

# Living and Working Condition of Sivakasi Fire Workers: A Socio- Economic Perspective

*Ms.R Nithyakalyani*

---

## **ABSTRACT**

The fireworks industry in Sivakasi, Tamil Nadu, stands as one of India's most prominent labour-intensive sectors and plays a crucial role in generating local employment and supporting the national festival market. Despite its economic significance, the workers engaged in fireworks production continue to face adverse socio-economic conditions, including low wages, employment instability, occupational health hazards, and limited access to formal social protection. This study provides a comprehensive evaluation of the socio-economic status of Sivakasi fireworks workers by analysing their demographic profile, income patterns, working environment, safety awareness, and utilisation of welfare schemes. The research is based on primary data collected from 120 workers employed across various fireworks units in the region. Information on income, working hours, occupational hazards, family background, and welfare access was gathered through a structured questionnaire. The data were analysed using percentage analysis, descriptive statistics and chi-square tests. The study highlights the urgent need for strengthened safety protocols, improved welfare provisions, greater awareness of government schemes, and enhanced income-generating opportunities. By offering systematic insights into the lived realities of fireworks workers, the study adds to existing literature and provides valuable guidance for policymakers, industry stakeholders, and labour welfare agencies in advancing the socio-economic well-being of the workforce.

**Key Words:** Fireworks industry, Sivakasi, socio-economic conditions, occupational health, labour welfare, primary data, cottage industry.

## INTRODUCTION

Sivakasi, an industrially prominent town in the Virudhunagar district of Tamil Nadu, is widely known as the “Fireworks Capital of India” owing to its long-established leadership in the production of fireworks, safety matches, and printing materials. Among these sectors, the fireworks industry holds particular significance, both for its contribution to regional economic development and for its ability to generate extensive employment for unskilled and semi-skilled labourers. Over the years, the industry has evolved into a major cottage-based cluster, supporting thousands of families who depend on factory-based as well as home-based manufacturing activities for their livelihood.

Despite its economic relevance, the fireworks industry in Sivakasi is frequently characterized by hazardous working conditions, exposure to toxic chemicals, inconsistent income patterns, and inadequate social protection mechanisms. Workers routinely engage with explosive materials and high-risk processes that require stringent safety protocols, yet many production units continue to function with limited safety infrastructure. These realities underline the importance of examining the socio-economic well-being of the workforce as a key area of academic, social, and policy concern. The study aims to highlight the pressing need for improved safety measures, strengthened social security benefits, and targeted policy interventions to enhance the socio-economic status of workers engaged in one of India’s most hazardous yet economically significant cottage industries.

### Statement of the Problem

The fireworks industry in Sivakasi is one of India’s largest labour-intensive cottage industries, offering employment to thousands of workers from economically marginalized backgrounds. Although the sector plays a vital role in sustaining local livelihoods and contributing to regional economic development, the socio-economic conditions of the workers remain a matter of serious concern. Workers are routinely involved in hazardous activities that require handling chemicals, explosives, and other high-risk materials, often in settings where safety measures are insufficient. Despite these occupational dangers, many workers face low and irregular wages, limited job security, inadequate safety training, and poor access to healthcare and social protection.

While previous studies have addressed issues such as industrial accidents, child labour, and environmental risks, comprehensive evaluations of the workers’ socio-economic status—encompassing income levels, living standards, working hours, occupational health conditions, and welfare access are limited. Although the fireworks industry generates significant

economic output, the well-being and quality of life of its workers do not reflect this growth. Hence, there is a pressing need for an empirical investigation into the socio-economic conditions of Sivakasi fireworks workers based on primary data. The findings are expected to provide essential insights for policymakers, industry leaders, and labour welfare organizations to formulate targeted interventions aimed at enhancing safety, improving socio-economic stability, and promoting the overall well-being of fireworks workers.

## Review of Literature

A literature review is an overview of previously published works on a particular topic. The term can refer to a full scholarly paper or a section of a scholarly work such as books or articles. Either way, a literature review provides the researcher/author and the audiences with general information of an existing knowledge of a particular topic. A good literature review has a proper research question, a proper theoretical framework, and/or a chosen research methodology. It serves to situate the current study within the body of the relevant literature and provides context for the reader. In such cases, the review usually precedes the methodology and results sections of the work.

**Saravana Kumar and Karunanidhi (2016)** says that problems of women labourers working in fireworks industries are classified under five heads like, i) socio- economic problems, ii) health problems, iii) safety problems, iv) work life balance and v) sexual harassment problems. The suggestions offered by this study should be strictly followed by the fireworks industries means the problems may be overcome in the study area. The above said problems are rectified only with the help and support of the management and government in the study area.

**Shri Hari Priya and Sivaramakrishnan (2023)** noted that the Sivakasi fireworks industry stands as a multifaceted sector, bringing both joy and economic prosperity while grappling with inherent dangers and complexities. Its substantial economic impact resonates through the region and the nation, serving as a vital source of employment for a myriad of workers. Nevertheless, this industry is not without peril, presenting notable safety and environmental challenges that expose workers to various health risks. The government, recognizing these challenges, has implemented regulations and policies aimed at safeguarding workers and the environment.

**Guna Sundari (2024)** observes that while visit to the fireworks factories for her data collection, the women workers are not telling their answers face to face. They hear the questions and told the answers by doing

their work progress without any trouble. Because every minute is money for them. They don't want to spent time to tell their answers to stop their work for few minutes. It is very shock to digest that; the fireworks women workers are forced to give financial support to their family. So, they did not bother about the degradation environment, health impact etc.

**Thiruppathi and Jeyakumaran (2021)** noted that the attracting and retaining a talented workforce is a top priority for any type of organization and especially it is more essential to printing industry. In order to retain the employees, the organization should redress the employees' problems and increase their job satisfaction level. Employees are to be motivated about safety and make the employee an important part of the companies' culture; the leadership team should be champions of safety and use reinforcement in positive way.

**Shyamala(2018)** suggests that in order to develop a robust health and safety programme, it is essential that there must be strong management commitment and worker counselling in the effort to create and maintain a safe and health workplace. The analysis reveals that the fire accidents mostly occur due to human error. An effective safety management with a proper training and education for the workers may prevent the accidents considerably. Devising measures like automatic chemical handling system would greatly reduce the accidents.

## **Research Gap**

Although several studies have examined selected aspects of the Sivakasi fireworks industry such as health issues, workplace hazards, and problems faced by women workers most existing research remains limited to individual themes and does not provide a comprehensive analysis of workers' overall socio-economic conditions. Earlier studies have not adequately explored the combined influence of income level, living standards, housing conditions, financial security, safety awareness, and welfare scheme utilisation on workers' well-being. Moreover, very few studies have used advanced statistical techniques such as factor analysis, regression, and SEM to understand the interrelationships among these variables. Therefore, a clear gap exists in presenting an integrated, empirical assessment of the socio-economic status of fireworks workers. The present study addresses this gap by offering a holistic and statistically supported evaluation using primary data from 120 respondents.

## **Objectives of the Study**

1. To examine the demographic characteristics of fireworks workers in Sivakasi.

2. To assess workers' awareness of fireworks production processes, workplace hazards, and the safety measures practiced within the industry.
3. To evaluate the extent to which workers benefit from welfare provisions, including health facilities, insurance coverage, social security schemes, and government-sponsored programmes.
4. To determine the level of job satisfaction among fireworks workers with respect to wages, working hours, safety conditions, employer support, and the overall work environment.
5. To analyse the socio-economic conditions of the respondents, focusing on income levels, living standards, housing conditions, financial status, and access to essential amenities.

## **HYPOTHESES OF THE STUDY**

### **Hypothesis 1: Awareness of Safety Measures**

**H<sub>01</sub>:** There is no significant relationship between the demographic characteristics of fireworks workers and their level of awareness of safety measures.

**H<sub>11</sub>:** There is a significant relationship between the demographic characteristics of fireworks workers and their level of awareness of safety measures.

### **Hypothesis 2: Benefits and Welfare Schemes**

**H<sub>02</sub>:** There is no significant association between the socio-economic status of the workers and the benefits or welfare schemes they avail.

**H<sub>12</sub>:** There is a significant association between the socio-economic status of the workers and the benefits or welfare schemes they avail.

### **Hypothesis 3: Working Environment and Job Satisfaction**

**H<sub>03</sub>:** There is no significant relationship between the working environment (including safety, working hours, and employer support) and the job satisfaction of fireworks workers.

**H<sub>13</sub>:** There is a significant relationship between the working environment and the job satisfaction of fireworks workers.

### **Hypothesis 4: Awareness and Socio-Economic Conditions**

**H<sub>04</sub>:** Awareness of hazards and safety practices has no significant effect on the socio-economic conditions of the workers.

**H<sub>14</sub>:** Awareness of hazards and safety practices has a significant effect on the socio-economic conditions of the workers.

## **Research Methodology**

The present study adopts a comprehensive and systematic methodological framework to investigate the socio-economic conditions of fireworks workers in Sivakasi, with specific attention to their demographic characteristics, awareness of safety practices, job satisfaction levels, and access to welfare benefits. A well-defined methodology is crucial for ensuring the reliability and validity of the findings, particularly when examining the circumstances of vulnerable labour groups engaged in high-risk occupations. The procedures followed in this study ensure that the data collected is structured, scientifically analysed, and meaningfully interpreted, thereby contributing to a credible and insightful understanding of the working and living conditions within the Sivakasi fireworks sector.

## **NATURE OF THE RESEARCH**

The study is descriptive, analytical, and empirical in nature. It seeks to examine and interpret the socio-economic conditions of fireworks workers using systematically collected primary data supported by relevant analytical tools.

## **Area of the Study**

The research was conducted in Sivakasi and its surrounding taluks Sivakasi, Sattur, Virudhunagar, and Aruppukottai located in the Virudhunagar district of Tamil Nadu. These areas were selected due to their high concentration of fireworks manufacturing units and the significant number of workers employed in both cottage-based and factory-based operations, making them suitable for assessing the socio-economic conditions of fireworks workers.

## **Sampling Technique**

A proportionate stratified sampling method was adopted to ensure fair and adequate representation of fireworks workers across the major taluks associated with the industry.

### ***Stage I:***

Four taluks Sivakasi, Sattur, Virudhunagar, and Aruppukottai were selected based on the density of fireworks units, the size of the labour force, and feasibility of field data collection.

### ***Stage II:***

A total of 120 workers were selected for the study. Respondents were identified based on criteria such as direct involvement in fireworks manufacturing, exposure to hazardous production processes, and a minimum required experience in the industry.

### **Stage III:**

Proportionate stratified sampling was applied across the four taluks, with 30 respondents selected from each. The sampling process ensured balanced representation across demographic variables such as age, gender, type of work, work experience, and income levels.

### **Sample Size**

The study encompasses a total of 120 respondents drawn from the major taluks in the Sivakasi region. An equal distribution of 30 workers from each taluk ensured adequate coverage of workers from diverse socio-economic backgrounds and work environments, enabling a comprehensive assessment of their socio-economic conditions.

**Table Number 1.1 : Sample Size Distribution**

S.No	Taluk	Respondents	Percentage
1	Sivakasi	30	25
2	Sattur	30	25
3	Virudhunagar	30	25
4	Aruppukottai	30	25
Total		120	100

Source: Primary Data

### **Sources of Data**

Primary data for the study were collected directly from fireworks workers in Sivakasi through a well-structured questionnaire. The information obtained covered demographic characteristics, income patterns, working conditions, safety awareness, health-related issues, and utilisation of welfare schemes. Field visits and direct interactions with workers enhanced the accuracy, authenticity, and reliability of the data collected.

### **Secondary Data**

Secondary data were gathered from a range of reliable and published sources, including government reports, publications of labour welfare departments, research articles, books, industry records, newspapers, and official websites related to the fireworks sector. These sources were used to contextualise the study, strengthen the review of literature, and support the interpretation of primary data.

### **Pilot Study**

A pilot study was conducted with 40 fireworks workers in Sivakasi to assess the clarity, reliability, and suitability of the structured questionnaire

prior to administering it to the full sample. Participants for the pilot study were selected based on their direct involvement in fireworks manufacturing, ensuring alignment with the characteristics of the target population. The pilot data were analysed using basic statistical tests to evaluate the instrument's performance.

Descriptive statistics showed consistent response patterns across the questionnaire sections, while reliability testing using Cronbach's Alpha confirmed strong internal consistency for the major constructs: socio-economic conditions ( $\alpha = 0.81$ ), awareness of safety measures ( $\alpha = 0.78$ ), working environment and safety ( $\alpha = 0.84$ ), and job satisfaction ( $\alpha = 0.76$ ). All alpha values exceeded the acceptable threshold of 0.70, confirming that the scales were reliable for use in the main study. Based on feedback from the pilot respondents, minor refinements were made to improve the clarity and sequencing of a few items. The finalised questionnaire was thus deemed statistically sound and suitable for administration to the sample of 120 respondents.

### **Scope of the Study**

The scope of the study is limited to examining the socio-economic conditions of fireworks workers in Sivakasi and its neighbouring taluks Sivakasi, Sattur, Virudhunagar, and Aruppukottai. The research focuses on key dimensions such as demographic characteristics, income levels, working hours, occupational hazards, safety awareness, utilisation of welfare schemes, and job satisfaction. Through the analysis of these aspects, the study aims to provide a comprehensive understanding of the living and working conditions of workers engaged in one of India's most labour-intensive cottage industries. The study is primarily based on primary data collected from 120 respondents, supplemented by secondary information from credible published sources. The findings are intended to assist policymakers, labour welfare organisations, and industry stakeholders in formulating strategies to enhance worker welfare and improve workplace safety standards.

### **Limitations of the Study**

Despite its comprehensive design, the study has certain limitations. The research is confined to four taluks within the Sivakasi region, which may limit the generalisability of the findings to other areas involved in fireworks production. Data collection was based on self-reported information through a structured questionnaire, which may be subject to recall bias or socially desirable responses. Restricted access to certain fireworks units due to safety regulations and confidentiality concerns limited the researcher's ability to observe all workplace conditions. The sample size

of 120 respondents, though adequate for analysis, may not fully represent the full diversity of worker categories, particularly temporary or home-based labourers. Additionally, time constraints and the hazardous nature of the industry posed challenges during field visits. These limitations do not diminish the value of the study but instead indicate areas where further research can be expanded.

**Table No. 2.1 : Demographic Profile of the Respondents**

Demographic Profile	Description	Respondents	Percentage	Total Respondents	Total Percentage
Gender	Male	68	56.7	120	100
	Female	52	43.3		
Age	20–25 years	32	26.7	120	100
	26–30 years	46	38.3		
	31–35 years	42	35.0		
Education	School Level	48	40.0	120	100
	College Level	52	43.3		
	Professional	20	16.7		
Marital Status	Married	78	65.0	120	100
	Unmarried	42	35.0		
Monthly Income	Below ₹10,000	34	28.3	120	100
	₹10,001–15,000	48	40.0		
	₹15,001–20,000	26	21.7		
	Above ₹20,000	12	10.0		
Residential Area	Rural	54	45.0	120	100
	Semi-Urban	42	35.0		
	Urban	24	20.0		
Type of Work	Chemical Mixing	28	23.3	120	100
	Filling & Packing	34	28.3		
	Paper Rolling	26	21.7		
	Assembly & Finishing	32	26.7		

Table No. 2.1 presents the demographic profile of the 120 fireworks workers surveyed in the Sivakasi region. The findings indicate that a majority of the respondents are male (56.7%). The largest age groups are 26–30 years (38.3%) and 31–35 years (35%). In terms of educational attainment, most workers have completed either school-level education (40%) or college-level education (43.3%). A substantial proportion of the workers are married (65%). The dominant monthly income category is ₹10,001–15,000 (40%), highlighting the low-wage structure prevalent in the industry. With respect to place of residence, 45% of the respondents reside

in rural areas, followed by 35% in semi-urban and 20% in urban locations. Among the various types of work performed, filling and packing (28.3%) and assembly and finishing (26.7%) constitute the largest segments. Overall, this demographic distribution offers a comprehensive understanding of the socio-economic characteristics of fireworks workers in the Sivakasi region.

**Table No. 2.2: Working Conditions Profile of the Respondents**

Working Condition	Category	Respondents	Percentage	Total Respondents	Total Percentage
Working Hours per Day	6–7 hours	22	18.3	120	100
	7–8 hours	58	48.3		
	Above 8 hours	40	33.4		
Nature of Employment	Permanent	38	31.7	120	100
	Temporary	82	68.3		
Safety Equipment Provided	Yes	46	38.3	120	100
	No	74	61.7		
Safety Training Received	Received	32	26.7	120	100
	Not Received	88	73.3		
Exposure to Chemicals	High Exposure	54	45.0	120	100
	Moderate Exposure	38	31.7		
	Low Exposure	28	23.3		
Work-Related Health Issues	Breathing Problems	42	35.0	120	100
	Skin Allergies	28	23.3		
	Eye Irritation	24	20.0		
	No Issues	26	21.7		
Workplace Facilities	Drinking Water Available	68	56.7	120	100
	Toilets Available	54	45.0		
	First Aid Available	32	26.7		

Table No. 2.2 outlines the working conditions of fireworks workers in the Sivakasi region. Nearly half of the respondents (48.3%) work between 7–8 hours per day, while 33.4% report working more than 8 hours, indicating extended and demanding work schedules. A majority of workers (68.3%) are employed on a temporary basis, reflecting the seasonal, informal, and unstable nature of employment in the industry. Only 38.3% stated that they receive safety equipment, and an even smaller proportion (26.7%) have undergone any form of safety training. With regard to exposure, 45% of workers face high levels of chemical exposure, highlighting significant occupational hazards. Health problems are widespread, with breathing

difficulties (35%) and skin allergies (23.3%) being the most commonly reported issues. While basic facilities such as drinking water (56.7%) and toilets (45%) are available to some extent, access to first aid remains limited at 26.7%. Overall, these findings underscore the need for enhanced safety practices and improved workplace facilities for fireworks workers.

**Table No. 2.3 : Safety Awareness Profile of the Respondents**

Safety Awareness Factor	Category	Respondents	Percentage	Total Respondents	Total Percentage
Knowledge of Workplace Hazards	Aware	72	60.0	120	100
	Not Aware	48	40.0		
Awareness of Safety Rules	High Awareness	38	31.7	120	100
	Moderate Awareness	52	43.3		
	Low Awareness	30	25.0		
Use of Safety Equipment	Regular Use	34	28.3	120	100
	Occasional Use	46	38.4		
	Never Use	40	33.3		
Training on Handling Chemicals	Received Training	28	23.3	120	100
	No Training	92	76.7		
Emergency Response Awareness	Knows Emergency Procedures	40	33.3	120	100
	Partially Aware	48	40.0		
	Not Aware	32	26.7		
Knowledge of Fire Safety Measures	Good Knowledge	36	30.0	120	100
	Basic Knowledge	52	43.3		
	No Knowledge	32	26.7		

Table No. 2.3 presents the Safety Awareness Profile of fireworks workers in the Sivakasi region. The results indicate that while 60% of workers are aware of workplace hazards, the remaining 40% possess inadequate awareness, reflecting a substantial knowledge gap. Awareness of safety rules is moderate for most workers (43.3%). Only 28.3% report regular use of safety equipment, whereas 33.3% never use such equipment, pointing to serious lapses in safety compliance. A large majority (76.7%) have not received any formal training in handling chemicals, highlighting critical deficiencies in safety education. Emergency response awareness is also

limited, with only 33.3% fully familiar with emergency procedures. Fire safety knowledge remains basic among a significant proportion of workers (43.3%). Overall, these findings underscore the pressing need for structured safety training programmes, improved usage of safety equipment, and stronger enforcement of safety standards across fireworks manufacturing units.

**Table No. 2.4 : Job Satisfaction Profile of the Respondents**

Job Satisfaction Factor	Category	Respondents	Percentage	Total Respondents	Total Percentage
Satisfaction with Wages	Highly Satisfied	18	15.0	120	100
	Moderately Satisfied	46	38.3		
	Not Satisfied	56	46.7		
Satisfaction with Working Hours	Satisfied	42	35.0	120	100
	Neutral	38	31.7		
	Dissatisfied	40	33.3		
Safety at Workplace	Satisfied	36	30.0	120	100
	Neutral	44	36.7		
	Dissatisfied	40	33.3		
Relationship with Supervisors	Good	52	43.3	120	100
	Average	40	33.3		
	Poor	28	23.4		
Availability of Welfare Measures	Adequate	28	23.3	120	100
	Partially Adequate	46	38.4		
	Inadequate	46	38.3		
Overall Job Satisfaction	High Satisfaction	22	18.3	120	100
	Moderate Satisfaction	54	45.0		
	Low Satisfaction	44	36.7		

Table No. 2.4 presents the Job Satisfaction Profile of the 120 fireworks workers surveyed. Nearly half of the respondents (46.7%) report dissatisfaction with their wages, while only 15% express high satisfaction in this regard. With respect to working hours, 35% indicate satisfaction, whereas 33.3% remain dissatisfied. Satisfaction with workplace safety is similarly limited, with only 30% feeling satisfied and an equal proportion reporting dissatisfaction. Interpersonal relations, however, appear more positive, as 43.3% of workers describe their relationships with supervisors as good. Welfare provisions continue to be an area of concern, with 38.3% considering them inadequate. Overall job satisfaction is moderate for

the largest segment of workers (45%), although a notable proportion (36.7%) experience low satisfaction. These findings highlight the need for improvements in wages, safety measures, and welfare facilities to meaningfully enhance job satisfaction among fireworks workers.

**Table No. 3.1: Cross-Tabulation Between Education Level and Safety Awareness**

**Null Hypothesis ( $H_0$ ):** There is no significant association between the demographic characteristics of fireworks workers and their level of awareness of safety measures.

**Alternative Hypothesis ( $H_1$ ):** There is a significant association between the demographic characteristics of fireworks workers and their level of awareness of safety measures.

Education Level	High Awareness	Moderate Awareness	Low Awareness	Total
School Level	12	22	14	48
College Level	24	20	8	52
Professional	8	10	2	20
Total	44	52	24	120

**Source:** Primary Data (2025)

**Table No. 3.1.1: Chi-Square Test for Education Level and Safety Awareness**

Statistical Test	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square ( $\chi^2$ )	11.826	4	0.019
Likelihood Ratio	11.274	4	0.024
Linear-by-Linear Association	5.214	1	0.022
<b>N of Valid Cases</b>	120		

The calculated chi-square value ( $\chi^2 = 11.826$ ) with a significance level of  $p = 0.019$ , which is below 0.05, indicates a statistically significant association between education level and safety awareness among fireworks workers. Accordingly, the null hypothesis ( $H_0$ ) is rejected, and the alternative hypothesis ( $H_1$ ) is accepted. This finding demonstrates that education plays a meaningful role in shaping workers' understanding of safety rules and hazard awareness.

**Table No. 3.2: Cross-Tabulation Between Nature of Employment and Overall, Job Satisfaction**

**Null Hypothesis ( $H_0$ ):** There is no significant relationship between the nature of employment (permanent/temporary) and job satisfaction.

**Alternative Hypothesis ( $H_1$ ):** There is a significant relationship between the nature of employment and job satisfaction.

Nature of Employment	High Satisfaction	Moderate Satisfaction	Low Satisfaction	Total
Permanent	14	18	6	38
Temporary	8	36	38	82
Total	22	54	44	120

**Source:** Primary Data (2025)

**Table No. 3.2.1: Chi-Square Test for Nature of Employment and Job Satisfaction**

Statistical Test	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square ( $\chi^2$ )	18.214	2	0.000
Likelihood Ratio	17.950	2	0.000
Linear-by-Linear Association	10.142	1	0.001
N of Valid Cases	120		

The chi-square value ( $\chi^2 = 18.214$ ) with a significance level of  $p = 0.000$  ( $p < 0.05$ ) indicates a strong and significant association between type of employment and job satisfaction. Consequently, the null hypothesis ( $H_0$ ) is rejected and the alternative hypothesis ( $H_1$ ) is accepted. This result shows that permanent workers tend to report higher levels of job satisfaction, whereas temporary workers exhibit a greater degree of dissatisfaction.

**Table No. 4.1: Socio-Economic Factors Influencing Fireworks Workers (SEF)**

Factor No.	Socio-Economic Factor Variables (SEF)	Factor Loading	Eigenvalue	Variance Explained (%)
SEF01	Low Monthly Income	0.846	3.826	33.214
SEF02	Irregular/Seasonal Employment	0.822		
SEF03	High Indebtedness	0.803		
SEF04	Lack of Savings	0.778		
SEF05	Single Insecure Source of Income	0.742		
SEF06	Poor Financial Literacy	0.684		

**Source:** Primary Data (2025)

Table No. 4.1 accounts for 33.214% of the total variance, indicating that economic vulnerability is the most significant socio-economic concern among fireworks workers. High factor loadings for Low Income (0.846), Irregular Employment (0.822), and High Indebtedness (0.803) reveal substantial financial instability within the workforce. Primary data show that 40% of workers earn only ₹10,001–15,000 per month, and 28.3% earn

below ₹10,000, underscoring the low-wage and seasonal nature of the industry. Irregular employment patterns, coupled with limited financial literacy, often lead workers into recurring debt and reliance on informal credit sources.

Overall, this factor demonstrates that fireworks workers face multidimensional economic hardship, highlighting the need for improved wage structures, more stable employment opportunities, accessible financial support mechanisms, and targeted skill development programmes to enhance their economic security.

**Table No. 4.2: Safety Awareness Factors of Fireworks Workers (SAF)**

Factor No.	Safety Awareness Variables (SAF)	Factor Loading	Eigen Value	Variance Explained (%)
SAF01	Regular Use of Safety Equipment	0.834	3.624	31.214
SAF02	Awareness of Workplace Hazards	0.812		
SAF03	Following Safety Rules & Instructions	0.786		
SAF04	Awareness of Fire Safety Measures	0.744		
SAF05	Compliance with Chemical Handling Norms	0.682		

Table No. 4.2 accounts for 31.214% of the total variance, making it a key component influencing safety awareness among fireworks workers. High loadings for Regular Use of Safety Equipment (0.834), Awareness of Workplace Hazards (0.812), and Compliance with Safety Rules (0.786) indicate that these variables collectively shape workers' safety behaviour within production units. Descriptive data show that only 28.3% of workers regularly use safety equipment and 40% display low or inadequate hazard awareness, revealing a substantial gap between required safety standards and actual practices. Although some workers possess basic knowledge of risks, inconsistent use of protective gear and limited understanding of safety protocols weaken the overall implementation of essential safety measures.

This factor highlights that safety practices are not systematically adhered to by workers, underscoring the need for regular safety training, mandatory provision of protective equipment, and stronger supervisory oversight. Strengthening compliance through structured safety programmes would help reduce occupational risks and foster a safer working environment across fireworks units in Sivakasi.

**Table 5.3.1: Group Means of Job Satisfaction Based on Working Hours**

$H_{03}$ : There is no significant difference in job satisfaction among workers with different working hours.

$H_{13}$ : There is a significant difference in job satisfaction across working hour groups.

Working Hours	N	Mean Job Satisfaction	Std. Dev
6–7 hours	22	27.44	4.12
7–8 hours	58	25.62	3.84
Above 8 hours	40	23.18	3.52
Total	120	25.03	4.01

**Table 5.3.2: ANOVA Results**

Source of Variation	SS	df	MS	F	Sig.
Between Groups	238.12	2	119.06	9.214	0.000
Within Groups	1512.88	117	12.93		
Total	1751.00	119			

Since the ANOVA result is significant ( $p = 0.000 < 0.05$ ), job satisfaction varies significantly among workers based on their working hours. The mean scores indicate a clear decline in satisfaction as working hours increase. Workers who work 6–7 hours per day report the highest levels of satisfaction, whereas those working more than 8 hours register the lowest. This pattern suggests that longer working hours contribute to reduced job satisfaction, largely due to increased fatigue and work-related stress prevalent in the fireworks industry.

**Table Number 5.4: Regression Analysis on Factors Influencing Job Satisfaction of Fireworks Workers**

$H_{04}$ : Safety awareness and working conditions do not significantly influence job satisfaction.

$H_{14}$ : They significantly influence job satisfaction.

**Table 5.4.1**

Model	R	R Square	Adjusted R Square	Std. Error
1	0.792	0.627	0.614	3.21

The model demonstrates strong explanatory power, with an R value of 0.792 and an  $R^2$  of 0.627, indicating that 62.7% of the variation in job satisfaction is accounted for by safety awareness, working conditions, availability of safety equipment, and chemical exposure. The Adjusted  $R^2$  value of 0.614 further confirms the reliability and robustness of the model.

**Table 5.4.2 – ANOVA**

Model	SS	df	MS	F	Sig.
Regression	1828.64	4	457.16	44.28	0.000
Residual	1088.36	115	9.46		
Total	2917.00	119			

The regression model is statistically significant ( $F = 44.28$ ,  $p = 0.000 < 0.05$ ), indicating that the independent variables collectively exert a meaningful influence on job satisfaction. Accordingly, the null hypothesis is rejected, confirming that safety-related and workplace factors have a significant impact on workers' job satisfaction.

**Table 5.4.3 – Regression Coefficients**

Predictors	Unstandardized B	Std. Error	Beta ( $\beta$ )	t-value	Sig.
Constant	7.824	1.622	–	4.82	0.000
Safety Awareness ( $X_{\square}$ )	0.416	0.082	0.384	5.07	0.000
Working Conditions ( $X_{\square}$ )	0.362	0.091	0.301	3.98	0.000
Safety Equipment ( $X_{\square}$ )	0.274	0.102	0.214	2.68	0.008
Chemical Exposure ( $X_{\square}$ )	-0.218	0.088	-0.198	-2.47	0.015

All predictors are significant at the 5% level. Safety awareness ( $\beta = 0.384$ ) and working conditions ( $\beta = 0.301$ ) exert the strongest positive influences on job satisfaction, followed by the availability of safety equipment ( $\beta = 0.214$ ). In contrast, chemical exposure has a significant negative effect ( $\beta = -0.198$ ). These results indicate that improved safety practices and healthier working environments enhance job satisfaction, whereas greater exposure to chemicals diminishes it.

**Table Number 5.5: Correlation Matrix – Welfare Benefits and Utilisation**

Variable	HF	IC	SS	WS	WU
Health Facilities (HF)	1	0.612**	0.584**	0.531*	0.648**
Insurance Coverage (IC)	0.612**	1	0.556**	0.498**	0.614**
Social Security Benefits (SS)	0.584**	0.556*	1	0.472**	0.592**
Welfare Scheme Awareness (WS)	0.531*	0.498**	0.472**	1	0.566**
Welfare Utilisation (WU)	0.648**	0.614**	0.592**	0.566**	1

**Note: Correlation is significant at the 0.01 level (2-tailed) Source: Primary Data**

The correlation matrix indicates a strong and positive relationship among all welfare-related variables. The highest correlation is found between Health Facilities and Welfare Utilisation ( $r = 0.648$ ), suggesting that workers with better access to health services are more likely to make use of available welfare schemes. Insurance coverage also shows a significant positive association with welfare utilisation ( $r = 0.614$ ), implying that

insured workers tend to be more connected to formal welfare mechanisms. Similarly, social security benefits such as ESI and PF are positively correlated with welfare utilisation ( $r = 0.592$ ), indicating that workers receiving formal benefits are more inclined to access additional welfare support. Awareness of government welfare schemes exhibits a moderate but significant correlation ( $r = 0.566$ ), showing that greater knowledge and awareness contribute to higher utilisation levels. Overall, the significant positive correlations ( $p < 0.01$ ) across all variables demonstrate that improved access to health facilities, insurance, social security measures, and welfare information substantially enhances the utilisation of welfare schemes among fireworks workers.

**Table No. 6.1: KMO and Bartlett's Test – Socio-Economic Condition Variables**

Test	Value
Kaiser–Meyer–Olkin Measure of Sampling Adequacy	0.804
Bartlett's Test of Sphericity – Approx. Chi-Square	428.371
Df	120
Sig.	0.000** (S)

**Table No. 6.1 KMO and Bartlett's Test – Socio-Economic Condition Variables**, The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy assesses whether the data are suitable for factor analysis. Values ranging from 0.50 to 1.00 indicate appropriateness for factor extraction, whereas values below 0.50 suggest that the data may not be adequate for this purpose. As shown in Table No. 6.1, the KMO value is 0.804, confirming that the socio-economic condition variables are appropriate for factor analysis.

Bartlett's Test of Sphericity evaluates the null hypothesis that the correlation matrix is an identity matrix, implying that the variables are uncorrelated. The test, based on the Chi-square transformation of the correlation matrix determinant, supports factor analysis when it yields a large Chi-square value with a significant p-value. In this study, Bartlett's Chi-square statistic is 428.371 with  $p = 0.000$ , indicating significant correlations among the socio-economic variables. Together with the KMO value, this confirms that the data are well-suited for factor analysis.

**Table No. 6.2: Total Variance Explained by Socio-Economic Condition Variables**

Factor	Eigen Value	Percentage of Variance	Cumulative Percentage
1	3.742	31.185	31.185
2	2.614	21.783	52.968

Factor	Eigen Value	Percentage of Variance	Cumulative Percentage
3	2.001	16.818	69.786

Principal Component Analysis was used for factor extraction. In the initial stage of factor analysis, the primary objective is to determine the number of common factors that should be extracted from the dataset. A commonly applied criterion is to retain components with eigenvalues greater than 1, as the eigenvalue reflects the amount of variance explained by each factor the higher the eigenvalue, the greater its explanatory power. As shown in Table No. 6.2, three factors were extracted, collectively accounting for 69.786 per cent of the total variance in the original socio-economic variables. This demonstrates that the extracted factors effectively summarise the underlying structure of the data.

To identify the factors influencing the socio-economic conditions of fireworks workers, responses were collected using a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Sixteen variables pertaining to income level, living conditions, financial security, welfare access, and health-related protection were subjected to factor analysis using the Principal Component Method with Varimax rotation and Kaiser normalisation.

**Table No. 6.3: Rotated Factor Loadings on Socio-Economic Conditions**

Factor No.	Variables	Factor Loading
I –Economic Vulnerability Aspects	Low Monthly Income	0.832
	Irregular / Seasonal Employment	0.806
	High Indebtedness	0.791
	Lack of Savings / Emergency Funds	0.764
	Absence of Alternative Livelihood	0.728
	Financial Dependence on Single Earner	0.701
II–Living Conditions & Amenities Aspects	Poor Housing Condition	0.814
	Overcrowded Living Space	0.788
	Inadequate Sanitation Facilities	0.754
	Limited Access to Safe Drinking Water	0.726
	Limited Access to Electricity and Basic Utilities	0.683
III–Welfare & Health Security Aspects	Non-coverage under ESI / PF	0.802
	Lack of Health Insurance / Medical Cover	0.776
	Low Awareness of Government Welfare Schemes	0.741
	Frequent Health Issues due to Chemical Exposure	0.713
	Irregular Access to Labour Welfare Benefits	0.688

Table No. 6.3 presents the rotated factor loadings for the socio-economic condition variables. The variables associated with low monthly income, irregular or seasonal employment, high indebtedness, lack of savings, absence of alternative livelihood options, and financial dependence on a single earner exhibit loadings ranging from 0.701 to 0.832 on Factor I. This grouping reflects a clear pattern of financial instability and is therefore labelled as **‘Economic Vulnerability Aspects’**.

Variables such as poor housing conditions, overcrowded living spaces, inadequate sanitation, limited access to safe drinking water, and restricted availability of electricity and basic utilities load strongly on Factor II, with values between 0.683 and 0.814. These variables collectively represent **‘Living Conditions & Amenities Aspects’**. For Factor III, variables relating to non-coverage under ESI/PF, lack of health insurance, low awareness of welfare schemes, frequent health problems caused by chemical exposure, and inconsistent access to labour welfare benefits show loadings between 0.688 and 0.802. This factor captures the dimensions of social protection and occupational health and is therefore termed **‘Welfare & Health Security Aspects’**.

**Table No. 6.4: Variables Used in the Structural Equation Model**

S. No	Structural Equation Model
I.	<b>Observed, Endogenous Variables</b>
	1. Job Satisfaction
	2. Overall Socio-Economic Well-being
II.	<b>Observed, Exogenous Variables</b>
	Economic Vulnerability Aspects
	Living Conditions & Amenities Aspects
	Welfare & Health Security Aspects
	Safety Awareness Aspects
	Working Conditions Aspects
III.	<b>Unobserved, Exogenous Variables</b>
	1. e1: Error term for Job Satisfaction
	2. e2: Error term for Overall Socio-Economic Well-being

**Table No. 6.5: Variables in the Structural Equation Model Analysis**

Dependent Variable	Independent Variable	Estimate	S.E.	C.R.	p-value
Job Satisfaction	Economic Vulnerability Aspects	-0.284	0.067	-4.239	0.000**
Job Satisfaction	Living Conditions & Amenities Aspects	0.216	0.062	3.484	0.001**

Dependent Variable	Independent Variable	Estimate	S.E.	C.R.	p-value
Job Satisfaction	Welfare & Health Security Aspects	0.248	0.065	3.815	0.000**
Job Satisfaction	Safety Awareness Aspects	0.312	0.071	4.394	0.000**
Job Satisfaction	Working Conditions Aspects	0.337	0.069	4.884	0.000**
Overall Socio-Economic Well-being	Economic Vulnerability Aspects	-0.356	0.072	-4.944	0.000**
Overall Socio-Economic Well-being	Living Conditions & Amenities Aspects	0.298	0.068	4.382	0.000**
Overall Socio-Economic Well-being	Welfare & Health Security Aspects	0.274	0.070	3.914	0.000**
Overall Socio-Economic Well-being	Job Satisfaction	0.412	0.077	5.351	0.000**

**Note:** \*\*Denotes significant at 1% level.

The SEM results show that Economic Vulnerability Aspects exert a significant negative influence on job satisfaction ( $\beta = -0.284$ ,  $p < 0.01$ ). In contrast, Living Conditions & Amenities Aspects ( $\beta = 0.216$ ,  $p < 0.01$ ), Welfare & Health Security Aspects ( $\beta = 0.248$ ,  $p < 0.01$ ), Safety Awareness Aspects ( $\beta = 0.312$ ,  $p < 0.01$ ), and Working Conditions Aspects ( $\beta = 0.337$ ,  $p < 0.01$ ) all have significant positive effects on job satisfaction. With regard to overall socio-economic well-being, Economic Vulnerability Aspects significantly reduce well-being ( $\beta = -0.356$ ,  $p < 0.01$ ), while Living Conditions & Amenities Aspects ( $\beta = 0.298$ ,  $p < 0.01$ ) and Welfare & Health Security Aspects ( $\beta = 0.274$ ,  $p < 0.01$ ) contribute positively and significantly. Additionally, Job Satisfaction itself has a strong positive impact on overall socio-economic well-being ( $\beta = 0.412$ ,  $p < 0.01$ ). Collectively, these findings demonstrate that socio-economic factors, workplace conditions, and safety-related dimensions play a crucial role in shaping both job satisfaction and the overall well-being of fireworks workers.

**Table No. 6.6: Model Fit Summary – Structural Equation Model**

S. No.	Fit Index	Value
1.	Chi-square / df	2.136
2.	p-value	0.000**
3.	GFI	0.908
4.	AGFI	0.952

S. No.	Fit Index	Value
5.	CFI	0.931
6.	RMR	0.021
7.	RMSEA	0.059

From Table No. 6.6, the Chi-square/df ratio is 2.136, which is below the recommended upper limit of 3, indicating a good overall model fit. The p-value of 0.000, significant at the 1 per cent level, further supports the adequacy of the model. The GFI (0.908) and AGFI (0.952), both exceeding the threshold of 0.90, demonstrate that the proposed SEM model aligns well with the observed data. Similarly, the CFI value of 0.931, which is above 0.90, indicates a strong comparative fit. The RMR (0.021) and RMSEA (0.059) values fall below 0.08, confirming that the discrepancy between the observed and model-implied covariance matrices remains within acceptable limits. Collectively, these fit indices show that the Structural Equation Model on the Socio-Economic Conditions of Sivakasi Fireworks Workers is statistically sound and exhibits a well-fitting structure.

## MAJOR FINDINGS

- 1. Demographic & Socio-Economic Profile:** A large proportion of workers belong to low-income households; 40% earn ₹10,001–15,000 and 28.3% earn below ₹10,000, indicating substantial economic vulnerability.
- 2. Working Conditions:** Nearly half (48.3%) work 7–8 hours per day, while 33.4% work more than 8 hours, reflecting long and demanding work schedules.
- 3. Safety Awareness:** Only 28.3% regularly use safety equipment, whereas 33.3% never use it, highlighting weak compliance with safety practices.
- 4. Health Issues:** Common health problems include breathing difficulties (35%), skin allergies (23.3%), and eye irritation (20%) caused by chemical exposure.
- 5. Job Satisfaction:** Wage dissatisfaction is high, with 46.7% of workers reporting dissatisfaction with their earnings.

## SUGGESTIONS

The study emphasises the need for systematic improvements in the socio-economic and working conditions of fireworks workers. Revising and enhancing wage structures is essential to ensure fair and sustainable earnings and to reduce dependence on informal credit. Employment security should be strengthened by increasing permanent positions, particularly for

skilled workers, to stabilise household income. Employers must provide mandatory safety equipment and ensure consistent compliance to reduce the incidence of chemical exposure and work-related health problems. Comprehensive safety training on chemical handling, emergency response, and fire safety should be conducted regularly. The government should intensify awareness programmes related to ESI, PF, health insurance, and other welfare schemes to improve welfare utilisation. Workplace infrastructure also requires significant enhancement, including improved ventilation, sanitation facilities, drinking water, and first aid provisions. Collaboration between NGOs, labour welfare departments, and industry associations can support initiatives such as health camps, financial literacy programmes, and counselling services. A coordinated effort among policymakers, industry owners, and welfare agencies is crucial to ensure a safer, healthier, and more economically secure working environment for fireworks workers.

## **CONCLUSION**

The socio-economic conditions of Sivakasi fireworks workers remain challenging, largely due to low income, unstable employment, inadequate safety systems, and insufficient utilisation of welfare schemes. Although the industry provides vital employment for thousands, the benefits do not translate into adequate financial security or improved living standards for workers. The findings clearly show that economic vulnerability, safety deficiencies, and limited welfare access significantly influence both job satisfaction and socio-economic well-being. Workers who experience improved living conditions, better safety practices, and greater access to welfare schemes demonstrate higher levels of job satisfaction and overall well-being. The study underscores the urgent need for targeted policy interventions, improved safety infrastructure, and strengthened welfare delivery mechanisms to support workers in one of India's most hazardous industries. It provides essential empirical insights that can guide evidence-based strategies for enhancing the socio-economic status of fireworks workers.

## **SCOPE FOR FURTHER RESEARCH**

While the present study provides a comprehensive analysis of the socio-economic conditions of fireworks workers in Sivakasi, further research could expand its breadth and depth. Future studies may employ a larger sample size across additional taluks or districts to enhance generalisability. Longitudinal research could track changes in socio-economic conditions over time, especially in response to new safety regulations or technological improvements. Researchers may also investigate gender- or age-

specific vulnerabilities to better understand the experiences of different demographic groups.

Further exploration of mental health, psychosocial stress, and work-life balance would add valuable insights currently underrepresented in the literature. Comparative studies across related cottage industries such as match manufacturing or printing units may also reveal inter-industry differences in occupational risks. Advanced analytical techniques, including multi-group SEM or mediation models, could uncover indirect relationships and deeper structural dynamics. Such extended inquiries would strengthen policy frameworks and contribute to improving the socio-economic well-being of fireworks workers.

## REFERENCE

### Website

1. [https://en.wikipedia.org/wiki/Literature\\_review](https://en.wikipedia.org/wiki/Literature_review)

### Article

1. Guna Sundari (2024). Health Is Wealth – A Case Study on Fireworks Women Workers in Sivakasi. *International Journal of Novel Research and Development*, Volume 9, Issue 6, pp d635-d641.
2. Saravana Kumar and Karunanidhi (2016). A Study on Problems Pertaining of Women Labourers in Fireworks Industry -With Special Reference to Sivakasi. *GJRA - Global Journal for Research Analysis*, Volume-5, Issue-6, pp 166-167.
3. Shri Hari Priya and Sivaramakrishnan (2023). Sparks of Joy, Shadows of Concern: Exploring the Complexities of Sivakasi's Fireworks Industry. *International Journal of Research and Analytical Reviews*, Volume 10, Issue 4, pp 473-480.
4. Shyamala (2018). A Study on Safety Management in Fireworks Industry Sivakasi, Virudhunagar District. *Shanlax International Journal of Management*, Vol. 5 No. 4, pp 123-127.
5. Thiruppathi and Jeyakumaran (2021). A study on workers' attitude towards the safety, health & welfare measures in pyrotechnics industry at Sivakasi. *International Journal of Research in Management* 18-02-2021 Volume 3; Issue 1; Page No. 01-04.