

Occupational safety awareness, practice, and their correlation among employees of food and beverage industries of Telangana, India

NG Sunil Kumar¹, Pinakapani P², Thirupathi C³

¹Research Scholar, Department of Management, Gandhi Institute of Technology and Management, Hyderabad Business School, Hyderabad 502329, India

²Professor, Department of Marketing, Gandhi Institute of Technology and Management, Hyderabad Business School, Hyderabad 502329, India

³Assistant Professor, School of Management Studies, National Forensic Sciences University (NFSU), Delhi Campus, India

Corresponding author:

NG Sunil Kumar¹, Research Scholar, Department of Management, Gandhi Institute of Technology and Management, Hyderabad Business School, Hyderabad 502329, India

E-mail: snjavara@gitam.in

ORCID ID:

<https://orcid.org/0000-0003-4108-5146>

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ABSTRACT

Introduction: In all manufacturing sectors, it is very important to ensure workers are informed of potential safety risks because of the implications for public safety, employee welfare, and organizations. This research aims to examine safety hazard awareness in the food and beverage industry (FBI) in Telangana, India, and to investigate the relationship between safety awareness and workplace safety practices.

Methods: The study utilized a cross-sectional survey design with data collected from June to August 2023. A random sampling technique was employed, selecting 110 employees from Telangana, India's Food and Beverage industry. The collected statistical data was analyzed using key statistical indicators, including the Spearman rank correlation coefficient, the Kruskal-Wallis's test, and the Mann-Whitney *U* test for p-value determination. These analyses were conducted using SPSS.

Results: With 90% male participants in the survey and 48.18% from the production department, a significant association between safety awareness and age group, and level of education was found with p values 0.013 & 0.032 respectively. Similarly, there was a significant association between safety practice, age group, experience level, and job position with p-values of 0.006, 0.0049 & 0.011 respectively. A positive correlation coefficient value of 0.53 represented a noteworthy positive correlation between safety awareness and practice.

Conclusion: The findings show that workers have a significant level of awareness regarding safety in the workplace. In addition to that, a noteworthy positive correlation was discovered between safety awareness and safety practices inside the selected Food and Manufacturing companies of Telangana. Subsequent investigations and studies on safety awareness and hazards will enhance the safety climate and culture across the manufacturing industry.

Keywords: Health, Manufacturing, Safety, Safety Awareness, Safety Practice

Introduction

The organizational work environment is made up of several factors that affect indirectly or directly the worker's behavior. In return, it negatively or positively affects the worker's safety, though the environment of the workplace is overlooked.¹ The problems based on occupational Health and Safety(HS)remained a concern to several business

organizations.² A statistical report from the International Labour Organization indicated that nearly 240 employees die in an hour due to improper occupational safety awareness in the workplace, which in turn results in several 6000 daily deaths globally.³Workplace HS is related to public health and is envisioned to enhance the HS in

the promises of the working environment. Workplace HS assesses the illness and injury trends among employees and provides solutions to eliminate hazards and risks in the workplace.⁴ Safety threats are a great issue in several industries in the current era as there is a lack of safety awareness in workplaces, no proper assessment of hazards and identification methods, and no effective implementation of hazard programs for employees.⁵ All these attributes have direct or indirect affection on most industrial incidents resulting in employee injuries, hour loss, equipment damage, and low production efficiency.⁶ The significance of workplace safety is emphasized in many kinds of literature.^{7, 8} The safety hazard presence in the workplace tends to increase the potential risk of harm to employees. Hence, for any organization or industry that needs to gain success, it is necessary to conduct risk and hazard assessment initially to classify the threats that pose a danger to workers in the workplace. In developing countries, most workers are directly exposed to at least one form of industrial safety hazard. Alternatively, it can be stated that emerging countries need more concern in the assessment of safety hazards and proper safety hazard programs should be provided to the employees in manufacturing industries from developing countries.⁹

Mostly all types of organizations have Health and Safety (HS) risks, it is the responsibility of every employer to make sure workers can do jobs safely without any risk. Different equipment, machines, and materials are hazardous manufacturing sectors that need special care and attention based on safety procedures. Workplace HS is a large umbrella. The work environment not only covers the safety use and first aid allocation of machines but also designs efficiency in place, prevents infection, and responds to workplace violence. The work environment is concerned with protecting conserving and utilizing resources that can help prevent injuries and promote safety culture because of hazards in the work environment. Additionally, it also aims to enhance the efficiency and quality of an organization's safety management.¹⁰ Many accidents and injuries are caused in industries.¹¹ Millions of people's livelihood is based on Food and Beverage Industries. It significantly contributes to the foreign exchange of a country. Based on ILO's report, it is estimated that nearly 4% of loss in Gross – Domestic – Product is due to work environment

accidents.¹² The estimated cost yearly due to work-related accidents is \$2.8 trillion. The most hazardous industry in the world is the process industry.³ Hence, issues regarding HS should be the main concern in all businesses as productivity and safety are interwoven.⁷

The work environment hazard must be identified, controlled, and minimized to the lowest responsible level achievable.¹³ Though each company has its own risk, the chemical industry is considered a highly risky manufacturing industry like the petrochemical industry which is one of the largest productions of propylene, ethylene, butadiene, and other products that are involved in producing secondary products like soaps, detergents, solvents and plastics.¹⁴ Several threats have been identified in the chemical industry workplace.¹⁵ Moreover, occupational HS is suitable for all types of branches like commerce, information technology, health services, traditional industries, schools, universities, and so on.¹⁶ Diseases and accidents related to work have a great influence on individuals and their families. As it affects the business, economic growth, disruption in productivity, and restraining competitiveness in the business of supply chain, society, and lifestyle.¹² Management of the organization should understand the statutory requirements regarding safety and should have an effective occupational HS committee, while employers should be aware of work safety hazards and safety practices.¹⁷ Research by Hong & Surlenty found that safety behavior, safety rules, and safety promotion were high among SME workers. This alternatively reflects on the involvement of management; employee engagement and the environment of the workplace are the factors influencing HS in the occupational sector.¹⁸ Thoroughly understanding the level of occupational safety and health (OSH) awareness among workers in the majority of the manufacturing companies in Malaysia is well evident which ultimately helps in reducing safety incidents.¹⁹ Occupational hazards in the workplace can be categorized into five main types: physical, chemical, biological, mechanical, and psychosocial. These diverse hazards require careful identification and management to ensure employee safety and well-being.¹⁵

There are many obligations for the industry to safeguard their workers from occupational hazards. There is no proper awareness of safety practices among employees to overcome occupational hazards. Manufacturing industries generally lack

adequate training and awareness of safety protocols in equipment failure.²⁰ Further, there is no regular onsite supervision, a lack of managerial support, and financial constraints in providing awareness programs to the employees.²¹ Many kinds of literature have pictured the impact of occupational hazards on organizations and employees.¹² It is a challenge and responsibility for the industries to provide training programs on safety practices in industries.²² Not all industries are adaptable to considering safety awareness among employees because of the cultural and social factors existing in the country. However, high-risk industries are examined regularly, it is required for low-risk industries to monitor safety practices to avoid a reduction in productivity. The present study helps to identify safety hazard awareness among the employees in the manufacturing industry. The article by Salhi, Chater, & Maurady investigates dimensions of safety cultures in Morocco's automotive industry, revealing a very good (strong) correlation with occupational accidents, notably emphasizing the impact of employees' attitudes, insufficient staff participation, and inadequate supervision, with a heightened influence during the COVID-19 period.²³

Different safety management practices are executed in industries in developed countries to promote the HS of workers. Proper awareness of safety practices during occupational hazards in manufacturing industries makes their employees feel secure and safe. When there is safety awareness among the employees enhances the productivity and quality of delivery in the industry. While focusing on the food industry it is a challenge for the management to examine the health status of the employees, as it alternatively affects public health. Furthermore, Management should be accountable for analyzing the safety awareness among workers, if there is any hazard caused it affects the organization's fame, health, and public. This study aims to analyze safety hazard awareness among employees in manufacturing industries and to assess the correlation between safety hazard awareness and safety practices at the workplace.

Methods

This study employed a cross-sectional survey design, utilizing simple random sampling to ensure a representative selection of participants. The sample size is calculated using the simple random sampling method at a 95% confidence level and

considering a 10 % margin of error. The calculation of sample size for the unknown population is given by the formula.

$$n = \frac{Z^2 \cdot p \cdot (1 - p)}{E^2}$$

Where:

n = sample size, Z= Z-score corresponding to the desired confidence level (The value of Z-Score for a 95% level of confidence will be 1.96), p = estimated proportion (generally it is taken 0.5 to maximize the required sample size), E = margin of error

$$n = \frac{1.96^2 \cdot 0.5 \cdot (1 - 0.5)}{0.1^2}$$

$$= \frac{0.9604}{0.01}$$

$$= \approx 96$$

The study was conducted in food and beverages manufacturing companies in India, with approximately 110 (Higher than the minimum sample size at 95% confidence level and 10 % margin of error) participants, and data was collected from June to August 2023. This approach allowed for the collection of data at a single point in time, providing a snapshot of the relationship between variables across the sampled population. This article relies on descriptive and empirical studies, emphasizing a quantitative analysis approach employing primary data. Data was collected through surveys using questionnaires based on the Likert scale, and the collected information was subsequently put into IBM SPSS Statistics 22 software for analysis.

A Cronbach alpha test is performed to check the reliability and validity of the data collected from the survey. The value of Cronbach's Alpha is found to be 0.71 which means the collected data has good reliability and validity.

Workers eligible for this study must belong to the selected food and beverages manufacturing sectors in Telangana state, India, and possess a level of literacy sufficient for effective communication and understanding of the research questions and tasks included in the study. The questionnaire was structured into three comprehensive segments to gather valuable insights on hazard awareness and safety practices among participants. The initial segment focused on obtaining demographic details, encompassing information such as age, gender, education level, years of experience, department, and designation. The subsequent two segments

delved into safety awareness and practices, each featuring ten questions. Respondents are told to answer their views on the given questionnaire on a Likert scale ranging from "Disagree", "Partially Agree" and "Fully Agree". Non-parametric Kruskal Walli's and Mann-Whitney U tests were used to analyze the relationship between different variables taken into conducting this research. Approval has been obtained from the research cell of GITAM, Hyderabad. All participants provided informed

consent after being fully briefed on the study's objective and procedures. Also, they were assured the confidentiality of the data provided.

Results

These tables unveil variations in safety perceptions among different groups, enabling targeted interventions and improvements tailored to specific organizational needs.

Table 1: Demographic variables of the participants in Food and Beverages Industries in India (n=110)

Demographic Variables	Category	Frequency N (%)
Age Group (Years)	18-25	5(4.55%)
	25-35	51(46.36%)
	35-45	30(27.27%)
	45 & Above	24(21.82%)
Gender	Male	99(90%)
	Female	11(10%)
Education level	School	18(16.36%)
	Intermediate	12(10.91%)
	Bachelor's Degree	59(53.64%)
	Master's Degree	21(19.09%)
Experience in years	Less than 5	22(20%)
	5-10	47(42.73%)
	10-20	28(25.45%)
	20 and above	13(11.82%)
Department	Production	53(48.18%)
	Maintenance	11(10%)
	Utilities	18(16.36%)
	Quality Assurance (QA)	18(16.36%)
	Stores	7(6.36%)
	HSE	3(2.73%)
Designation	Sr. Manager	4(3.64%)
	Manager	9(8.18%)
	Assistant Manager	12(10.91%)
	Executive	54(49.09%)
	worker	31(28.18%)

This study involves a total of 110 candidates and the demographic distribution of these candidates is shown in Table 1. Astonishingly, about 90% of the participants are male and the rest are females which shows that the FBI sector contains most male workers. Department-wise, there is 48.18% inclusion from production and 16.36% in each QA and utilities department, respectively. Most of the participants about 46.36% are between the ages of 25

and 35, followed by the age group 35 to 45 years which covers up 27.27%. In terms of experience, the majority of candidates 42.73% have 5-10 years of experience and 53.64% of employees acquire a bachelor's degree. Executive job holds 49.09% of total participation and 19.09% of the total population have a master's degree. This table also shows how the workforce is formed in the Indian Food and Beverages manufacturing industry of

India. Kruskal-Wallis’s test is employed in this research because safety awareness and safety practices do not qualify for normality.

Table 2: Occupational safety awareness among employees from different sociodemographic of Food and Beverages Industries in Telangana state of India

Occupational Safety Awareness					
Demographic Variables	Category	Mean Rank	Kruskal Wallis H/Mann–Whitney U	df	P-value
Age Group (Years)	18-25	30	10.861	3	0.013*
	25-35	49.64			
	35-45	68.95			
	45 &above	56.46			
Gender	Male	54.87	0.410 (Mann–Whitney U)	1	0.522
	Female	61.18			
Education level	School	41.69	8.829	3	0.032*
	Intermediate	51.63			
	Bachelor's Degree	55.08			
	Master's Degree	70.74			
Experience in years	Less than 5	41.68	6.705	3	0.082
	5-10	55.56			
	10-20	62.14			
	20 and above	64.35			
Department	Production	52.38	13.857	7	0.054
	Maintenance	45.32			
	Utilities	53.17			
	Operations	83			
	Manufacturing	52.38			
	Quality Assurance	54.08			
	Stores	80.71			
	HSE	101.5			
Designation	Sr. Manager	85.5	8.775	4	0.067
	Manager	69.44			
	Assistant Manager	65.92			
	Executive	52.24			
	worker	49.23			

With a p-value of 0.013, which is below the significance level of $\alpha = 0.05$, there is substantial evidence to reject the null hypothesis and accept the alternative hypothesis. This indicates a significant association between occupational safety awareness and age groups at the 5% level of significance. Likewise, the p-value of 0.032 across different educational levels indicates that there is an association between safety awareness and educational backgrounds with a significance level of

5%. The rest of the sociodemographic has a greater p-value than the significance level i.e., different experience levels possess a p-value of 0.082, in the department, it is 0.054, across different designation groups it is 0.11, and among different gender p-value is 0.522. The p-value shows that there is no association between safety awareness across these demographic variables Department, Designation, Experience in years, Gender.

Table 3: Safety practices among employees from different demographics of Food and Beverages Industries in Telangana state of India

Safety Practice					
Demographic Variables	Category	Mean Rank	Kruskal Wallis H/Mann-Whitney U	df	P-value
Age Group (Years)	18-25	18	12.396	3	0.006*
	25-35	50.16			
	35-45	5.91			
	45 & Above	52.93			
Gender	Male	53.51	0.000 (Mann-Whitney U)	1	0.996
	Female	53.45			
Education level	School	45.35	5.202	3	0.158
	Intermediate	59.05			
	Bachelor's Degree	50.7			
	Master's Degree	65.19			
Experience in years	Less than 5	39.39	7.84	3	0.049*
	5-10	55.38			
	10-20	63.85			
	20 and above	51.46			
Department	Production	54.04	7.19	7	0.409
	Maintenance	48.09			
	Utilities	47.44			
	Operations	82			
	Manufacturing	43.25			
	Quality Assurance	52.42			
	Stores	64.25			
	HSE	88.5			
Designation	Sr. Manager	51.55	12.982	4	0.011*
	Manager	41.5			
	Assistant Manager	76.79			
	Executive	49.06			
	worker	51.55			

This means that safety practice is significantly associated with different experience levels, positions, and age groups. Furthermore, Demographics that possess a p-value more than significance level α (0.05) are Gender with a p-value of 0.996, Education level with p value 0.158, and Department with a p-value of 0.409, respectively and these values indicate that there exists no association between safety practice and these sociodemographic characteristics (gender, education level ad department).

From Table 2, it is well evident that the correlation between safety awareness and safety practices is

positive. Spearman coefficient of correlation. 562 represents a medium dependency between safety practices and occupational safety awareness. It means people who are aware of safety parameters are adopting safer ways to carry out their work. Another statistical indicator, the p-value, also shows the significant association between safety awareness and practices among the population taken into this study. The p-value of 0.001, which is much less than the significance level α -value 0.05 to prove the null hypothesis, provides enough support to reject the null hypothesis and adopt an alternative hypothesis. That means there is an association between safety practices and safety awareness among employees of

the food and beverage industries of Telangana state, India.

Table 4: Spearman Rank order correlation between hazard awareness and safety practices among employees of Food and Beverages Industries in Telangana state of India

<i>Descriptive and Inferential Statistics.</i>	<i>Occupational Safety</i>	
	<i>Awareness</i>	<i>Safety Practice</i>
Mean	2.679090909	2.614545455
Variance	0.046989992	0.084006672
Observations	110	110
Spearman Correlation	0.562	
p-value	<0.001**	

Discussion

There are so many occupational safety hazards that exist in the workplace. Employees must be aware of these hazards to reduce incidents and foster a safe working environment. That is why this paper is conducted to examine the level of occupational safety awareness and practice across different socio-demographics. About 46% of the population is of the age group of 25-30 years, which indicates that the involvement of young generation workers is very noticeable in the food and beverages sector. Occupational safety awareness among different age groups is found significantly different with a p-value of $0.013 < 0.05$.²⁴ This result agrees with the study (Dragano, et al., 2018) which also shows that awareness among different age groups is significantly different.²⁴ AlMousa, et al., 2022 found that there is a significant difference in safety cultural awareness across different genders but in this research, the occupational safety awareness across different genders is not significantly different as seen from the p-value of $.522 > 0.05$.²⁵ While the study by AlMousa et al. (2022) explores safety culture awareness across genders, this study focuses on occupational safety awareness, which is closely related. The difference in findings between the two studies could be due to the low participation of females in the food and beverage sector in Telangana, where women make up only 10% of the workforce. This limited female representation may have influenced the overall results on safety awareness.²⁵

This study reveals that occupational safety awareness across different education levels is significantly different as can be seen from the p-value $0.032 < 0.05$ (α) and the master-level study group has a greater mean rank value of 70.74 as compared to others' education levels also agrees with the study conducted in Tigray Region,

Ethiopia. Workers holding certificates or higher levels of education exhibit a 13 times greater likelihood of being aware of occupational safety and PPE. Furthermore, there is no significant difference in knowledge regarding occupational safety awareness across different experience levels as seen in Table 2 but Employees with more extensive experience, particularly those with over 20 years of experience, demonstrate higher mean ranks in safety awareness compared to their less experienced counterparts. But in this regard, this study negates the findings by Ramli, et al., 2020,²⁷ Which found that occupational safety hazard awareness among the staff who have more experience and the undergraduate students who have very little experience is significantly different. Comparatively, the staff has more occupational hazard awareness than newly joined undergraduate students. Regarding department and designation, the p-value provides evidence to say that there is no association between different departments, job roles, and safety hazard awareness with p-values > 0.05 . Meanwhile, it is worth noticing that occupational safety awareness across HSE departments and certain designations like Sr. managers exhibit higher mean rank in occupational safety awareness.

The result reveals that there is an association between ($p=0.006 < 0.05$) safety practice and age groups addressing the lowest mean rank between age group 18-25 years. This result is against the findings of article,²⁸ which discovered there is no noticeable difference in safety practice and compliance among different age groups in government link companies of Malaysia. This conflict arises because there might be some lack of knowledge of newly hired employees, especially of the age group 18-25(4.55%), and 25-35(46.36%), regarding occupational safety in the food and beverages industries. Interestingly, Gender

differences have minimal impact on adherence to safety practices as seen from the p-value ($p=0.996>0.05$) within the food and beverages industry although paper (Copsey & Schneider, 2018) highlights the need for stakeholders to consider gender differences and promote diversity in the workplace to create better, healthier, and more gender-sensitive environments.²⁹ The p-value across different education levels shows no statistically significant differences in safety practice with a p-value of 0.158 which is greater than $\alpha=0.05$ (significance level). In contrast, there is an association between safety practice and different experienced groups with a p-value of $0.049<0.05$ which is not in line with the study by Isa, et al., 2021.²⁸ This study indicates that there is no notable (significant) correlation or association between the age group and work experience of employees with the adherence to the organizations safety culture and practices, this is because Older workers especially of work experience between 10-20 years with mean rank 63.85 are more reliable than young workers and usually have possessed multiple skills, knowledge, physically fit, and a higher level of dedication towards work.²⁸ But after 20 years of work experience the safety practice rank is degraded to 51.46, this is because employee usually get older after 20 years of working and their physiological systems such as muscle strength, stature, dexterity, and mobility might be degraded gradually.²⁸ Likewise, the Kruskal Wallis H test gives a p-value that indicates there is no significant difference in safety practices across different departments. Additionally, the p-value on safety practice across different designations from the Kruskal Wallis-H test comes out to be 0.011 providing a significant confidence level to reject the null hypothesis i.e., there exist significant

differences in safety practices across different job roles.

Furthermore, the Spearman rank correlation coefficient between safety practices and safety awareness is calculated and shown in Table 4. The value of the Spearman correlation is 0.562, which shows that there is a medium correlation between safety practice and safety awareness. From this result, it can be concluded that employees who are aware of occupational safety will adopt a safer way to perform the work and vice versa. A similar kind of result was found in the study of Adhikari & Wagle, 2021, which highlighted the data showing a significant association between the awareness of PPE use and awareness of occupational health problems with the practice of PPE and safety.³⁰ The workers who were aware of the use of PPE and occupational safety were more likely to practice PPE and safety than the workers who were not aware.

Conclusions

This study assessed occupational safety awareness and safety practice across different sociodemographic and calculated the correlation between them. A significant variation in occupational safety awareness is found across different age groups and education levels. Similarly, few sociodemographic like age, experience, and designation have a significant amount of impact on safety practices in the workplace. Furthermore, positive medium correlations were found between occupational safety awareness and safety practices among employees of the food and beverage industries inside Telangana state, India. As the research has demonstrated, to foster a safe working culture and bolster safety practices in the workplace there should be proper and comprehensive occupational awareness.

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