An analysis of health risk factors in firework industry workers

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Abstract

The industrialized process used in the fireworks sector involves labor-intensive biochemical management. Therefore, it is determined that the fireworks industry is quite risky. According to the respondents, the present study concentrates on the health conditions and work-life balance of women who work in the fireworks industry. The goal of this study is to examine the health conditions and work-life balance of women who work in the fireworks industry. The purpose of the paper is to evaluate the health status of firework industry employees. Production growth in these businesses is largely dependent on employees' health issues and the nature of their jobs. Numerous studies have already been conducted to examine women workers in various units. The current study concentrates on the health issues and work-life balance of women who work in the creation of fireworks. It is necessary to thoroughly examine women's work in terms of real work required, the total hours allotted, the compensation, if any, and the impacts of all these on their nutrient intake and also on their mental and physical health, to comprehend the occupational determinants of wellbeing. Analyzing the different kinds of physical pressure encountered is crucial. The impacts of postural alignment, the use of toxic materials for extended periods, and low pay all contribute to the occupation's worsening impact on women's health.

Keywords *firework; health afflictions; industry;;health system; workers;*

1 Introduction

It is commonly known that the fireworks industry is dangerous. Risk to life and property is present throughout the whole manufacturing process, as well as during storage and transportation of fireworks in retail locations. Manufacturing techniques, storage methods, and handling practices are some of the crucial elements that influence the likelihood of an explosive incident. Sivakasi, Tamil Nadu, is home to 90% of India's fireworks businesses, making its workers the most vulnerable to accidents. There are about 700 factories, and 75000 people work there. Assembly was a crucial step in the production process where employees come into direct touch with dangerous substances, increasing the risk of injury. Lead poisoning, ulcers, and harm to the main nervous system are a few of the key issues these folks are dealing with. Along with unsanitary conditions, poor training puts lives at bigger risk. A common form of job that results in yearly fatalities is child labor.

Any developing country must pursue industrial development. India's firework industries play a major role in the country's industrial development. It provides a lot of work opportunities for locals in and around Sivakasi, Tamil Nadu. This region is best suited for the production of fireworks due to its year-round dry environment. Sparklers and firecrackers are provided by these businesses for all festivals. Throughout the world, fireworks are employed during cultural and national celebrations. About 90% of India's firework production comes from Sivakasi, a city with a sizable

female workforce. The majority of these companies are located in rural areas, hence the workers there are virtually completely illiterate. Even though every task is carried out manually, the staff are still not trained to handle chemicals.

Therefore, compared to other professions, the injury rate is greater. The knowledge of MSDS, which serve as a manual for managing chemicals, must be taught to employees. Metallic objects should be avoided when working with chemicals. Even if the accident cost is greater, these sectors recover quickly, meeting 90% of the demand for fireworks items around the world. So Sivakasi is referred to as "Mini Japan" (Kutty Japan). Before beginning the manufacturing process, enterprises must do a thorough hazard monitoring and assessment to preserve safety in chemical management. This was done to lower the risk by implementing effective control mechanisms. Numerous health effects of fireworks include eosinophilic pneumonia from inhaling the smoke, asthma from inhaling barium-rich aerosols, thyroid hormone injury from perchlorates, and reduced visibility owing to the development of opaque clouds.

The management is lacking in offering services such as preserving baby care, schools, recreation, and athletic facilities for their kids, it was discovered while examining the welfare services for the workforce. However, facilities for drinking water, restrooms, transportation, and security were well organized. The basic goal of occupational safety and health is to safeguard people against risks in the workplace and offer suitable mitigating measures to reduce potential risks. Every firework sector should adhere to the health and safety regulations outlined in the factories act to accomplish this, and the government must take the required actions to assess the industries' safety procedures and policies. This analysis aims to report on the production procedure, risks related to the firework sectors, as well as the impact of such goods on air quality. The most popular application for fireworks displays is a demonstration of the effects they make. A handful of locations frequently have fireworks fights. The four main impacts of fireworks are smoke, light, noise, and floating objects. Fireworks come in many different shapes and sizes. Headaches and lowered mental acuity may result. People with heart, respiratory, or nervous system issues are often more severely affected. In addition to respiratory issues, fireworks can lead to sinusitis, bronchial asthma, laryngitis, pneumonia, rhinitis, and allergic or chronic bronchitis.

The chemical used in fireworks irritates the eyes and skin. Exposure delay may impact white blood cells, thyroid, and kidney. The nose, throat, and lungs become irritated. The women operate in a dangerous environment with numerous substances that have the potential to be fatal. So, to understand the health concerns of women working in the fireworks industry, this study was undertaken. Making crackers has been one of the key unorganized sectors in the Sivakasi Taluk, which is far away in the Virudhunagar district. The economy is strengthened by the fireworks business. Women make up the majority of workers in this field, and it is primarily women that produce crackers. The actions that take place at every level of an organization, which promote human integrity and progress while also fostering greater organizational effectiveness, are connected to work-life balance. Therefore, it is appropriate to attempt to determine the most significant factors that contribute to the improvement of Work-life Balance under various employee views in the fireworks sector. Production growth in these businesses is largely dependent on employees' health issues and the nature of their jobs. Numerous studies have already been conducted to examine women workers in various units. The current study concentrates on the health issues faced by those who produce fireworks. The female firefighters come from a low socioeconomic background and lack literacy. Chemicals are used in the making of crackers, that can be taken into the bloodstream and harm developing children's skin, bones, and teeth as well as women's reproductive problems. Additionally, toxic gases can irritate and harm young airways more easily.

2. Health Issues;

2.1. Possible hazards of pyrotechnics

Every chemical used in the fireworks industry is dangerous. Fuel and an oxidizing agent are combined to create fireworks. As a result of the workers' ongoing exposure to toxins, there may be health repercussions. Toxic discharge, fire, and explosion are the primary risks associated with the fireworks industry. Fire is the main danger here, as it can cause both property loss and human illness. Another major risk that arises in the fireworks industry is electrostatic.

When the surfaces of solids and chemicals come into contact with one another, these kinds of dangers could develop. Using a wooden surface, chemicals like fuels, oxidizing agents, and igniters are manually blended. Friction, static electricity, human error, and impact are among the potential risks during chemical blending. Activities including reckless handling, impact loading, inappropriate dragging, and stacking are risky acts and human mistakes that lead to accidents during the transportation of produced goods. Pollutants from firecrackers, like carbon dioxide, sulphur dioxide, nitrous oxides, carbon monoxide, and other dispersed particles, can have negative effects on one's health. When crackers are consumed at festivals, the environment is highly hazardous. to evaluate the risks associated with the fireworks industry.

2.2. Chemical Health Risk Assessment (CHRA

It chose a chemical research lab with a high level of exposure to conduct Chemical Health Risk Assessment (CHRA). Calculate the magnitude rating and the exposure rating to get the CHRA duration rating. Qualitative observations were used to calculate the duration rating. The rating with the shortest duration is 2, where the level of exposure is only 13.6% of the working hours. The highest rating is 6, which corresponds to an exposure level that exceeds 90.2% of working hours. After that, a different rating method used the compounds present to establish the magnitude rating. The risk rating (RR), which was derived after calculating the magnitude value, was created by taking the square root of the product of the exposure value and hazard score. According to the assessment, each division in the research center needs to identify the safety precautions to minimize exposure.

2.3. Risk Assessment of Safety and Health (RASH)

The parent risk evaluation model, which incorporates the health risk, is used in health and safety risk analysis. This approach was suggested for the building industry, but this can be utilized as a basic risk evaluation for the fireworks industry as well. As handling and extended exposure to chemicals are involved in the firework industry, RASH may be an appropriate tool for determining the level of risk. The risk was formerly defined as the product of likelihood and severity; however, RASH takes into account both harshness and severity for both health and safety.

3. TYPES OF HEALTH PROBLEMS

Four prevalent health issues have been identified by the researcher among the sample employees. They are dry cough, shoulder pain, low blood pressure, chronic high blood pressure, neck pain, back pain, and cough.

3.1. Continuous Cough

A persistent cough disrupts your daily activities or prevents you from getting a good night's sleep. It could be challenging to take a breath. Vomiting may result from it. You can become completely worn out as a result. When you need to communicate on the job, coughing might get in the way and cause disruption.

3.2. Dry Cough

A dry cough is a form of cough in which no mucus or phlegm is produced. Tickly coughs and it is strongly linked, and the names are frequently used indiscriminately. As opposed to chesty coughs where mucus is generated, both dry coughing and tickly coughs are referred to as non-productive coughs. The most frequent cause of a dry cough seems to be an infection with flu and cold viruses. The irritation of your throat is caused by environmental irritants like tobacco smoking can also cause it. The majority of the time, dry coughs result from irritation or inflammation of the pharynx or rear of the throat.

3.3. Back Pain

Back pain is a type of discomfort that typically results from problems with the bones, joints, nerves, muscles, or other components in the spine. Back pain can start suddenly or develop gradually; it can be continuous or sporadic; it can remain localized or spread to other parts of the body. It could feel like a scorching sensation or a dull discomfort. Along with other symptoms, the pain may extend into the arms and hands and also the feet or legs. These signs could be weakness, tingling, or numbness.

3.4. Low Blood Pressure

Hypotension, or low BP, is when the blood pressure is minimal that the blood circulation to the body's organs is insufficient and signs and symptoms of low blood flow appear.

3.5. High Blood Pressure

The pressure of blood pressing against the artery walls while the heart beats are referred to as "hypertension." This stress can harm the body in many ways if it increases and remains high over time.

3.6. Neck Pain

Many people have neck pain at some point in their lives, making it a widespread problem. Many other spinal issues, such as stiffness in the neck and upper back muscles or pinching of the nerves coming from the cervical vertebrae, might also be the reason.

3.7. Shoulder Pain

One of the more prevalent causes of doctor consultations for musculoskeletal injuries is shoulder issues, including the discomfort. The body's shoulder joint has the most incredible range of motion. However, due to the permitted range of motion, it is an unsteady joint. This instability raises the risk of joint damage, which frequently triggers a degenerative cycle in which tissues deteriorate and lose their functional capacity. Shoulder discomfort can be isolated or might radiate to the arm or the tissue around the shoulder.

3.8. Explosion Injuries

3.8.1. Impact wound with a deep wound

After accidents at work, the fireworks-related injury brought on by a gunpowder blast is often a compound injury. The thermal wounds are always severe, with huge, deep wounds, as a result of the high surrounding temperature caused by explosions, which is greater than 1000 C.

3.8.2. Harm from inhalation

Increased carbon monoxide inhalation would result from breathing hot smoke when burning stuff. The amount of carboxyhemoglobin would grow as it entered the bloodstream. Chronically elevated amounts of carboxyhemoglobin could eventually cause mortality by central nervous system injury, migraines, and other symptoms.

3.8.3. Intraocular foreign body

Any substance that enters the ocular tissue is an IOFB. Metals like iron and copper enter the cornea's front section during fireworks explosions. This could result in glaucoma, cataract development, and retinal injury.

4. Result and Discussion

The ability to adapt and regulate oneself in the context of public, emotional, and physical problems is referred to as being in good health. "Health is a condition of complete social, physical, and mental well-being and not only the lack of disease or disability," said the World Health Organization (WHO). The aspect of health status encompasses more factors than only the existence or lack of an illness. It comprises measurements of functioning, physical sickness, and mental well-being more generally, and is frequently summarised by average lifespan or self-assessed general health. The current chapter examines the health of a group of fireworks employees. Table 1 shows the health of a selected group of fireworks workers.

Table 1 Health of a Selected Group of Fireworks Workers

Sample Factories	Often Health Problem		Grand Total
	Yes	No	
Type A	197 (98.00)	4 (1.99)	201 (60.17)
Type B	52 (96.29)	2 (3.70)	54 (16.16)
Type C	76 (96.20)	3 (3.79)	79 (23.65)
Grand Total	**325 (97.30)**	**9 (2.69)**	**334 (100.00)**

Out of 326 sample employees, 319 reported having frequent health issues, whereas 8 reported not having frequent health issues. This data was used to determine the health condition of the sample employees. 3.89 percent of employees in each of the 3 sample factory types have "no frequent health concerns." Figure 1 shows the frequent health issue.

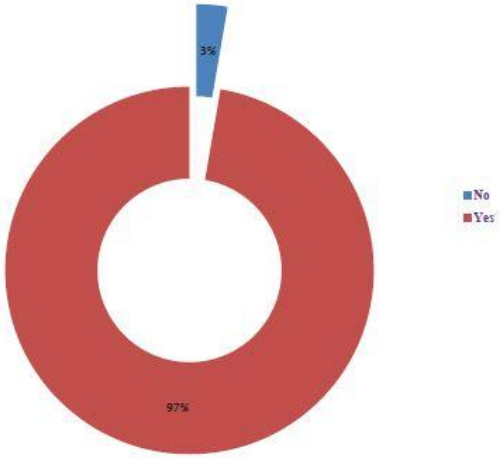


Figure 1 Frequently Health Issues

According to the aforementioned table, 319 of the 326 sample employees experienced various health issues while operating in fireworks manufacturers. Table 2 shows the kinds of health issues experienced by typical fireworks

employees. Due to routinely working in a seated position for extended periods, 47.34% of the sampled workers experienced back pain. 34.23 percent of workers who produced fireworks in a repetitious manner while extending their shoulder or neck for an extended period regularly experienced neck pain. 16.94% of women employees have dry coughs as a result of their chemical environment. 89.09 percent of the sample workers have High BP or Low BP as a result of the chemical pollution in the environment. In total, 96.87 percent of the sample employees in the test factories experienced various health issues.

Table 2 Kinds of Health Issues Experienced by Typical Fireworks Employees

Sample Factories	Have Health Problem					No Health Problem	Grand Total
	Continuous Cough / Dry Cough	Back Pain	Low / High BP	Neck / Shoulder Pain	Total	Total	
Type A	31 (15.73)	92 (46.70)	17 (8.62)	57 (28.93)	197 (60.61)	4 (44.44)	201 (60.17)
Type B	8 (15.38)	22 (42.30)	5 (9.61)	17 (32.69)	52 (16.00)	2 (22.22)	54 (16.16)
Type C	10 (13.15)	31 (40.78)	8 (10.52)	27 (35.52)	76 (23.38)	3 (33.33)	79 (23.65)
Grand Total	49 (15.07)	145 (44.61)	30 (9.23)	101 (31.07)	325 (97.30)	9 (2.69)	334 (100.00)

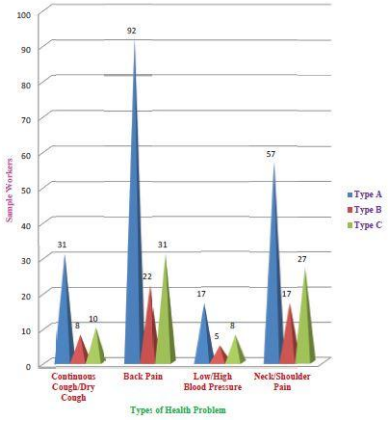


Figure 2 Kinds of Health Issues Sample Fireworks Employees' Experience

Figure 2 shows the health issues kinds tested in fireworks employees. It was discovered that 39.23% of the sample employees had sinus problems without their knowledge. Due to working on a surface that was heated and chemically surrounding, 30.23% of female workers experienced significant headaches during their shifts. Due to a dirty work environment, 17.98% of employees have asthma. 9.34% of the female responders among the sample of workers have eosinophilia. It is also noted that the sample respondents were unaware of the precise nature of the typical respiratory issues they had at work. However, they believed that working in the factories that make pyrotechnics caused breathing problems. Table 3 and figure 3 show the respiratory issues tested in employees of fireworks. Not even, did they know the name of the respiratory issues they had? Using the symptoms experienced by sample workers working in the fireworks manufacturers, the researcher classified the four prevalent respiratory issues into 4 groups.

Table 3 Kinds of Respiratory Issues Experienced by Typical Fireworks Employees

Sample Factories	Types of Respiratory Problem					No Health Problem	Grand Total
	Asthma	Sinus	Eosinophilia	Head Ache	Total	Total	
Type A	34 (17.25)	92 (46.70)	14 (7.10)	57 (28.93)	197 (60.61)	4 (44.44)	201 (60.17)
Type B	8 (15.38)	22 (42.30)	5 (9.61)	17 (32.69)	52 (16.00)	2 (22.22)	54 (16.16)
Type C	13 (17.10)	31 (40.78)	10 (13.15)	22 (28.94)	76 (23.38)	3 (33.33)	79 (23.65)
Grand Total	**55 (16.92)**	**145 (44.61)**	**29 (8.92)**	**96 (29.53)**	**325 (97.30)**	**9 (2.69)**	**334 (100.00)**

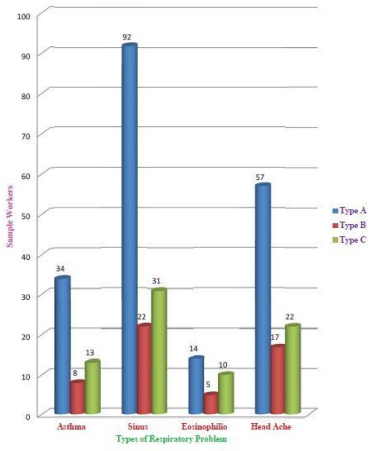


Figure 3 Different Respiratory Issues Suffered by a Sample of Fireworks Employees

It has been discovered that the workplace environment in firms making pyrotechnics is contaminated with various toxins. While processing the creation of fireworks, women employees will be working with these chemicals. Due to the usage of more chemicals during manufacture, the sample respondents' main skin problems are itchy or allergic reactions in their skin. 30.23 percent of female workers experience skin boils, which afflict 45.98 percent of the sample's workers. Skin lesions and skin cancer were discovered in 19, 232, and 8, 232 workers, etc. According to the above data, the main skin condition that the sample respondents were impacted by was itching because more chemicals were being used.

Table 4 Different Skin Conditions Suffered by a Sample of Fireworks Employees

Sample Factories	Types of Skin Diseases					No Health Problem	Grand Total
	Itching	Skin Cancer	Skin Boils	Skin Lesions	Total	Total	
Type A	92 (46.70)	10 (5.07)	57 (28.93)	38 (19.28)	197 (60.61)	4 (44.44)	201 (60.17)
Type B	22 (42.30)	5 (9.61)	8 (15.38)	17 (32.69)	52 (16.00)	2 (22.22)	54 (16.16)
Type C	31 (40.78)	8 (10.52)	27 (35.52)	10 (13.15)	76 (23.38)	3 (33.33)	79 (23.65)
Grand Total	**145 (44.61)**	**23 (7.07)**	**92 (28.30)**	**65 (20.00)**	**325 (97.30)**	**9 (2.69)**	**334 (100.00)**

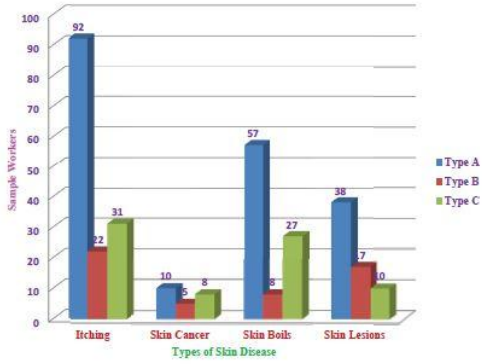


Figure 4 Various skin conditions are experienced by a sample of fireworks employees.

Figure 4 and Table 4 show the various skin conditions of a sample of fireworks employees. Table 5 analyses the sample workers' willingness to get ongoing care for chronic illnesses for the rest of their lives. A person with a chronic illness might need to receive therapy for the rest of their life to maintain their health. 45.89% of the 176 respondents in the sample who are employed are unwilling to take lifetime medicine. because they are unwilling to spend more money on prescription drugs and other forms of medication. 30% of the sampled workers consent to therapy for a specified number of days. That is, to have a brief improvement from the chronic illness. 15.78% of the sample workers disregard lifelong treatment. As a result, they prefer to self-medicate at their discretion or on the advice of others rather than seeking medical attention. 13% of the sampled workers are prepared to receive ongoing medical care for their condition. Because they are concerned about their health and understand how crucial it is to preserve it to have long, good health and a healthy family. Overall, it is clear that many of the sample women employees do not want to accept or take lifelong therapy because of a variety of factors.

Table 5 Typical Fireworks Workers' Willingness to Receive Lifelong Care

Sample Factories	Willingness of Lifelong treatment				Grand Total
	Accept	Till Some days	Not Willing to spent of Medicines	Self Medication	
Type A	10 (10.41)	26 (27.08)	48 (50.00)	12 (12.5)	96 (58.89)
Type B	5 (20.00)	8 (32.00)	9 (36.00)	3 (12.00)	25 (15.33)
Type C	6 (14.28)	13 (30.95)	16 (38.09)	7 (16.66)	42 (25.76)
Grand Total	21 (12.88)	47 (28.83)	73 (44.78)	22 (13.49)	163 (100.00)

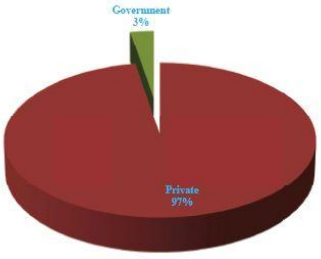
4.1. Medical Treatment Type

The use of medical supplies and a doctor are required to treat or resolve health issues in female workers. Even if some people in this day and age would prefer medical care at a government hospital, most workers require private care. Table 6 displays the medical care received by an employee of fireworks.

Table 6 Medical Care Received by a Sample of Fireworks Employees

Sample Factories	Type of Medical Treatment		Grand Total
	Private Hospital	Govt. Hospital	
Type A	197 (98.00)	(1.99)	201 (60.17)
Type B	52 (96.29)	(3.70)	54 (16.16)
Type C	76 (96.20)	(3.79)	79 (23.65)
Grand Total	**325 (97.30)**	**(2.69)**	**334 (100.00)**

Figure 5 shows the medical treatment kinds. Of the 334 sample workers, 97.30% of women choose to receive medical care at a private hospital. Only 2.69 percent of the women who responded favored medical care at government hospitals.



Figures 5 many forms of medical care

5. Conclusion:

The study's goal is to learn more about the sociodemographic characteristics of women employed in the fireworks industry. Additionally, it looks for medical conditions that fireworks industry workers may have. The study is then expanded to examine the workers' quality of life in the fireworks industry. There are also suggested potential solutions to help the situation of women employed in the fireworks sector. Production growth in these businesses is largely dependent on employees' health issues and the nature of their jobs. Numerous studies have already been conducted to examine women employees in various units. The current study concentrates on the health issues and work-life balance of women who work in the creation of fireworks. So, to understand the health concerns of women working in the fireworks industry, this study was undertaken.

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