DEVELOPMENT OF A WORKPLACE SAFETY ASSESSMENT TOOL: SAFETY CLIMATE, SAFETY BEHAVIOUR AND SAFETY OUTCOMES

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Abstract - This study aimed to develop and validate a comprehensive questionnaire for assessing workplace safety, focusing on four main domains: safety climate, management commitment, working environment, and safety outcomes. The research process began with an extensive review of existing literature and established safety management frameworks, enabling the identification of key constructs and the generation of an initial pool of items. To ensure the questionnaire's content validity, a panel of 6 experts, comprising professionals from environmental sciences as well as officers from environmental and management departments, was invited to evaluate each item. The experts were asked to assess the clarity, relevance, and representativeness of each question in relation to the intended domain. Using the Content Validity Index (CVI) as a quantitative measure, the results indicated strong agreement among the panel, with CVI values for each domain ranging from 0.80 to 0.90, surpassing the generally accepted threshold of 0.80 for newly developed instruments. Feedback from the panel was systematically reviewed, leading to refinements in wording, removal of redundant items, and adjustments to ensure that each domain was adequately covered. These revisions enhanced the questionnaire's ability to comprehensively assess workplace safety while maintaining clarity for respondents. Following the content validation phase, the questionnaire underwent a pilot test involving a representative sample from the target population. This step aimed to evaluate the instrument's reliability and identify any potential ambiguities from the perspective of actual users. Cronbach's alpha values for each domain exceeded the recommended minimum of 0.70, indicating high internal consistency and confirming that the items within each domain reliably measured the same underlying construct. Participants in the pilot study also provided qualitative feedback, which highlighted a high level of clarity and ease of completion. Minor adjustments were made based on this feedback to further improve flow and readability.The final version of the questionnaire offers a practical, empirically validated tool that organizations can use to monitor their workplace safety performance from multiple perspectives. In the safety climate domain, the questionnaire assesses employees' shared perceptions about the priority given to safety within the organization, their confidence in safety policies, and the extent to which safety is integrated into everyday operations. In the management commitment domain, items evaluate leadership's dedication to safety through tangible actions such as resource allocation, safety communication, and visible involvement in safety initiatives. In conclusion, the development and validation of this workplace safety questionnaire represent a significant advancement in the availability of practical, evidence-based safety assessment tools. Through its strong theoretical foundation, high CVI values, expert-informed refinement, and demonstrated reliability, the questionnaire provides organizations with a robust method for evaluating and improving workplace safety performance. The instrument's applicability across industries, combined with its ability to generate actionable insights, makes it an invaluable resource for safety practitioners, researchers,and policy makers committed to fostering safer workplaces.

Keywords - Reliability, Safety climate, Safety Behaviour, Safety Outcome, Validity

I. INTRODUCTION

Workplace safety is a cornerstone of organizational success, directly influencing employee well-being, productivity, and overall operational efficiency. In recent years, the emphasis on occupational safety has grown significantly, driven by increasing awareness of workplace hazards and the need for proactive risk management. Despite this progress, many organizations still rely on fragmented tools and approaches to assess safety, often focusing on isolated elements such as incident rates or compliance checklists. These methods fail to capture the broader, more nuanced dimensions of safety culture, behavior, and outcomes.

Safety climate has long been recognized as a key predictor of individual safety behaviors (Fang et al., 2015). According to behavior-based theories, emphasizing safety-related actions can significantly reduce risk-taking tendencies, thereby lowering the incidence of accidents and injuries (Wallace & Chen, 2005; Choudhry & Fang, 2008).

Recent research, primarily focused on construction workers in Hong Kong and mainland China—has contributed valuable insights. Fang, Chen, and Wong (2006) developed an 87-item safety climate (SC) questionnaire, which they tested in Hong Kong, identifying ten core SC dimensions. Later, Choudhry et al. (2009) highlighted two influential SC factors,supervisor and coworker influence, encompassing approximately 22 items within the Hong Kong construction sector (Chen et al., 2018).

The present study seeks to investigate the relationship between safety climate, safety behaviors, and safety outcomes among minority workers, specifically those

employed in sanitation and waste management. To achieve this objective, a mixed-methods approach combining both quantitative and qualitative techniques will be employed, targeting sanitary workers in eastern Pakistan.

II. MATERIALS AND METHODS

2.1Questionnaire Design and Structure

The questionnaire was developed based on a comprehensive literature review and expert evaluation. It begins with demographic questions, followed by three core sections addressing safety climate, safety behaviors, and safety outcomes.

A panel of five reviewers, comprising three safety experts and two sanitation specialists , will assess all items to ensure clarity and relevance. The phrasing and language of the questions will be refined to minimize comprehension difficulties.

Each item in the main body of the questionnaire will be rated using a five-point Likert scale. For safety climate questions, responses range from 1 (strongly disagree) to 5 (strongly agree). For safety behaviors and safety outcomes, the scale ranges from 1 (never) to 5 (quite often or more than five times).

The safety climate section includes 25 items adapted from McCabe et al. (2017) and Chen et al. (2018), categorized into six dimensions: Management Commitment (MC): 6 items ,Supervisor Perception (SP): 6 items ,Coworker Perception (CP): 4 items ,Safety Knowledge (SK): 5 items , Work Pressure (WP): 2 items ,Role Overload (RO): 2 items

2.2 Reliability and Validity Assessment

The reliability and validity study will be conducted during the second phase of the research. The questionnaire will first be translated into the local language by a team comprising language experts, sanitation sector officers and managers, and professionals from the waste management industry. Following the initial translation, a back-translation into English will be performed to ensure accuracy and consistency. The finalized version will then be reviewed by a panel of 10 experts specializing in environmental science, industrial practices, and occupational health. Expert selection criteria include a minimum of two years of experience in the sanitation industry and possession of a master's degree or a relevant professional certification in occupational health. These experts will evaluate each item in the questionnaire, and their feedback will be used to calculate the Content Validity Index (CVI). A CVI of 0.9 will be considered acceptable, based on the benchmark established by Polit and Beck (2004).To assess reliability, a pilot study will be conducted involving approximately 10% of the total sample size, and Cronbach's alpha will be calculated to determine the internal consistency of the questionnaire.

III. RESULTS

Content validity was assessed by six experts who reviewed the 24-item questionnaire for relevance and clarity. The Item-Level Content Validity Index (I-CVI) was presented in Table 1 values ranged from 0.83 to 1.00, indicating strong agreement among the panel and confirming that the items were appropriate and representative of the intended constructs. These values meet the recommended threshold for expert panels of this size, supporting the questionnaire's content validity.

Reliability analysis was conducted using Cronbach's alpha and presented in Table 2 across five key domains: Safety Climate, Management Commitment, Safety Communication, Learning, and Trust, Work Environment, and Safety Behavior. The alpha values ranged from 0.76 to 0.91, demonstrating acceptable to excellent internal consistency. These results affirm that the questionnaire reliably measures the dimensions it was designed to assess.

	Expert-1	Expert-2	Expert-3	Expert-4	Expert-5	Expert-6	Experts	Agree	I-CVI
Item-1	4	3	4	4	4	3	6	6	1.00
Item-2	4	4	3	4	4	4	6	6	1.00
Item-3	4	4	4	4	4	4	6	6	1.00
Item-4	3	4	3	4	4	4	6	6	1.00
Item-5	4	4	4	3	4	3	6	6	1.00
Item-6	4	3	4	4	3	4	6	6	1.00

Item-7	4	4	4	4	4	4	6	6	1.00
Item-8	4	3	3	4	4	3	6	6	1.00
Item-9	4	3	4	3	4	3	6	6	1.00
Item-10	4	3	4	3	4	3	6	6	1.00
Item-11	4	4	4	4	3	4	6	6	1.00
Item-12	3	3	3	4	4	3	6	6	1.00
Item-13	4	4	4	2	4	4	6	5	0.83
Item-14	4	3	4	4	4	4	6	6	1.00
Item-15	4	4	4	3	2	4	6	5	0.83
Item-16	3	3	3	4	4	3	6	6	1.00
Item-17	4	4	4	4	4	3	6	6	1.00
Item-18	4	4	4	2	4	4	6	5	0.83
Item-19	4	4	4	4	4	4	6	6	1.00
Item-20	4	4	2	4	3	4	6	5	0.83
Item-21	4	4	4	4	4	3	6	6	1.00
Item-22	4	3	2	4	4	4	6	5	0.83
Item-23	4	4	4	4	4	4	6	6	1.00
Item-24	3	4	4	3	4	4	6	6	1.00
Proportion Relevance	1.00	1.00	0.92	0.92	0.96	1.00			0.97

Table 1: Validity testing of the questionnaire content validity index (CVI) method

Variables	Cronbach Alpha
Safety Climate	0.81
Management Commitment	0.76
Safety Communication Learning and Trust	0.78
Work Environment	0.88
Safety Behavior	0.82
Safety outcome	0.91

Table 2: Reliability analysis for the questionnaire

IV. DISCUSSION

The content validity results of the questionnaire, with I-CVI values ranging from 0.83 to 1.00, indicate strong expert agreement on the relevance and clarity of the items. According to Polit and Beck (2004), an I-CVI of 0.78 or higher is considered acceptable when six or more experts are involved, making these findings well within the recommended threshold. This suggests that the questionnaire items are well-aligned with the constructs they aim to measure and are suitable for use in the target population of sanitation and waste management workers.

The internal consistency of the questionnaire, as measured by Cronbach's alpha, ranged from 0.76 to 0.91 across five domains: Safety Climate, Management Commitment, Safety Communication, Learning and Trust, Work Environment, and Safety Behavior. These values reflect acceptable to excellent reliability, consistent with the standards proposed by Nunnally and Bernstein (1994), who recommend a minimum alpha of 0.70 for research instruments. The

high reliability scores suggest that the items within each domain are cohesively measuring their respective constructs, providing confidence in the stability of the responses.

These findings support the use of the questionnaire as a valid and reliable tool for assessing safety-related perceptions and behaviors among minority workers in sanitation and waste management. Previous studies in construction settings, such as those by Fang et al. (2015) and Choudhry and Fang (2008), have demonstrated the importance of safety climate in predicting safety behaviors and outcomes. By extending this research to a new occupational group and cultural context, the current study contributes to a broader understanding of how safety climate influences worker behavior and offers a foundation for targeted interventions to improve occupational health outcomes.

V. CONCLUSION

In conclusion, the questionnaire demonstrated strong content validity and reliable internal consistency, making it a robust tool for assessing safety climate, behaviors, and outcomes among sanitation and waste management workers. The I-CVI values ranging from 0.83 to 1.00 reflect expert consensus on item relevance and clarity, while Cronbach's alpha values between 0.76 and 0.91 across all domains confirm the instrument's reliability. These findings support its suitability for future research and practical applications aimed at improving occupational safety in underserved worker populations.

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