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Occupational Safety & Health In Factories: A Statistical Analysis Of 10 Years Of OSH Data In India

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Abstract: Comprehensive analysis of Occupational Safety & Health (OSH) data in India over the past decade (2012-2021), pertaining to factories registered under the Factories Act, 1948 (OSH&WC Code 2020) reveals significant positive trends. This paper aims to identify trends, disparities, and areas for improvement in worker well-being by analyzing data on registered factories, employment, fatalities, non-fatal injuries, and dangerous occurrences. Utilizing statistical analysis, visualizations, and comparative assessments, the article sheds light on the current state of OSH in India. The key findings include fluctuations in registered factories and employment, trends in dangerous occurrences, and a consistent decline in fatal and non-fatal injuries. The analysis reveals the need for continuous improvement in workplace safety and proactive measures to address emerging challenges.

Keywords: Occupational Safety & Health, Registered Factories, Fatal Injuries, Non-fatal Injuries, Industrial Safety

Introduction: The International Labour Organization (ILO) defines Occupational Safety and Health (OSH) as a multidisciplinary field concerned with the well-being and safety of workers in the workplace¹. The primary goal of OSH is to ensure that working environments are safe and do not pose any harm to the physical, mental, or social well-being of workers. The Ministry of Labour & Employment, Government of India's 'National Policy on Safety, Health and Environment at Work Place' recognizes that safety and health of workers has a positive impact on productivity and economic and social development². In order to create and maintain a safe and healthy working environment and comply with the OSH requirements pursuant to national laws and regulations, employers are encouraged to make appropriate arrangements for the establishment of an OSH management system³. By analyzing 10 years of OSH data across Indian States/UTs, this article aims to provide an analysis and examine trends in key indicators such as the number of factories, workers, fatalities, non-fatal injuries, and dangerous occurrences.

Methodology: The article uses secondary data collected from the office of the Chief Inspector of Factories (CIF) / Directorate of Industrial Safety & Health (DISH) of all States/UTs of India having factories registered under the Factories Act, 1948 as per the Ministry of Labour's (State Level) mechanism of collecting OSH Data⁴.

¹ https://www.ilo.org/wcmsp5/groups/public/---europe/---ro-geneva/---sro-budapest/documents/publication/wcms_797477.pdf

² <https://labour.gov.in/sites/default/files/SafetyHealthandEnvironmentatWorkPlace.pdf>

³ <https://www.ilo.org/safework/areasofwork/occupational-safety-and-health-management-systems/lang--en/index.htm>

⁴ https://dgfasli.gov.in/sites/default/files/service_file/Nat-OSH-India-Draft%281%29.pdf

The data, covering the period from 2012 to 2021, organized by State/UT and year, facilitates a detailed examination of trends and variations over the specified period. The data over the period 2012-2021 covers:

- Registered Factories
- Employment in Factories (Workers)
- Dangerous Occurrences
- Fatal Injuries
- Non-Fatal Injuries

Table 1: Occupational Safety & Health Data of registered factories (2012-2021)

Year	Registered Factories	Employment	Dangerous Occurrences	Fatal Injuries	Non-Fatal Injuries
2012	353684	14910645	1310	1317	28700
2013	340226 (-3.81%)	14042410 (-5.82%)	1343 (2.52%)	1312 (-0.38%)	26852 (-6.44%)
2014	361994 (6.4%)	20034859 (42.67%)	1534 (14.22%)	1266 (-3.51%)	25500 (-5.04%)
2015	348429 (-3.75%)	16374546 (-18.27%)	1091 (-28.88%)	1107 (-12.56%)	20257 (-20.56%)
2016	360949 (3.59%)	17376854 (6.12%)	700 (-35.84%)	1189 (7.41%)	5367 (-73.51%)
2017	339931 (-5.82%)	16409493 (-5.57%)	1382 (97.43%)	1084 (-8.83%)	4866 (-9.33%)
2018	364268 (7.16%)	18724733 (14.11%)	1124 (-18.67%)	1154 (6.46%)	4528 (-6.95%)
2019	355478 (-2.41%)	18552909 (-0.92%)	1371 (21.98%)	1127 (-2.34%)	3927 (-13.27%)
2020	363442 (2.24%)	20298387 (9.41%)	634 (-53.76%)	1050 (-6.83)	2832 (-27.88%)
2021	321578 (-11.52%)	17414912 (-14.21%)	1058 (66.88%)	988 (-5.90%)	2803 (-1.02%)

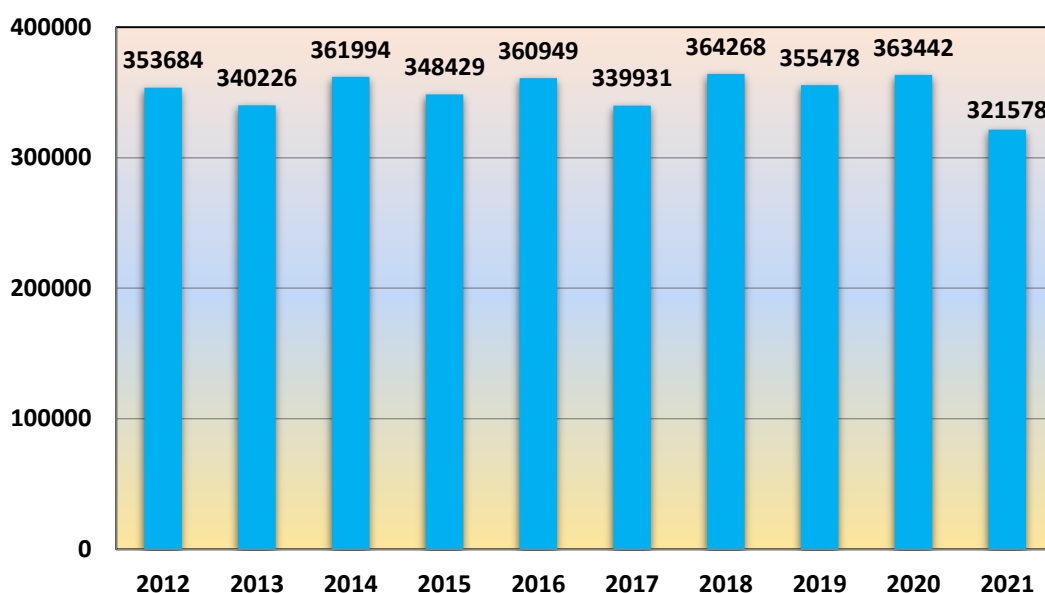
Data Source: The office of the Chief Inspector of Factories (CIF) / Directorate of Industrial Safety & Health (DISH) of States/UTs.

N.B.: i) Figures in the bracket represent percentage change as compared to the previous year.

ii) For detailed State/UT-wise data and information on data limitations, please refer to <https://dglasli.gov.in>

Key Findings: The comprehensive analysis of 10-year Occupational Safety & Health (OSH) data reveals a fluctuating trend with a predominantly positive trajectory. Examining these trends in registered factories, employment, dangerous occurrences, fatal injuries, and non-fatal injuries provides insights that suggest both positive strides and challenges in fostering a safer and healthier working environment. The key findings of the analysis are as follows:

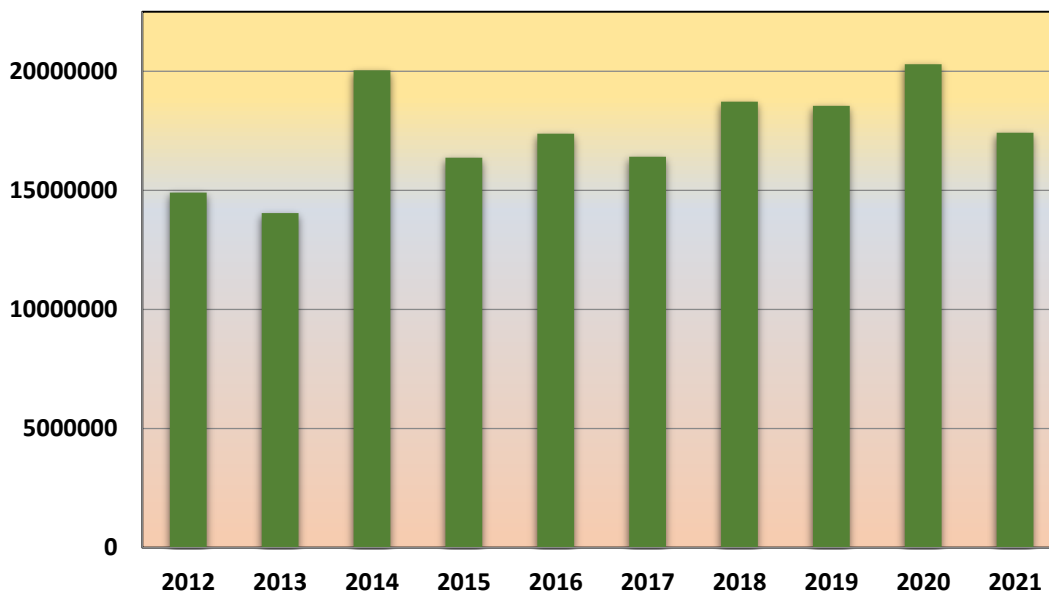
1. **Registered Factories:** The number of registered factories has shown fluctuations over the years. The overall trend indicates some variability, with both increases and decreases in every alternate year. The years 2014, 2016 and 2018 saw a significant increase of 6.4%, 3.59% and 7.16% respectively, suggesting significant growth in the establishment of factories. This could be due to possible economic expansion or increased industrial activities. The increase in the number of registered factories in the years 2014, 2016, 2018 and 2020 may indicate moderate increase, signaling a recovery or stabilization or may be due to potential factors like policy changes or improved economic conditions. The largest growth of 7.16% in the year 2018 which came just after the year of significant decline i.e. 5.82%. This sharp increase suggests a rebound or positive economic conditions. The largest decline of 11.52% came in the year 2021. This could be due to external shocks, such as the COVID-19 pandemic impacting negatively and rendering closure of a large number of units in the manufacturing sector.



Graph 1: Registered factories in India (2012-2021)

2. **Employment:** The employment data reveals a fluctuating pattern, like the factories' data, with periods of growth (2014, 2016, 2018, and 2020) and contraction (2013, 2015, 2017, 2019, and 2021). The employment peak in 2014 marked a significant 42.67% increase; the potential factors contributing to this spike may include government policies, industry-specific initiatives, or economic reforms that stimulated growth and investment in the manufacturing sector. Notably, the year 2014 i.e. the peak employment year and year of highest growth (42.67%) is followed by year 2015 which saw the largest decline of 18.27% and the year of least employment. This may raise concerns about economic factors or industry-specific challenges. Despite a 9.41% increase in 2020, 2021 witnessed a sharp decline of 14.21%, potentially influenced by external factors such as global economic conditions or the COVID-19 pandemic.

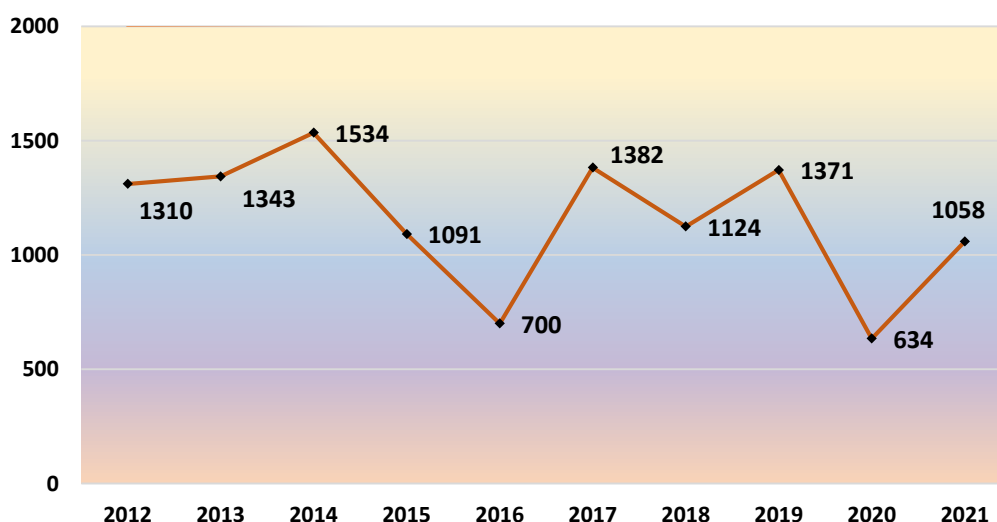
Fluctuations in employment highlight the need for adaptive training programmes to ensure that the workforce is equipped with the necessary skills and knowledge contributing to a safer and more resilient workforce. During periods of rapid employment growth, OSH measures must be actively reinforced to accommodate the influx of new workers. Proactive safety training programmes and effective communication can prevent accidents and injuries associated with a growing workforce.



Graph 2: Employment in Registered factories in India (2012-2021)

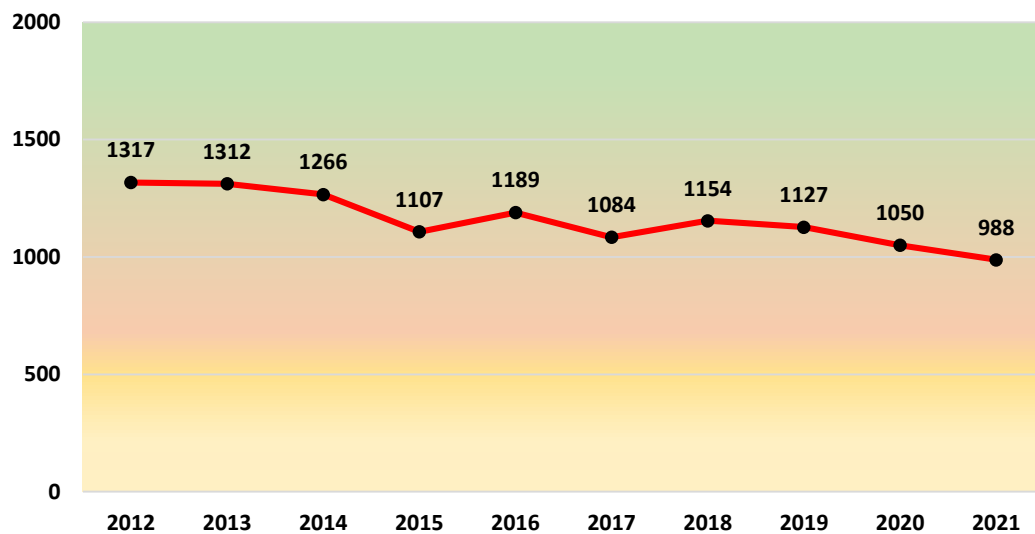
3. Dangerous Occurrences: The data reveals fluctuating trends in Dangerous Occurrences, with a notable decrease in 2015 and 2016, followed by a sudden spike in 2017. Subsequent years witnessed a consistent decline, reaching its lowest point in 2020, but a rebound was observed in 2021. Over the years, we observe a fluctuating pattern, with some years experiencing a rise and others a decline. In 2013, there was a 2.52% increase in dangerous occurrences compared to the previous year (2012). This moderate rise could be attributed to various factors, such as increased industrial activity. The years 2015 and 2016 stand out with substantial decreases, i.e. 28.88% and 35.84% respectively, showcasing successful safety interventions. The years 2017 and 2019, marked by sharp increases, underscore the need for continuous vigilance and improvement. 2020's dramatic decrease of 53.76% may be attributed to the pandemic's impact on industrial activities. The year 2021 witnessed a 66.88% increase, indicating a potential setback in the progress made in the preceding year. This surge suggests a rebound in dangerous occurrences, necessitating urgent corrective actions. However, external factors such as economic conditions or pandemic-related disruptions could have influenced these figures.

The year-wise analysis reveals a fluctuating pattern in dangerous occurrences in Indian factories. While there have been notable improvements, sporadic spikes underscore the need for continuous vigilance and improvement in safety protocols.



Graph 3: Dangerous Occurrences in Registered factories in India (2012-2021)

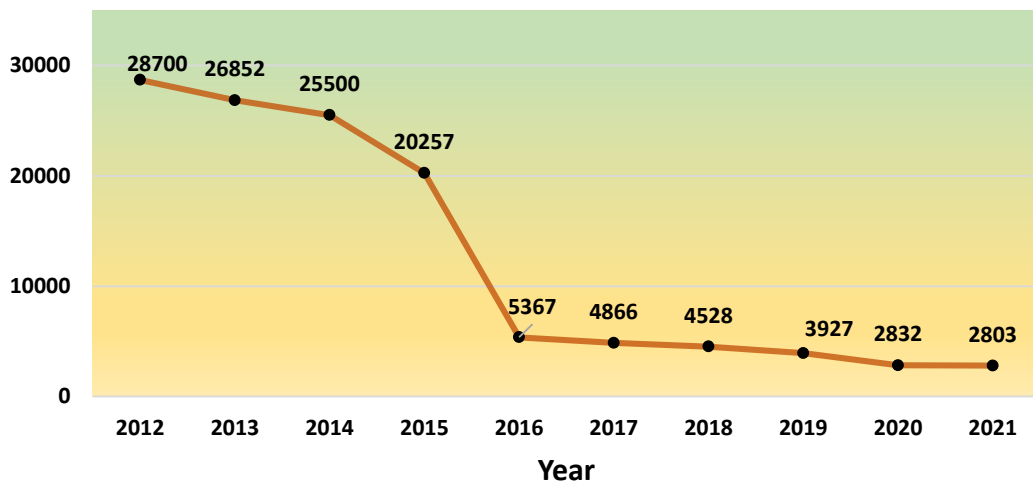
4. **Fatal Injuries:** There is a consistent decline every year in the no. of total injuries. Each year, the no. of total injuries reported is less than the previous year. There is decline of 24.98 % in the no. of fatal injuries in the registered factories since 2012 to 2021 i.e. fatal injuries in registered factories decreased from 1317 to 988. The initial years, from 2012 to 2014, witnessed a modest decline in fatal injuries, with a 0.38% reduction in 2013 and a more substantial 3.51% decrease in 2014. A significant reduction occurred in 2015, marked by a 12.56% decrease in fatal injuries. This was immediately followed by an upward spike in 2016 of 7.41%, emphasizing the importance of proactive measures to prevent fatal injuries in factories. The period from 2018 to 2021 reflected mixed trend, with increase in 2018 (6.46%) followed by decrease in 2019 (-2.34%) and 2020 (-6.83%). The year 2021 continued this trend with a 5.90% decrease in fatal injuries.



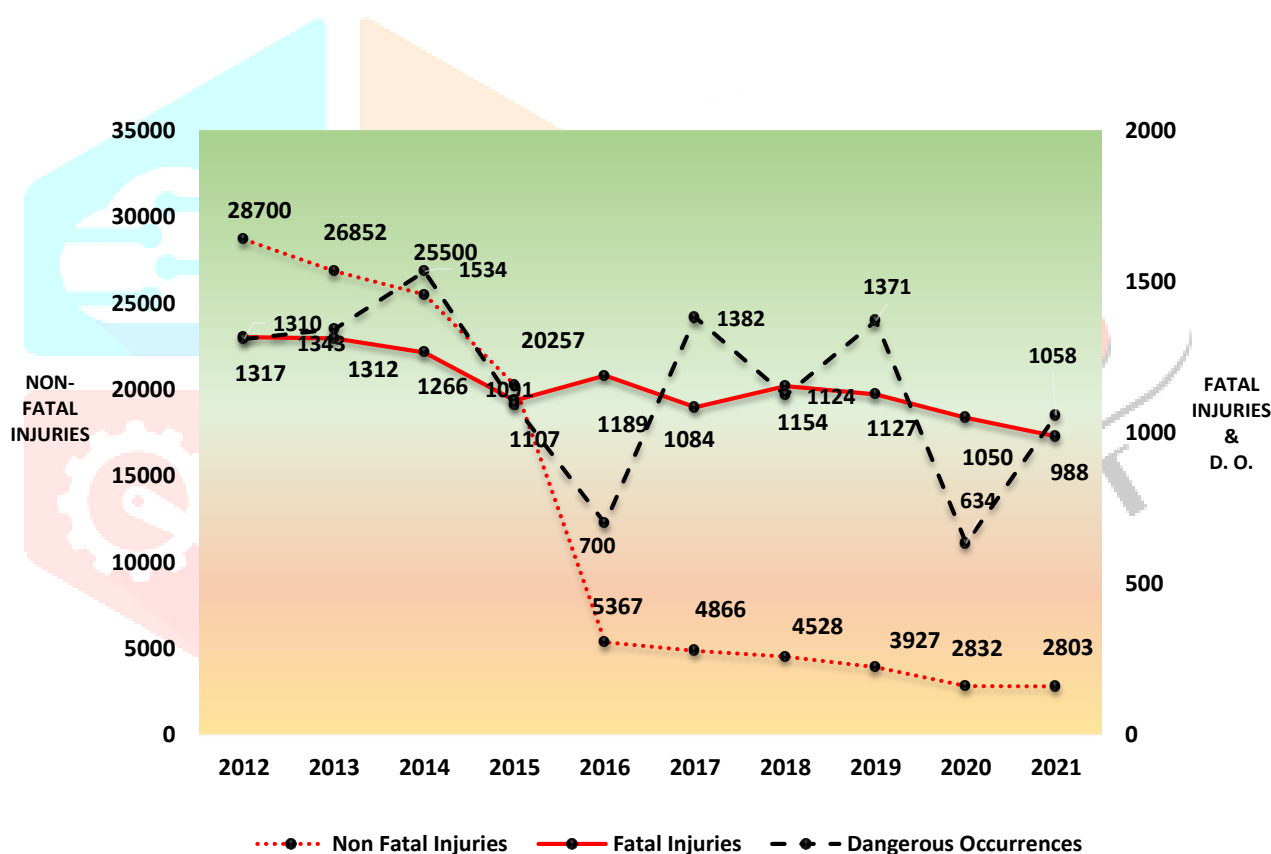
Graph 4: Fatal Injuries in Registered factories in India (2012-2021)

5. **Non-Fatal Injuries:** Like Fatal-Injuries, there is a consistent decline every year in the no. of non-fatal injuries. During 2012-2021, the non-fatal injuries in the registered factories decreased by 90.23 % from 28,700 to 2,803. The overall trend reveals a substantial reduction in non-fatal injuries over the years, showcasing a positive impact of safety initiatives in factories. In 2013, non-fatal injuries decreased by 6.44% compared to 2012. This decline may indicate an improvement in safety measures or increased awareness among workers. The trend continued in 2014 with a 5.04% decrease in injuries. A remarkable 20.56% decrease in 2015 might be attributed to enhanced safety regulations or increased compliance. The year 2016 witnessed a staggering unprecedented 73.51% drop⁵ in non-fatal injuries. Although there was a further reduction by 9.33%, the rate of decline slowed in 2017. In 2018 and 2019, the decline continued at a rate of 6.95% and 13.27% respectively. The year 2020 saw a substantial 27.88% drop, which may partly be attributed to the unprecedented challenges posed by the COVID-19 pandemic. In the year 2021, non-fatal injuries only decreased by 1.02%, suggesting a commendable resilience in safety measures. The slowdown in the rate of decline in recent years (2018-2021) may indicate the need for continuous innovation in safety practices to address emerging challenges. West Bengal recorded a significant decline in non-fatal injuries in 2016 and 2018 compared to previous years, with no reported data for 2017, 2019, 2020, and 2021.

⁵ This might be primarily because West Bengal reported a significant decline in non-fatal injuries in 2016 and 2018 compared to previous years, with no reported data for 2017, 2019, 2020, and 2021. For detailed data, refer Table-5 of Annexure.



Graph 5: Non-fatal Injuries in Registered factories in India (2012-2021)



Graph 6: Fatal Injuries, Non-fatal Injuries and Dangerous Occurrences in Registered factories in India (2012-2021)

Insights & Suggestions: As noted in the article, the overall national trend wrt factories, employment, and fatalities show improvement, the following insights and suggestions may address gaps and further reduce fatalities in factories, thereby improving the Occupational Safety and Health (OSH) situation:

- 1) **Implementing a robust safety management system:** The primary cause of accidents in factories is frequently attributed to the lack of effective implementation and maintenance of safety management systems. Having a robust safety management system is crucial to mitigating most safety risks. A proactive safety approach, including hazard identification and control, regular equipment maintenance, and emergency response planning, along with comprehensive training programmes,

regular inspections, adoption of new technologies, and fostering a strong safety culture, is essential to prevent accidents in industrial environments.

- 2) **Promote data-driven decision making:** Encourage the use of OSH Statistics and data analysis to inform evidence-based policy decisions and resource allocation for OSH interventions. Establish a continuous monitoring system for OSH data to promptly identify fluctuations and trends. Regularly analyze data to understand the impact of external factors such as economic conditions, policy changes, or global events on OSH indicators. Utilize available data on OSH incidents to identify high-risk areas, trends, and contributing factors, and develop targeted interventions and safety measures based on data analysis.

In this light, it is important to make mention of '**OSH Data Convergence**'. This initiative aims to address existing gaps in OSH data and related issues by establishing a convergence mechanism among various stakeholders involved in OSH data management. These stakeholders include the technical divisions of DGFASLI, DGMS, ESIC, CLC (C), MoL&E, and other relevant entities dealing with OSH Data. The envisioned '**OSH Data Convergence**' framework seeks to foster collaboration among the aforementioned entities, thereby streamlining the exchange of critical OSH data. By facilitating a cohesive flow of OSH information and insights, this initiative will significantly contribute to informed decision-making processes, and thereby strengthening our commitment to occupational safety and health.

- 3) **Invest in training and awareness programmes:** Train employers, managers, and workers on OSH best practices, emergency procedures, and hazard identification. Conduct regular safety training programmes focusing on sector-specific hazards and safe work practices. Implement continuous education and up skilling initiatives to create a safer and more resilient workforce.
- 4) **Foster collaboration and stakeholder engagement:** Encourage collaboration between government agencies, employers, employees, safety experts, and research institutions to share knowledge, best practices, and resources for improving OSH.
- 5) **Promote collaboration and knowledge sharing:** Encourage knowledge sharing and best practices among industries, states, and stakeholders. Foster a culture of safety at all levels through collaboration and communication. Support research and development of new technologies and safety solutions to address emerging risks and challenges in the workplace.
- 6) **Benchmarking Against Global Standards:** Benchmark OSH performance against international standards and best practices. Identify areas where the country can align with or exceed global safety benchmarks to enhance overall workplace safety.
- 7) **Technological Solutions:** Explore and implement advanced technologies, such as IoT sensors, wearables, and AI, to monitor workplace conditions and provide real-time feedback. Leverage technology for predictive analytics to prevent accidents.
- 8) **Periodically review and update OSH policies:** Align policies with evolving industry standards, technological advancements, and lessons learned from incidents. Ensure that policies are dynamic and responsive to changing circumstances.

Conclusion: The statistical analysis of OSH data from 2012 to 2021 in the registered factories provides valuable insights into the dynamic nature of the industrial landscape. The analysis shows a positive trend, indicating a concerted effort to improve workplace safety. While the data reflects substantial progress, it is crucial to remain vigilant, adapt to changing circumstances, and continuously enhance safety measures to ensure the well-being of the workforce in the years to come. As we navigate economic shifts and industrial advancements, prioritizing the well-being of workers remains a paramount concern for sustainable and responsible industrial growth.

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