorders (Naeini *et al.*, 2014 and Anonymous, 2014). The agricultural industry includes sugar industry, rice mill, paper mill, agricultural machinery manufacturing industry, rubber industry, vegetable oil industry, pulses mill, vegetable and fruit packaging industry and jam/jelly industry etc. These industries lead a lot of manual material handling (MMH) including lowering, lifting, pulling and pushing with their muscular power. The manual material handling activities that are properly designed can improve performance while also lowering costs, incidents, and accidents; however, inappropriate designed manual material handling activities can lead to work-related musculoskeletal disorders (WMSDs), (Crowl, 2007). These agro-industries are also produced some amount of dust, dirt, allergens and other microbiological agents such as bacteria, fungi, rickettsia etc. Dust and microbiological agent exposure can lead to respiratory, allergy, and eye disorders (Douwes *et al.*, 2003; Heederik, and Wouters, 2007; Smit *et al.*, 2008). ILO, Geneva (1981), delivered a convention on occupational safety, occupational health, and working conditions, as well as communication and collaboration at all levels in this domain. The ILO norm on safety and health, which is the most significant requirement, must be followed by all fields of economic activity and all workers.

As a result, we reviewed the occupational health situation of workers in India's agro-industries. Our review's specific goals were to: (i) provide an overview of selected India's agro-industries and (ii) identify morbidity pattern among agro-industries.

METHODS

The major agricultural industries of India were selected namely; rice mill, sugar industry, vegetable oil mill, pulses milling industry and agricultural implement/machinery manufacturing industry to examine and reviewed the occupational health scenario. To fulfill the objectives a comprehensive literature review was conducted between 2020 and 2021; and published papers in different journals, newspaper reports and Govt. published report were considered.

Using 'free-text' and keywords, an electronic search was conducted on PubMed, Google scholar, PLOS, Medline Plus, Sci-hub and Index Copernicus. Occupational health, agro-industrial sector, agriculture sector, manufacturing sector, India, occupational disorders, morbidity pattern, musculoskeletal symptoms and employees in India were among the keywords searched. In addition to manual notes, Microsoft Access 2010 was used to store the material and handle references. Indian Journal of Public Health, Indian Journal of Occupational and Environmental Medicine, Indian Journal of Occupational Health, American Journal of Industrial Medicine, Occupational and Environmental Medicine, International Journal of Occupational Safety and Ergonomics, and American Journal of Industrial Medicine, as well as a few other related journals, were cited for preparing the datasets for this review paper. The Grey literature used for the review primarily consisted of reports of the Ministry of Labour and Employment, Government of India; World Health Organization (WHO), Geneva; National Institute of Occupational Health, Ahmedabad; United States Department of Labor-Occupational Safety & Health; Indian Council of Medical Research, New Delhi; and report published in some reputed Indian news-paper.

RESULTS AND DISCUSSION

Morbidity patterns among rice mill workers. In India's agricultural processing sector, rice processing is the most important agro-based industrial sector. Its annual turnover crosses 3.65 billion rupees in the year 2020. Every year, India deals with around 85 million tonnes of paddy, providing food and other essential products to the population. More over half of the rice produced is processed by modern rice mills, 40% by traditional mills, and the other 10% is hammered by hand (Anonymous, 2020).

Rice grain dust leads diseases and also effects of various human organs as well health such as skin, nose, eyes, lung and the airways (Hurst and Dosman 1990). Respiratory diseases such as phlegm, tightness of chest and cough may aroused when workers exposed to husk during various operation like milling, in transportation operations and various mixing processes (Yach *et al.*, 1985; Massin *et al.*, 1995). It was revealed that there was a link between dust exposure levels and the respiratory health of workers in grain and flour mills, as

well as a link between dust exposure levels and chronic respiratory symptoms, implying that grain and flour dust exposure can cause to chronic bronchitis.

Ghosh *et al.* (2014) studied the prevalence of respiratory system and pulmonary function tested among 120 rice mill workers of Karnataka (India). Their study revealed that the several types of respiratory disorder occurred such as dyspnea (44.2%), phlegm (40.8%), noise irritation (27.5%), chest tightness (26.7%) and cough (21.7%). They concluded that workers who had worked for more than 20 years had a much higher prevalence of respiratory problems. They also mentioned respiratory problems that could be caused by allergic reactions to a protein component of the rice husk or a microbiological contamination. The demographic factors didn't show any significant difference between workers. A same finding was also calculated by Post *et al.*, 1998, on the exposure of organic dust and prevalence of respiratory symptoms among workers in grain processing industry. Warren *et al.* (1974) reported that 8 of 15 grain workers have asthmatic response related with respiratory symptoms. Hurst and Dosman (1990) reported cough, chills, exhaustion, and breathlessness are the most common symptoms related with grain dust, but pyrexia, malaise, and weight loss are also noticed. Grain dust exposure has been linked to a variety of lung disorders (pulmonary diseases). Organic and inorganic grain dust lead pulmonary fibrosis, chronic bronchitis, Asthma, asthma-like syndrome and organic dust toxic syndrome (Kirkhorn and Garry 2000).

Morbidity patterns among sugar industry workers. India ranked second after Brazil in terms of area and production (FAOSTAT, 2020) and the sugar industry is a big business in India. Around 525 mills produced more than 30 million tonnes of sugar in the year 2018-19 (Bhosale, 2019). Sugarcane is grown for its sucrose content and is mostly consumed as refined sugar or other processed products. Sugarcane processing produces bagasse, molasses, and press mud. The Indian sugar industry has employed these by-products to generate bioethanol, electricity, and a number of other goods over the years (Solomon, 2011).

In sugar industry large amount of bagasse is produced during sugar manufacturing so workers may be at risk due to bagasse leads airborne dust which causes diseases. Sugar mill exposed to bagasse particles which were high in concentrations. Bagasse exposure can increase the bagassosis and chronic respiratory problem that could affect the work efficiency of the workers (Balge and Krieger 2012). Inhaling bagasse dust in sugar mill causes lung disease called bagassosis (Madu and Sharman 2020).

Singh *et al.* (1999) studied on the respiratory diseases among agricultural industry workers in India. In sugar industry they found 18% of the surveyed workers having rhinitis and 10% suffered from breathlessness and 80% of them had wheeze. Breathlessness was

found independent of age and family history. Gascon *et al.* (2012) reported about bagasse and microbiological exposure among sugar cane refinery workers in Costa Rica. They reported 77.1% and 40 % of total workers had eye problems and prevalence of rhinitis, respectively. The bagasse exposed workers health level of shortness of breath and rhinitis increased. The persons who were connected to long period with sugar industry associated with wheezing and shortness of breath (dyspnea) problems. Bagasse exposure associated with ocular irritation and a higher probability of eye infections (Peate, 2007). Sugarcane workers had reported headache, low back pain, fatigue and other musculoskeletal problems (Coronel-Sánchez *et al.*, 2020). Choobineh *et al.* (2009) studied about musculoskeletal problem among Iranian sugar industry workers and they reported that 58.6% workers suffered from keens pain and 54.3% workers with lower back pain. Long hours standing posture, manual material handling and awkward postures carried high and very high level of WMSDs (99.1% of the workers) at a quick exposure check (QEC) by researchers.

Morbidity patterns among vegetable oil refinery/industry workers. The Indian vegetable oil industry accounts for about 5% of the world's vegetable oil production and India's share in the world's vegetable oil imports is about 14 %. India's edible oil markets don't have sufficient amount of edible oil whereas consumption get increased, so India's import of premium edible oils (Anonymous, 2012). According to trade and government estimates, India produced about 10.65 million tonnes of edible oils in 2019-20, less than half of the nearly 24 million tonnes it consumed during that time. The rest was imported, with India purchasing approximately 7.2 million tonnes of palm oil, 3.4 million tonnes of soya oil, and 2.5 million tonnes of sunflower oil from Indonesia and Malaysia, Brazil and Argentina, primarily from Russia and Ukraine, respectively (Anonymous, 2021a). The primary goal of edible oil refining is to make the oil acceptable to consume. This entails rendering the oil flavourless, odourless, changing its colour and crystal habit, rearranging of its molecular structure, and making the extracted or mechanically pressed oil suited for our needs. The goal of vegetable oil refining is to create high-yield, high-purity triglycerides, as well as value-added co-products from processes including degumming, neutralization, bleaching, dewaxing/winterization, and deodorization (Michael, 1998).

Deros *et al.* (2016) developed and investigated on fruit bunches for palm oil industry and their study revealed that 87.1% and 94.3% of the total workers suffered from lower and upper back pain, respectively. This showed that loading activity into the lorry is at high risk and posture needed to be changed as sooner. Workers in the oil palm sector have been reported to be at risk for musculoskeletal problems, injuries, mental problems, and bacterial infections such malaria and leptospirosis

(Myzabella *et al.*, 2019). In palm oil industry, Syazwani *et al.*, (2016) study done on the palm loader and collector and its ergonomic risk assessment by REBA technique and they concluded that workers were exposed to high risk level (61%) and very high risk level (39%) of working posture problems with palm loader and collector.

Morbidity patterns among workers in pulses/dal milling industry. India is a major producer of pulses in the world. Bengal gram pigeonpea, green gram, black gram, and lentils are among the pulses cultivated in the country. The dal milling industry is one of India's most important agro-processing industries. These Dal mills process 75% of the country's total pulse crop. Dal milling is the process of converting the entire pulse into Dal (Babel *et al.*, 2014).

In dal milling industries, workers are exposed to harmful flour dust and if this dust perceived as a frequent cause of the respiratory system illnesses (Meo and Al-Drees 2005). Page *et al.*, (2010); Skjold *et al.* (2008) demonstrated that rhinitis, asthma, conjunctivitis, and epidermal responses are the most common manifestations of occupational allergies and are caused by flour dust exposure. Conjunctivitis, allergy and baker's asthma, wheezing, febrile responses, grain fever, lung fibrosis, rhinitis, allergic alveolitis, impairment of lung function, and chronic obstructive pulmonary disease have all been reported in flour and grain mill workers (Dosman *et al.*, 1979).

Patel and Ingle (2008) reported that over 50% of pulse processing workers (dana bazaar/wholesale grain market and dal mill) showed hearing loss in the noise-sensitive higher (binaural mid and high) frequencies.

Among workers in the dal mill having high rate of hearing loss. They also suggested some feasible methods for protection of industrial worker's ear from hearing impairment by using of hearing protection devices, a full hearing conservation programme including training and uses of audiometry time to time.

Morbidity patterns among workers in agricultural implement/machinery manufacturing industry. The total prevalence of morbidity was 60% among iron and steel workers in a central Indian industry. Lumbago (musculoskeletal pain) was the most common morbidity in the workers, accounting for 33.25%, which was higher in the non-exposed group (49.73%) than the exposed group (18.78%), followed by occupational dermatitis (27%), which was higher in the exposed group (33.33%) than the non-exposed group (19.79%). It was observed that occupation-related morbidities were more common in exposed group like occupational dermatitis (65.74%; non-exposed group -34.26%), bronchial asthma (91.66%; non-exposed group- 8.34%), tuberculosis (75%; non-exposed group- 25%), chronic bronchitis (88.75%; non-exposed group- 11.25%), folliculitis (100%; non-exposed group-0%), injuries (94.66%; non-exposed group- 5.34%), heat stress (90%; non-exposed group-10%), chronic conjunctivitis (95.45%; non-exposed group- 4.55%). Hypertension was seen in 92 (23%) workers (Biswas *et al.*, 2014). Shift workers missed more days (18.6 days) owing to sickness absenteeism than regular workers (14.4 days) due to health problems including the musculoskeletal system (41.6 %), gastrointestinal system (29.5 %), and hypertension (26%), (Manjunatha *et al.*, 2011).

Table 1: Summary of studies reporting occupational health hazards in the agro-industrial sector.

Type of industry	Findings related occupational health hazards
Rice mill	Respiratory morbidity, obstructive and restrictive lung disorders (Rana <i>et al.</i> , 2018), affected respiratory system (42.66%), musculoskeletal pain (20%), low backache (16%), knee pain (10.66%), conjunctivitis (6.66%), allergic skin diseases (4%), (Prakash <i>et al.</i> , 2010).
Sugar industry	Lung cancer, chronic infections (Phoolchund, 1991), fatigue, low back pain, eye problems (Fatima and Shahid 2017), chronic cough and asthma, rhinitis (Gascon <i>et al.</i> , 2012), cough (38%), rhinitis (18%) and breathlessness (10%), (Singh <i>et al.</i> , 1999).
Vegetable oil industry	Upper and lower back pain (Ng <i>et al.</i> , 2015; Deros <i>et al.</i> , 2016 and Suandarin <i>et al.</i> , 2016), musculoskeletal disorder in any body part (93%), lower back (58%), knee (45.5%), shoulder (32.9%) and neck (32.3%), (Ng <i>et al.</i> , 2013).
Pulses mill	Skin allergy, neck pain, breathlessness, coughing and sneezing, allergic bronchitis and eye itching (Babel <i>et al.</i> , 2014), cough, chronic bronchial irritation, respiratory disorders (Taytard <i>et al.</i> , 1988; Rasheed and Khan 2005), cough (21.5%), rhinitis (16.4%) and breathlessness (9.9%), (Singh <i>et al.</i> , 1999).
Agricultural implement manufacturing industry	Folliculitis (100%), chronic conjunctivitis (95.45%), injuries (94.66%), bronchial asthma (91.66%), heat stress (90%), chronic bronchitis (88.75%), tuberculosis (75%), occupational dermatitis (65.74%), hypertension (23%) (Biswas <i>et al.</i> , 2014), musculoskeletal problems and fatigue associated with low back pain (Deros <i>et al.</i> , 2011; Shan <i>et al.</i> , 2012), dust, smoke and ultraviolet rays-related eye problems (59%), skin problems (26%), noise-related hearing problems (Chauhan <i>et al.</i> , 2014), Musculoskeletal problems (31.4%), gastrointestinal problems (25.8%), respiratory problems (18.1%), (Manjunatha <i>et al.</i> , 2011).

Guo *et al.* (2004) conducted a study on prevalence of musculoskeletal disorder (MSD) among workers in Taiwan. Among the participants, projecting about 860,000 female and 1,016,000 male workers cases, 37.0% had MSD. The prevalence of MSD in female workers (39.5%) was significantly higher than that in male workers (35.2%). Among all the body parts, lower back and waist (18.3 and 19.7% in male and female workers, respectively) were most frequently affected followed by shoulders (14.4 and 17.4% in male and female workers, respectively). Chronic bronchitis symptoms were more common in present welders (11.3%) than in non-welders in a welding shop (5.0%). 16.7% of workers with a cumulative exposure index of more than 10 years to welding fume reported symptoms of chronic bronchitis, compared to 4.7 percent of workers with a cumulative exposure index of less than 4 years (Bradshaw *et al.*, 1998).

CONCLUSION

The agricultural industry workers are exposed to dust, adverse microclimatic conditions, excessive noise, and insufficient light are among elements that in their work environment. Furthermore, there are various safety and health risks involved with grain handling operations, the two biggest causes of mortality being suffocation and falls. Fires, explosions, electrocutions, and injuries from badly guarded machinery are among the other dangers. Molds, chemical fumigants, and gases associated with deteriorating and fermenting silage can potentially cause exposure to grain dust and other airborne pollutants. In order to solve these problems, (work-related musculoskeletal disorders) WMSDs and other occupational health hazards need to be identified and analyzed. Foundational factors, development factors, psychosocial and physical workplace exposure are very important to be considered in any WMSDs study. In addition it is important to consider both psychosocial and physical workplace exposure in each study. Lacking in prospective and randomized trial study design also have been noticed, particular in selected five industries. This makes it difficult to establish a causal relationship in the investigations. Therefore more research are need to be conducted to provide more information for improving working practices and working environment by providing proper trainings and seminar to the workers about safety at workplace that will reduce work injuries and also improved productivity among workers in agricultural industry.

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