ORIGINAL ARTICLE

Relationship between Knowledge of Iraqi Cement Factory Workers toward First Aid and Occupational Safety

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Abstract

Background: Industrial work environments, such as cement factories, present considerable occupational hazards. Occupational safety knowledge and first aid proficiency are essential for ensuring comprehensive workplace safety. Knowledge of safety mitigates the risks, whereas first aid offers prompt assistance. Despite advancements, gaps remain in workers' integrated knowledge of safety and emergency response. An integrated understanding is crucial for implementing effective safety practices. This study aimed to assess the knowledge level of cement factory workers in Iraq regarding occupational safety and first aid. More importantly, we sought to establish the relationship between their knowledge in these two areas and aimed to determine whether a correlation existed between the workers' demographic characteristics and their knowledge.

Methods: A descriptive quantitative cross-sectional study was conducted between December 26, 2024, and February 28, 2025, using a convenience sampling technique. The study included 350 workers recruited from five cement factories in the Middle Euphrates region of Iraq. Data were collected using a structured, self-administered questionnaire consisting of three main sections: socio-demographic characteristics, occupational safety knowledge, and first aid knowledge. The validity of the instrument was established through expert review, and its reliability was confirmed using Cronbach's alpha coefficient. Data were analyzed using descriptive statistics, Spearman's rank correlation coefficient, and the Kruskal–Walli's test.

Results: The study showed disparate degrees of expertise in both domains. The general proficiency in first aid was assessed as "Fair" (mean score 1.31), revealing deficiencies in areas such as burns and bone injuries. Statistically significant correlations were observed between the workers' knowledge of first aid and their understanding of workplace safety. Moreover, substantial correlations were identified between their knowledge in both areas and their socio-demographic features (e.g., age, level of education, and years of service).

Conclusion: The results demonstrated a significant association between occupational safety and workers' first aid knowledge in the cement industry. Persistent gaps in first aid awareness emphasize the urgent need for comprehensive, practical training programs tailored to address these deficiencies. Such programs must be specifically designed to meet the diverse needs of the workforce to foster a robust safety culture, with special attention to employees with lower educational backgrounds or limited experience.

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Moreover, these findings demonstrate the value of implementing clear policies and strategies aligned with international safety standards, such as those advocated by the International Labor Organization and the World Health Organization, to institutionalize safety procedures effectively. Integrating recommendations for occupational safety into factory regulations will promote adherence and systematic risk management.

Economically, improving first aid and safety knowledge can lead to reduced workplace injuries, minimizing lost workdays and associated costs, thereby enhancing overall productivity and operational efficiency. This underscores the value of investing in ongoing safety education to protect employees and optimize industrial performance.

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Introduction

Industrial work environments, such as cement plants, are vital to global economies, but they face significant challenges regarding worker safety and operational accuracy.[1,2] In this context, occupational safety and first-aid skills are critical components of a comprehensive safety framework. Occupational safety focuses on preventing harm through proactive measures, while first aid prioritizes immediate medical care to mitigate injury severity and save lives.[3,4] These occupational risks are pervasive across various local industries, including industrial settings within Iraq.[5]

Despite advancements in workplace safety, gaps persist in understanding the relationship between the workers' safety knowledge and their response to emergencies.[6] Research shows that safety awareness and adherence to initial protocols are crucial for implementing effective safety practices.[7] Therefore, an integrated approach that combines both occupational safety and first aid is essential for fostering a comprehensive safety culture and empowering workers to act responsibly in their environments.[8] Within the framework of Iraqi contractors and cement factory operations, it is essential to evaluate the workers' competencies in both occupational safety and first aid. This research addresses data scarcity on innovative interactions in specialized sectors, particularly Iraqi cement factories, where a comparative analysis of different knowledge types can reveal critical gaps.[9]

Recognizing the distinction between safety and first-aid knowledge is key to developing more integrated and effective training programs. Designing programs that enhance both skill sets concurrently will create a more informed workforce capable of managing risks effectively and will support the development of a robust safety culture in industrial organizations.[10]

Objective of the Study

This study primarily aims to assess the knowledge levels of cement factory workers in Iraq regarding both occupational safety and first aid and then determine the interrelationship between these two vital knowledge areas. Specifically, this study seeks to assess cement factory workers' knowledge of occupational safety and their knowledge of first aid. It also aims to determine the relationship between cement factory workers' knowledge of occupational safety and their knowledge of first aid and to explore the relationship between their knowledge in both areas and their socio-demographic characteristics.

Methods

This descriptive cross-sectional study was conducted from December 26, 2024, to February 28, 2025, following the acquisition of all necessary administrative and ethical approvals from the College of Nursing at the University of Kufa. The study targeted five factories located in the Euphrates region of Iraq, selected due to their diverse working environments and official responsibilities that require knowledge of occupational safety and first aid. A sample of 350 workers was determined using the Craigie and Morgan (1970) formula, with participants recruited in collaboration with factory management.

To ensure the validity of the study instrument, a panel of 12 experts from the fields of nursing and medicine, with an average experience of 8.2 years reviewed it to assess its face validity and appropriateness for collecting the intended data. A pilot study was also conducted to test the clarity and feasibility of the data collection methods and to avoid potential significant errors that could affect the research outcomes and increase time and financial costs.

Regarding reliability, the internal consistency of the questionnaire was evaluated using Cronbach's alpha coefficient, which yielded a value of 0.82, indicating a high level of reliability. During data collection, the participants were carefully monitored to ensure the accuracy and completeness of the responses, thereby enhancing the quality and credibility of the study findings.

The levels of first aid knowledge were classified based on the mean score (MS) obtained from the questionnaire, with three categories defined as follows: "Poor" (MS=0–0.66), "Fair" (MS=0.67–1.33), and "Good" (MS=1.34–2), following a methodology adopted in previous studies within the industrial sector (Al-Sallami & Khudair, 2022).

Similarly, occupational safety knowledge was assessed using a comparable scale, where knowledge levels were categorized as "Poor" (MS=0–0.32), "Fair" (MS=0.33–0.66), and "Good" (MS=0.67 and above). The occupational safety knowledge questionnaire was developed by the researcher to suit the specific professional and local context of cement factories in Iraq.

Results

Table 1 presents the distribution of participant according to their socio-demographic characteristics. The largest percentage of the Cement Factory workers' subgroup was within the age range of 41-50 years, accounting for 36.9% of the subjects. In terms of gender, male workers comprised 85.1% of the sample, while female workers represented only 14.9%. Regarding residency, the urban population represented a significant majority (81.4%). In terms of marital status, married individuals accounted for 82.9% of them. Workers at Al-Kufa Cement Factory made up 42.9% of the participants, while those with 21–30 years of service constituted 43.7% of the population. Nearly half of the participants reported having a fairly sufficient monthly income (46.0%), and it holds the position of Observer Technician (23.4%). Educationally, 20.3% had completed preparatory and bachelor's degrees. Regarding working hours, 94.0% of the sample worked for 8 hours, and a majority (73.7%) were free from chronic diseases. In the context of occupational safety training, 84.3% of the participants reported having received formal training, while 70.0% demonstrated knowledge of how to respond in emergency situations. Additionally, 86.3% indicated that they had access to appropriate personal protective equipment for their work.

Table 2 presents the overall assessment and mean scores of knowledge regarding occupational safety domains. The results indicate that all domains were rated as "Good," with mean scores of 0.89 for physical hazards, 0.73 for chemical hazards, and 0.85 for environmental hazards. The overall knowledge of occupational safety was also rated as "Good," with a mean score of 0.84.

Table 3 presents the overall assessment and mean scores of knowledge regarding first aid domains. The results indicated that most domains were rated as "Fair," with mean scores ranging from 1.10 to 1.31, while some items demonstrated higher scores of 1.42 and 1.52. The overall knowledge of first aid was rated as "Fair," with a mean score of 1.31.

Table 4 shows the relationship between cement factory workers' knowledge of occupational safety and their knowledge of first aid. The results of the statistical analysis revealed several statistically significant correlations between different domains ($p<0.05$), while a limited number of associations were not statistically significant ($p>0.05$). The strength of the correlations ranged from weak to moderate ($r=0.12–0.46$), indicating a positive association between occupational safety knowledge and first aid knowledge.

Table 5 displays the differences and relationships between the workers' knowledge toward occupational safety and their socio-demographical data. It shows that there is no significant relationship ($P>0.05$) between knowledge toward occupational safety and their socio-demographical data, except for gender, number of years of service, and acting in emergency situations inside the factory, in which there was a high significance ($P<0.05$).

Table 1: Socio-demographical Data of the Study Sample

Socio-demographical Data	Rating & Intervals	Freq.	%
Age (years)	<=30	35	10.0
	31 - 40	72	20.6
	41 - 50	129	36.9
	51+	114	32.6
Gender	Male	298	85.1
	Female	52	14.9

Socio-demographical Data	Rating & Intervals	Freq.	%
Resident	Urban	285	81.4
	Rural	65	18.6
Marital status	Married	290	82.9
	Single	23	6.6
	Separated	16	4.6
	Divorced	10	2.9
	widow(er)	11	3.1
Workplace	Al-Kufa Cement Factory	150	42.9
	Karbala Lime Factory	50	14.3
	Kar Najaf Investment Factory	50	14.3
	Samawa Cement Factory	50	14.3
	Babylon Cement Factory	50	14.3
Number of Years of Service	<=10	78	22.3
	11 - 20	86	24.6
	21 - 30	153	43.7
	31+	33	9.4
Monthly Income	Enough	103	29.4
	Fairly Enough	161	46.0
	Not Enough	86	24.6
Job Title	Worker	55	15.7
	Chief Workers	71	20.3
	Observer Technician	82	23.4
	Chief Observers Technician	41	11.7
	Assistant Engine Engineer	13	3.7
	Engineer	32	9.1
	Chief Engine	56	16.0
Educational level	Doesn't read and write	4	1.1
	Read and write	33	9.4
	Primary	38	10.9
	Secondary	48	13.7
	Preparatory	71	20.3
	Institute graduate	53	15.1
	Bachelor	71	20.3
	Postgraduate	32	9.1
Working hours	6	3	0.9
	7	18	5.1
	8	329	94.0
Do you suffer from chronic diseases?	Not have	258	73.7
	BP	50	14.3
	DM	22	6.3
	Asthma	1	0.3
	Respiratory Allergy	1	0.3
	Chronic Allergy	4	1.1
	Renal Failure	2	0.6
	Arterial Occlusion	2	0.6
	Arteriosclerosis	1	0.3
	Asthma+Bronchitis	3	0.9
	BP+DM+Asthma	2	0.6
	DM+Fatal Liver	1	0.3
	BP+DM	3	0.9
Have you received formal training on occupational safety in the factory?	Yes	295	84.3
	No	55	15.7
Do you know ow to act in emergency situations (such as fire or chemical leakage) inside the factory?	Yes	245	70.0
	No	105	30.0
Is personal protective equipment (such as gloves, goggles, and face masks) available to you while working?	Yes	302	86.3
	No	48	13.7

Table 2: Overall Assessment of the Knowledge Levels of Occupational Safety among Cement Factory Workers

Domains	Levels	Freq.	%	Ms.	Asses.
Knowledge about physical hazards	Fair	16	4.6	0.89	Good
	Good	334	95.4		
Knowledge about chemical hazards	Poor	15	4.3	0.73	Good
	Fair	93	26.6		
	Good	242	69.1		
Environmental hazards	Fair	9	2.6	0.85	Good
	Good	341	97.4		
Overall knowledge about occupational safety	Fair	13	3.7	0.84	Good
	Good	337	96.3		

Freq: Frequency; MS: Mean of Scores; Poor: MS=0-0.32; Fair: MS=0.33-0.66; Good: MS 0.67-1.

Table 3: Overall Assessment of the Knowledge Levels of First Aid among Cement Factory Workers

Domains	Levels	Freq.	%	Ms.	Asses.
General information about first aid	Poor	2	0.6	1.52	Good
	Fair	77	22.0		
	Good	271	77.4		
Domain one (1): wounds and bleeding	Poor	8	2.3	1.42	Good
	Fair	107	30.6		
	Good	235	67.1		
Domain two (2): bones and joints injuries	Poor	21	6.0	1.10	Fair
	Fair	260	74.3		
	Good	69	19.7		
Domain Three (3): Other medical conditions	Poor	4	1.1	1.27	Fair
	Fair	173	49.4		
	Good	173	49.4		
Domain Four (4): Burns	Poor	3	0.9	1.31	Fair
	Fair	178	50.9		
	Good	169	48.3		
Overall knowledge about first aid	Fair	188	53.7	1.31	Fair
	Good	162	46.3		

Freq: Frequency; MS: Mean of Scores; Poor: MS=0-0.66; Fair: MS=0.67-1.33; Good: MS 1.34-2

These findings suggest that while most socio-demographical factors do not significantly influence the workers' knowledge of occupational safety, gender, years of service, and experience in emergency situations are important variables to consider. Understanding these relationships can help to tailor safety training programs to address specific needs within the workforce.

Table 6 shows the differences and relationships between the workers' knowledge of first aid measures and their socio-demographical data. It shows that there is a significant relationship ($P<0.05$) between the knowledge of first aid and their socio-demographical data, except for gender, residence, workplace, monthly income, working hours, chronic disease, and training on occupational safety, in which there was no significant difference ($P>0.05$). These findings suggest that while certain socio-demographical factors may influence the workers' knowledge of first aid, others do not play a significant role. The relationship highlights the importance of targeted training programs that can effectively enhance first aid knowledge across diverse worker populations, regardless of their background.

Discussion

The results of this study regarding cement factory workers reveal distinct demographic and occupational patterns consistent with recent international research findings. A notable percentage of workers, precisely 36.9%, were within the age range of 41-50 years. This indicates that cement factories tend to retain middle-aged employees due to their valuable experience and physical capabilities, which are particularly valued in industrial sectors.[11] The workforce consisted mainly of males (85.1%), reflecting the physically demanding nature of employment in cement factories.[12] Among the workers surveyed, 81.4% lived in urban areas, presumably because cement factories are strategically located near these centers. Data regarding marital status revealed that 82.9% of workers were married, indicating that employment in the cement industry provides job security and income stability favorable for family life.[13] The workforce of Kufa Cement Factory constituted 42.9% of the sample, suggesting a significant operational capacity of the plant.[14] Analysis of the years of service indicated that 43.7% of workers had between 21 and 30 years of experience, implying a low labor turnover rate.[15]

Table 4: Correlation between the Workers' Knowledge about Occupational Safety and their Knowledge about First Aid

Domains		test	Occupational Safety				First Aid					
			Knowledge about physical hazards	Knowledge about chemical hazards	Environmental hazards	Overall knowledge about occupational safety	1st Domain: General information about first aid	2nd Domain wounds and bleeding	3rd Domain bones and joints injuries	4th Domain Other medical conditions	5th Domain Burns	Overall knowledge about first aid
Occupational Safety	Knowledge about physical hazards	Spearman	1.00	0.21	0.22	0.46	0.14	0.08	0.22	0.05	0.02	0.12
		P-value	.	0.00*	0.00*	0.00*	0.01*	0.12	0.00*	0.36	0.73	0.02*
	Knowledge about chemical hazards	Spearman	0.21	1.00	0.13	0.34	0.06	0.20	0.13	0.05	0.06	0.08
		P-value	0.00*	.	0.02*	0.00*	0.29	0.00*	0.01*	0.38	0.29	0.13
	Environmental hazards	Spearman	0.22	0.13	1.00	0.25	0.17	0.07	-0.10	0.09	0.05	0.15
		P-value	0.00*	0.02*	.	0.00*	0.00*	0.17	0.05	0.11	0.39	0.00*
	Overall knowledge about occupational safety	Spearman	0.46	0.34	0.25	1.00	-0.03	0.12	0.06	-0.02	-0.02	-0.03
		P-value	0.00*	0.00*	0.00*	.	0.52	0.02*	0.29	0.72	0.66	0.58
First Aid	1st Domain: General information about first aid	Spearman	0.14	0.06	0.17	-0.03	1.00	-0.10	-0.02	0.02	-0.01	0.17
		P-value	0.01*	0.29	0.00*	0.52	.	0.05	0.70	0.69	0.81	0.00*
	2nd Domain wounds and bleeding	Spearman	0.08	0.20	0.07	0.12	-0.10	1.00	0.27	0.32	0.15	0.46
		P-value	0.12	0.00*	0.17	0.02*	0.05	.	0.00*	0.00*	0.00*	0.00*
	3rd Domain bones and joints injuries	Spearman	0.22	0.13	-0.10	0.06	-0.02	0.27	1.00	0.04	0.04	0.27
		P-value	0.00*	0.01*	0.05	0.29	0.70	0.00*	.	0.44	0.47	0.00*
	4th Domain Other medical conditions	Spearman	0.05	0.05	0.09	-0.02	0.02	0.32	0.04	1.00	0.34	0.57
		P-value	0.36	0.38	0.11	0.72	0.69	0.00*	0.44	.	0.00*	0.00*
	5th Domain Burns	Spearman	0.02	0.06	0.05	-0.02	-0.01	0.15	0.04	0.34	1.00	0.41
		P-value	0.73	0.29	0.39	0.66	0.81	0.00*	0.47	0.00*	.	0.00*
	Overall knowledge about first aid	Spearman	0.12	0.08	0.15	-0.03	0.17	0.46	0.27	0.57	0.41	1.00
		P-value	0.02*	0.13	0.00*	0.58	0.00*	0.00*	0.00*	0.00*	0.00*	.

* Significant at P<0.05; Normal distribution has not been achieved

In terms of education, only 20.3% of workers reported having completed preparatory studies or a bachelor's degree, highlighting the technical and manual nature of most occupations. Ninety-four percent of workers adhered to standard 8-hour shifts, and 73.7 percent did not report chronic diseases, indicating that factories uphold structured work patterns.[16]

Table 2 shows the comprehensive assessment of cement; the factory workers' comprehension of occupational safety measures was classified as "good." This evaluation demonstrates an adequate degree of occupational safety knowledge among employees. It highlights how important it is to improve competence in particular domains through focused training initiatives. The results indicate that safety training programs are generally beneficial; yet, they need improvement in some areas to adequately address hazards.[17]

Table 3 presents an evaluation of the first aid knowledge possessed by cement industry personnel, suggesting an overall rating of "Fair." This evaluation reveals a deficiency in essential information, underscoring the need to enhance specialized training initiatives. The results underscore the need for creating specialized training approaches to rectify the deficiency in practical first aid knowledge, rather than depending only on academic information. This finding aligns with local research in Iraq, which also found a "fair" level of first aid knowledge among elementary school instructors, highlighting the pressing need for required training sessions to enhance capabilities.[18] Nonetheless, these findings contradict those of,[19] in their examination of cement manufacturers in India and Malaysia. Research indicates that mandatory training programs and frequent evaluations resulted in workers exhibiting high levels of first aid knowledge, exceeding 70%. This suggests that improving institutional training might substantially elevate knowledge levels.

Table 5: Statistical Differences and Relationship between Workers' Knowledge toward Occupational Safety and their Socio-demographical Data

Socio-demographical Data	Rating & Intervals	Mean Rank	Kruskal-Wallis H	p-value
Age (years)	<=30	172.0	6.59	0.09
	31 – 40	167.4		
	41 – 50	177.9		
	51+	178.9		
Gender	Male	177.3	5.93	0.01*
	Female	165.2		
Resident	Urban	175.9	0.18	0.67
	Rural	173.9		
Marital status	Married	176.6	7.77	0.10
	Single	159.2		
	Separated	182.0		
	Divorced	182.0		
	widow(er)	166.1		
Workplace	Al-Kufa Cement Factory	177.3	5.68	0.22
	Karbala Lime Factory	175.0		
	Kar Najaf Investment Factory	182.0		
	Samawa Cement Factory	168.0		
	Babylon Cement Factory	171.5		
Number of Years of Service	<=10	166.3	8.93	0.03*
	11 – 20	180.0		
	21 – 30	176.3		
	31+	182.0		
Monthly Income	Enough	175.2	2.28	0.32
	Fairly Enough	173.3		
	Not Enough	180.0		
Job Title	Worker	169.3	6.60	0.36
	Chief Workers	177.1		
	Observer Technician	177.7		
	Chief Observers Technician	177.7		
	Assistant Engine Engineer	182.0		
	Engineer	165.6		
	Chief Engine	178.9		
Educational level	Doesn't read and write	182.0	4.78	0.69
	Read and write	176.7		
	Primary	172.8		
	Secondary	178.4		
	Preparatory	174.6		
	Institute graduate	178.7		
	Bachelor	169.7		
	Postgraduate	182.0		
Working hours	6	182.0	0.86	0.65
	7	182.0		
	8	175.1		
Do you suffer from chronic diseases?	Not have	174.5	1.44	1.00
	BP	178.5		
	DM	174.0		
	Asthma	182.0		
	Respiratory Allergy	182.0		
	Chronic Allergy	182.0		
	Renal Failure	182.0		
	Arterial Occlusion	182.0		
	Arteriosclerosis	182.0		
	Asthma+Bronchitis	182.0		
	BP+DM+Asthma	182.0		
	DM+Fatal Liver	182.0		
	BP+DM	182.0		

Socio-demographical Data	Rating & Intervals	Mean Rank	Kruskal-Wallis H	p-value
Have you received formal training on occupational safety in the factory?	Yes	175.5	0.00	0.97
	No	175.6		
Do you know ow to act in emergency situations (such as fire or chemical leakage) inside the factory?	Yes	179.1	9.87	0.00*
	No	167.0		
Is personal protective equipment (such as gloves, goggles, and face masks) available to you while working?	Yes	175.0	0.41	0.52
	No	178.4		

* Significant at P<0.05; Normal distribution has not been achieved

Table 6: Statistical Differences and Relationship between Workers' Knowledge toward First Aids Measures and their Socio-demographical Data

Socio-demographical Data	Rating & Intervals	Mean Rank	Kruskal-Wallis H	p-value
Age (years)	<=30	100.59	23.06	0.00*
	31 – 40	173.52		
	41 – 50	181.72		
	51+	192.71		
Gender	Male	173.60	0.71	0.40
	Female	186.38		
Resident	Urban	175.31	0.01	0.94
	Rural	176.33		
Marital status	Married	171.38	19.06	0.00*
	Single	137.63		
	Separated	267.69		
	Divorced	218.25		
	widow(er)	190.36		
Workplace	Al-Kufa Cement Factory	168.52	4.57	0.33
	Karbala Lime Factory	188.15		
	Kar Najaf Investment Factory	160.72		
	Samawa Cement Factory	178.61		
	Babylon Cement Factory	195.47		
Number of Years of Service	<=10	130.96	19.71	0.00*
	11 – 20	192.34		
	21 – 30	186.12		
	31+	187.67		
Monthly Income	Enough	175.10	0.85	0.65
	Fairly Enough	171.35		
	Not Enough	183.75		
Job Title	Worker	109.83	50.97	0.00*
	Chief Workers	143.87		
	Observer Technician	220.24		
	Chief Observers Technician	190.68		
	Assistant Engine Engineer	190.35		
	Engineer	207.95		
	Chief Engine	181.49		
Educational level	Doesn't read and write	182.75	35.98	0.00*
	Read and write	135.80		
	Primary	103.14		
	Secondary	161.68		
	Preparatory	202.46		
	Institute graduate	184.84		
	Bachelor	198.27		
	Postgraduate	196.36		
Working hours	6	267.83	2.54	0.28
	7	177.33		
	8	174.56		

Socio-demographical Data	Rating & Intervals	Mean Rank	Kruskal-Wallis H	p-value
Do you suffer from chronic diseases?	Not have	170.64	14.86	0.25
	BP	201.68		
	DM	177.32		
	Asthma	39.50		
	Respiratory Allergy	241.50		
	Chronic Allergy	137.38		
	Renal Failure	241.00		
	Arterial Occlusion	267.50		
	Arteriosclerosis	312.50		
	Asthma+ Bronchitis	215.83		
	BP+DM+Asthma	95.50		
	DM+Fatal Liver	93.50		
	BP+DM	107.33		
Have you received formal training on occupational safety in the factory?	Yes	176.98	0.41	0.52
	No	167.54		
Do you know ow to act in emergency situations (such as fire or chemical leakage) inside the factory?	Yes	196.40	34.92	0.00*
	No	126.74		
Is personal protective equipment (such as gloves, goggles, and face masks) available to you while working?	Yes	169.65	7.38	0.01*
	No	212.30		

* Significant at P<0.05; Normal distribution has not been achieved.

Table 4 reveals a significant correlation between these two domains of knowledge. This correlation indicates that workers' comprehension of preventative safety principles may enhance their ability to respond to potential injuries. Recent research substantiates this correlation, demonstrating that integrated training programs combining occupational safety and first aid significantly enhance the workers' competence in both domains, resulting in improved accident response and decreased recurrence. This association may be attributed to the observation that workers knowledgeable about workplace risks are more inclined to pursue first aid training to mitigate the potential consequences of these hazards.

Table 5 indicates that education and years of experience are significant predictors of occupational safety knowledge among cement workers, whereas age and gender exert minimal influence. These findings align with those of,[20] who observed similar correlations between educational background, experience, and safety awareness. Conversely,[21] contends that safety knowledge is primarily shaped by organizational culture and policies, further noting that intensive training can effectively compensate for lower levels of formal education

Thus, formal education and experience are important, but ongoing institutional training plays a vital role in enhancing all workers' safety understanding.

The results shown in Table 6 indicate a statistically significant relationship between cement plant workers' knowledge of occupational safety and many sociodemographic characteristics, such as gender, years of service, and familiarity with emergency procedures at the factory. The findings suggest that certain personal and professional attributes of employees affect their safety knowledge proficiency. The results correspond with the research conducted by,[22] which established a favorable association among educational attainment, years of experience, and workers' comprehension of industrial safety regulations. We recommend practical experience and emergency training as crucial elements in enhancing this understanding.

Limitations

This study has several limitations that should be considered when interpreting the findings. First, the use of a convenience sampling technique may limit the generalizability of the results to the broader population of industrial workers. Second, cross-sectional design restricts the ability to establish causal relationships between occupational safety knowledge and first aid knowledge. Third, data were collected using a self-reported questionnaire, which may be subject to response bias or social desirability bias. Despite these limitations, the study provides valuable insights into the relationship between occupational safety and first aid knowledge among workers in high-risk industrial settings.

Conclusion

The findings of this study demonstrate a statistically significant association between occupational safety knowledge and first aid knowledge among cement factory workers. While occupational safety knowledge was generally high, first aid knowledge remained at a moderate level, highlighting a critical gap in practical emergency preparedness. These results emphasize the importance of implementing integrated training programs that combine both occupational safety and first aid to enhance workers' competencies. Strengthening such programs is essential for improving workplace safety outcomes, reducing injury-related risks, and promoting a more resilient safety culture within industrial environments.

Recommendations

• Design and implement integrated, practical, and comprehensive training programs in occupational safety and first aid.

• These programs should focus on addressing specific knowledge gaps in first aid (such as burns, orthopedic injuries, wounds, and bleeding).

• Design training programs to meet the diverse needs of the workforce, particularly those with less education or experience

• Promotes a comprehensive and effective safety culture that links preventative knowledge with occupational safety and the ability to respond quickly and effectively to injuries.

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