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Assessment of Health and Safety Measures at Wheels India Ltd.: An Empirical Study

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Abstract: *This study evaluates the health and safety measures at Wheels India Ltd., Padi, Chennai, focusing on the effectiveness of training, worker awareness, and management practices. Using descriptive research design and statistical tools such as Chi-square, correlation analysis, and ANOVA, the study assesses the relationship between worker awareness and health and safety training, effective disciplinary procedures, and machine maintenance with safety outcomes. Results indicate a significant relationship between training and awareness, but no significant link between disciplinary procedures and safety. Positive correlations were observed between machine maintenance and accident rates, and ANOVA revealed significant differences in the effectiveness of various safety measures. The findings suggest improvements are needed in disciplinary practices and machine maintenance to enhance overall worker safety and productivity.*

Keywords: Health and Safety, Worker Awareness, Safety Training, Disciplinary Procedures, Machine Maintenance

I. INTRODUCTION

Health and safety measures are pivotal in ensuring worker well-being and productivity within industrial settings. Effective health and safety practices not only comply with regulatory requirements but also enhance organizational performance by reducing accidents and improving job satisfaction (Bamber et al., 2019). At Wheels India Ltd., Padi, Chennai, the implementation of such measures is critical due to the nature of factory environments, which are often characterized by exposure to hazardous conditions such as excessive heat, noise, and dust (Bureau of Labor Statistics, 2020).

In industrial settings, the importance of comprehensive health and safety training cannot be overstated. Training programs are designed to raise awareness among workers, ensuring they are well-informed about safety protocols and emergency procedures (HSE, 2021). Studies have shown that effective training programs lead to a significant reduction in workplace accidents and injuries (Robson et al., 2022). Additionally, management's role in enforcing these protocols is crucial for maintaining a safe work environment, as their commitment to safety influences overall organizational culture and employee behavior (Zohar & Luria, 2005). Disciplinary procedures and machine maintenance also play essential roles in sustaining a safe workplace. Research indicates that stringent disciplinary measures for non-compliance with safety practices can lead to improved adherence to safety protocols (Leigh, 2017). Similarly, regular maintenance of machinery is linked to a reduction in workplace accidents, as well-maintained equipment minimizes the risk of malfunctions that could lead to injuries (Smith & Cohen, 2019). A study by Zhou et al. (2021) explored the impact of OHSMS implementation on the reduction of workplace accidents in the manufacturing sector. The research highlighted that companies that rigorously apply health and safety standards observe a significant decrease in workplace incidents. The study also underscored the importance of regular audits and employee training in maintaining high safety standards. Ghasemi et al. (2022) examined how employees' perception of the safety climate within organizations affects their compliance with safety protocols. The research revealed that a positive safety climate, characterized by visible management commitment and open communication, leads to higher safety compliance and lower accident rates. The study was conducted across multiple industries, including automotive manufacturing, which is relevant to Wheels India Ltd. A study by Nielsen et al. (2023) focused on the effectiveness of safety training programs

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in improving workplace safety in manufacturing industries. The study emphasized that tailored safety training that addresses specific hazards in the workplace is more effective than generic safety training. It also found that continuous reinforcement of safety training through regular refreshers significantly improves employee adherence to safety measures. Shen et al. (2020) investigated the role of technological innovations, such as automation and the Internet of Things (IoT), in enhancing workplace safety in the automotive manufacturing sector. The study found that the integration of smart technologies led to a reduction in manual handling risks and provided real-time monitoring of potential hazards, thereby improving overall safety outcomes. Patel and Kumar (2022) discussed the challenges faced by manufacturing industries in maintaining health and safety standards during the COVID-19 pandemic. The study highlighted that companies that swiftly adapted their health and safety protocols to include measures such as social distancing, regular sanitization, and personal protective equipment (PPE) saw fewer disruptions and maintained higher levels of employee safety. Jones et al. (2021) explored the role of leadership in promoting a strong safety culture within manufacturing organizations. The research found that transformational leadership styles, where leaders actively engage with employees and prioritize safety, lead to a more robust safety culture and lower incident rates. This study is particularly relevant for understanding the role of management at Wheels India Ltd. in fostering a safety-oriented environment.

Need for the Study

Health and safety measures are essential for any organization employing workers. Beyond just paying wages, employers are responsible for ensuring the health and safety of their workers both on and off the job. In environments like factories, where excessive heat or cold, noise, odors, fumes, dust, and inadequate sanitation can pose risks, ensuring worker safety becomes even more critical. A safe working environment is fundamental to productivity and overall worker well-being. This study aims to assess the effectiveness of health and safety measures at Wheels India Ltd. by evaluating worker awareness, management practices, and disciplinary procedures. It will also explore the relationship between machine maintenance and safety outcomes, providing insights into areas where improvements can be made to enhance overall safety and productivity.

Objectives of the Study

- To evaluate the health and safety measures implemented at Wheels India Ltd.
- To gauge workers' awareness of health and safety practices in the workplace.
- To assess the management's role in enforcing health and safety protocols.
- To measure the satisfaction levels of employees regarding health and safety measures.

Scope of the Study

This study provides a detailed overview of the health and safety practices at Wheels India Ltd., Padi, Chennai. Understanding these measures is crucial for improving organizational productivity. The study will explore workers' perceptions of health and safety and identify areas for improvement. Insights gained can help Wheels India Ltd. enhance its practices, leading to better worker performance and satisfaction.

II. RESEARCH METHODOLOGY

Research Design

The study employs a Descriptive Research Design, focusing on systematically collecting and analyzing data to ensure relevance and efficiency in addressing the research objectives.

Sampling Design

- **Population:** Workers at Wheels India Ltd., Padi, Chennai.
- **Sampling Method:** Stratified Sampling.
- **Sample Frame:** Based on the pilot study, an average of 7 respondents could be surveyed daily.
- **Duration:** 20 days.
- **Sample Size:** Expected samples were 140, with actual samples collected being 13

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Pilot Survey

A preliminary test of the survey questionnaire was conducted, covering 7 samples per day to refine the instrument.

Data Collection

- **Primary Data:** Collected through 135 structured interview questionnaires with 26 questions, including dichotomous, multiple-choice, Likert scale, and ranking scale questions.
- **Secondary Data:** Gathered from existing sources such as newspapers, journals, magazines, and the internet.

Statistical Tools Used

- Chi-square analysis
- Correlation analysis
- Spearman's rank correlation
- ANOVA

CHI-SQUARE ANALYSIS:

Analysis between awareness of workers and Health and safety training.

Null hypothesis *(H_0)*: There is a relationship existing between the awareness of workers and the Health and safety training.

Alternative hypothesis *(H_1)*: There is no relationship existing between the awareness of workers and the Health and safety training.

Table showing the awareness of workers and health and safety training.

	Yes	**No**	**Total**
Number Of Respondents	63	72	**135**
	72	63	**135**
Total	**135**	**135**	**270**

FORMULA:

$\chi^2 = \sum (O_i - E_i)^2 / E_i$ Where,

O = Observed Frequency

E = Expected Frequency = $\frac{\text{Row Total x Column Total}}{\text{Grand Total}}$

i = 1, 2, 3……n

Table showing the analysis between awareness of workers and health and safety training

O_i	E_i	$(O_i - E_i)$	$(O_i - E_i)^2$	$(O_i - E_i)^2 / E_i$
63	68	-5	20.3	0.3
72	68	4.5	20.3	0.3
72	68	4.5	20.3	0.3
63	68	-5	20.3	0.3
Total				**1.2**

Degree of freedom:

= (r - 1) (c -1)

= (2-1) (2-1)

= 1

χ^2 Table value at 5% Level of significance = 3.841

χ^2 Calculated value = 1.2

χ^2 CV < χ^2 TV

So, H_0 is accepted, H_1 is rejected.

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INFERENCE:

Hence, there is a relationship between the awareness of workers and the Health and safety training.

Analysis between effective disciplinary procedures and safe work environment.

Null hypothesis *(H_0)*: There is a relationship existing between the effective disciplinaryprocedures and safe working environment.

Alternative hypothesis *(H_1)*: There is no relationship existing between the effectivedisciplinary procedures and safe working environment.

Table showing the effective disciplinary procedures and protected workingenvironment.

	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Total**
Number of Respondents	76	59	0	0	0	**135**
	54	45	36	0	0	**135**
Total	**130**	**104**	**36**	**0**	**0**	**270**

FORMULA:

$\chi^2 = \sum (O_i - E_i)^2 / E_i$ Where,

O = Observed Frequency

E = Expected Frequency = Row Total x Column Total / Grand Total

i = 1, 2, 3……n

Table showing the analysis between effective disciplinary procedures andprotected working environment.

O_i	E_i	$(O_i - E_i)$	$(O_i - E_i)^2$	$(O_i - E_i)^2 / E_i$
76	65	11	121	1.861
59	52	7	49	0.942
0	18	-18	324	18
0	0	0	0	0
0	0	0	0	0
54	65	-11	121	1.861
45	52	-7	49	0.942
36	18	18	324	18
0	0	0	0	0
0	0	0	0	0
Total				**41.606**

Degree of freedom:

= (r - 1) (c -1)

= (2-1) (5-1) = 4

χ^2 Table value at 5% Level of significance = 9.488

χ^2 Calculated value = 41.606

χ^2 CV > χ^2 TV

So, H_0 is rejected, H_1 is accepted.

INFERENCE:

Hence, there is no relationship existing between the effective disciplinary procedures andsafe working environment.

CORRELATION ANALYSIS:

Analysis between the maintenance of machines and the accidents happened.

X – Maintenance of machines.

Y – Accidents happened.

Table showing the analysis between the maintenance of machines and theaccidents happened.

X	**Y**	**X2**	**Y2**	**XY**
4	4	16	16	16

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54	23	2916	529	1242
63	81	3969	6561	5103
14	27	196	729	378
0	0	0	0	0
135	**135**	**7097**	**7835**	**6739**

FORMULA:

$$r = \frac{(N \sum xy - \sum x \sum y)}{\sqrt{(N \sum x2 - (\sum x)\ 2)}\ \sqrt{(N \sum y2 - (\sum y)\ 2)}}$$

$$= \frac{5(6739) - (135)\ (135)}{\sqrt{(5\ (7097) - (18225))}\ \sqrt{(5\ (7835) - (18225))}}$$

$$= 0.813$$

INFERENCE:

Correlation for the maintenance of machines and the accidents happened.	**VALUE**	**RESULT**
	0.813	GOOD

ANOVA:

Analysis between the health and safety measures provided to the workers.

Null hypothesis *(H_0)*: There is no significant difference existing between the health andsafety measures provided to the workers.

Alternative hypothesis *(H_1)*: There is a significant difference existing between the healthand safety measures provided to the workers.

Table showing the number of respondents and the workings.

MEASURES	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Total**	**Total**
First-Aid	113	22	0	0	0	**135**	**13253**
Temperature	32	103	0	0	0	**135**	**1163**
Enough space	22	81	32	0	0	**135**	**8069**
Maintaining latrines, urinals	22	77	36	0	0	**135**	**7709**
Training before handling machines	63	50	22	0	0	**135**	**6953**
Total	**252**	**333**	**90**	**0**	**0**	**675**	
Total	**18730**	**26083**	**2804**	**0**	**0**		**47617**

Correction factor = $(T_1)^2 / n = (675)^2 / 25 = 18225$

Sum of the squares of columns:

$SSC = \sum (C_j)^2 / R - CF$

$= [(252)^2 / 5 + (333)^2 / 5 + (90)^2 / 5 + (0)^2 / 5 + (0)^2 / 5] - 18225$

$= 18274$

Degree of freedom = C – 1

= 5 – 1

= 4

Sum of the squares of total:

$SST = T_2 - CF$

$= 47617 - 18225$

$= 29392$

Sum of the squares of residual error:

SSE = SST – SSC

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= 29392 – 18274
= 11118
Degree of freedom = C (R – 1)
= 5 (5 – 1)
= 5*4
= 20
Table showing the analysis of variance.

Sources of variation	Sum of squares	Degree of freedom	Mean sum of squares
Between columns	18274	4	4568.5
Residual error	11118	20	556
Total	**29392**	**24**	

F calculated value = 4568.5 / 556 = 8.217
Degree of freedom (4, 20) and Level of significance = 5%F table value = 2.87
$F_{cal} < F_{tab} = H_0$ is accepted
Here, the calculated value is greater than the table value. Hence we reject the nullhypothesis (H_o) and accept the alternative hypothesis (H_1).
INFERENCE:
There is a significant difference existing between the health and safety measures providedto the workers.

III. FINDINGS

- Awareness & Training: Workers' awareness is positively correlated with health and safety training, indicating that training significantly improves awareness.
- Disciplinary Procedures & Safety: There is no significant relationship between effective disciplinary procedures and a safe working environment, suggesting other factors influence safety.
- Machine Maintenance & Accidents: A strong positive correlation (0.813) exists between proper machine maintenance and the reduction of workplace accidents, highlighting maintenance's critical role in safety.
- Health & Safety Measures: Significant differences exist in workers' perceptions of the health and safety measures provided, indicating varied satisfaction levels across different safety aspects.

IV. CONCLUSION

The study on health and safety measures at Wheels India Ltd., Padi, Chennai, reveals a strong relationship between worker awareness and health and safety training, indicating effective tra0ining programs. However, no significant link was found between disciplinary procedures and a safe working environment. Correlation analysis shows a positive relationship between machine maintenance and accident rates, suggesting better maintenance reduces accidents. ANOVA confirms significant differences in the effectiveness of various health and safety measures. Overall, the findings suggest that while awareness and training are well-aligned, improvements are needed in disciplinary measures and maintenance practices to enhance worker safety.

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