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RESEARCH ARTICLE OPEN ACCESS

ACCIDENT PREVENTION IN THE DAIRY SECTOR: EVALUATION OF A SAFETY PROGRAM

Víctor Aldair Custodio Ríos*[1], Luis Sleither Huaman Tantacure[2] and Mirtha Yvis Santisteban Salazar[3]

[1, 2, 3]César Vallejo University, UCV, Chiclayo, Perú.

[1]http://orcid.org/0000-0001-6408-4520, [2]http://orcid.org/0000-0002-0360-3830, [3]http:// orcid.org/0000-0003-1836-5502

Email: *custodioriosaldair@gmail.com, 26tantacure@hotmail.com, ssalazarmy@ucvvirtual.edu.pe

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ABSTRACT

The research focused on the precarious working conditions in some dairy factories, where workers are exposed to various workplace hazards. This context highlighted the urgent need to strengthen safety plans, in line with Sustainable Development Goal 8, in order to reduce accidents and optimize processes in the sector. The main objective was to determine the influence of the development of an Occupational Health and Safety Plan (PSSO) on the prevention of workplace accidents in a dairy factory in Cutervo. This is an applied study with a quantitative approach and a pre-experimental design. The sample included 16 workers responsible for the production, packaging, and warehouse areas. The instruments used were a checklist, questionnaire, and field analysis form. The results show that workplace accidents were reduced by 64.7% (from 17 to 6 per month) and postural risk, assessed using the REBA method, decreased from 5.5 to 2.38. Following the research, it was possible to conclude that the actions taken optimized working conditions, reduced accidents, and promoted preventive awareness among workers.

I. INTRODUCTION

The growth of industrial activity and the need to maintain continuous production have increased occupational risks in dairy factories, where workers are exposed to machinery, physical exertion, and deficiencies in safety management. Non-compliance with protocols increases accidents in processing plants, affecting the well-being of personnel and operational efficiency [1]. Risk prevention is essential to protect the health and safety of workers, making it necessary to have standards and procedures in place to reduce hazards present in any productive activity [2]. In Peru, Law No. 29783 establishes that all companies must implement a Ocupaccional Safety and Health Plan (PSSO) adapted to their own risks. Compliance with this regulation is key to reducing accidents and strengthening a culture of prevention within organizations [3]. Poor ergonomics were identified as a significant factor, manifested in awkward postures, repetitive movements, excessive loads, and improper tool use, causing physical pain and musculoskeletal injuries, particularly in the lower back, shoulders, wrists, and knees. These problems are exacerbated in physically demanding work environments, such as weightlifting or maintaining awkward postures for extended periods [4]. Based on a preliminary analysis of accidents and incidents, the main physical risks present in the production area were identified; this information allowed the Pareto chart to be created.

Table 1: Frequency of accident causes.

Cause	Frequency	Percentage	Cumulative percentage
Repetitive movements	9	25.71%	25.71%
Awkward postures	8	22.86%	48.57%
Lifting heavy loads	7	20.00%	68.57%
Cuts	5	14.29%	82.86%
Falls and blows	4	11.43%	94.29%
Burns	2	5.71%	100.00%
Total	35	100.00%	

Source: Authors, (2026).

As a consequence of not adequately addressing occupational risks in the agribusiness sector, workers remain exposed to hazards that affect their health, such as musculoskeletal injuries, falls, and impacts with tools, negatively impacting their physical well-being and work efficiency. The absence of a preventative plan reduces productivity, as affected employees cannot perform their tasks effectively, which in turn increases accidents and generates medical and operational costs. This situation negatively impacts the organization's finances, and without the implementation of an improvement plan and safety standards, the organization risks facing penalties and reputational damage. Therefore, strengthening the PSSO in the production area was fundamental to preventing accidents, ensuring decent working conditions, complying with current regulations, and improving productivity [5]. This study poses the following research question: How does the implementation of an occupational safety and health program prevent workplace accidents in a dairy factory? Based on this question, the overall objective of this work is to analyze the influence of an occupational safety and health program on the prevention of workplace accidents within this factory.

II. THEORETICAL REFERENCE

II.1 BACKGROUND, APPROACHES, AND THEORETICAL FOUNDATIONS

II.1.1 Background

To contextualize the present research, background information was reviewed that showed the effects of the implementation of a “PSSO” on the prevention of accidents and ergonomic conditions in the work environment. A study was conducted at a dairy factory in Isfahan, Iran, to examine the effects of simultaneously implementing ergonomic measures and management decisions on reducing musculoskeletal disorders and improving work postures among employees. The study population consisted of 48 workers, who were examined before and after the intervention using the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) and the Quick Exposure Check (QEC) posture analysis. The results showed a significant decrease in the frequency and severity of musculoskeletal disorders, particularly in the lower back (from 364.5 before to 187.5 after, a 48.5% reduction), shoulders (from 190.25 to 114, a 40% reduction), and neck (from 164.5 to 85.5, a 48% reduction), as well as an improvement in work postures. The study concluded that simultaneous interventions in ergonomic engineering, training, and management decisions proved effective in reducing musculoskeletal disorders and improving work postures, contributing to the health and productivity of workers [6].

In a medium-sized agro-industrial corporation located in Metropolitan Lima, Peru, the objective was to implement ergonomic methods to improve internal procedures, optimize organizational resources, and achieve organizational effectiveness. The study population consisted of 50 workers who performed repetitive, physically demanding manual tasks such as cutting, peeling, sorting, and packaging products. Instruments such as the REBA method were used to measure the risks of repetitive postures and movements, in addition to direct observations, worker interviews, and anthropometric measurements. The results showed a decrease in the risk level for cutting, peeling, and sorting tasks, from "very high" to "medium," and an increase in labor productivity of 1.95%, from 339.7 kg/hour to 346.3 kg/hour. It was concluded that the application of ergonomic methods contributed to strengthening the health and safety of workers, reducing musculoskeletal injuries and increasing productivity, thus optimizing organizational resources and improving the organizational effectiveness of the company [7].

The study was conducted at Niisa Corporation S.A., located in the Ate district of Lima, Peru, in 2021, within the agro-industrial sector dedicated to cereal processing. Its objective was to determine how the implementation of an occupational health and safety (OHS) system reduces workplace risks at the company. The population consisted of 70 employees, representing the entire workforce. The study employed a pre-experimental design and a quantitative approach, administering a pre-test and a post-test to the same group. Data collection techniques included observation, checklists, internal records of training, medical examinations, audits, incidents, and accidents, as well as statistical analysis using the Student's t-test. The results showed a decrease in the workplace incident rate of 4.28% and in the workplace accident rate of 2.38%, along with 100% compliance with the planned OHS activities and an increase in training hours from 80 to 240 per employee. It was concluded that occupational hazards decreased significantly as a result of the application of the OSH system; in addition, the company's ability to compete and its productivity increased, and a culture of prevention was fostered in accordance with Law No. 29783 [8].

II.1.2 Approaches and Theories

II.1.2.1 Occupational Health and Safety Plan (PSSO)

Regarding the theory associated with occupational safety and health, there is Heinrich's theory of pure causality, which states that sometimes work accidents cannot be foreseen or prevented, no matter how exhaustive the safety measures developed are. The theory indicates that there are elements in the work environment that are beyond human control and that, despite the best intentions, safety plans may not always be effective in preventing certain accidents [9]. It will be understood as an official document that will establish tactics, measures and methods to detect, analyze and manage threats in an organization or project, with the objective of safeguarding the physical and psychological well-being of employees during the performance of their duties [10].

II.1.2.2 Workplace Accidents

The theory related to accidents is based on risk assessment, which maintains that, to prevent accidents, it is essential to conduct a detailed analysis of all factors involved in work activities. This analysis must be continuous and adaptable, since risks can change depending on factors such as personnel characteristics and the safety regulations implemented [11]. Likewise, the REBA method theory establishes that the evaluation of ergonomic risks should consider the entire body, integrating segments such as neck, trunk, arm, wrists and legs, allowing the determination of the degree of musculoskeletal risk to which the worker is exposed [12].

A work accident is an unexpected and violent event that occurs during the course of a work activity, causing physical or mental injury to the worker, and is directly related to the work or the work environment [13].

III. MATERIALS AND METHODS

The research was applied because it aimed to solve a specific problem, namely the accident rate and poor ergonomics in the dairy factory, through the development and implementation of an Occupational Safety and Health Plan (OSHPP) that could be immediately transferred to business practice [14]. A quantitative approach was adopted because numerical data were collected and examined to objectively analyze the effectiveness of the proposed plan [15]. The pre-experimental design, that is, with a pre-test and a post-test with a single group, was appropriate because, although there was no randomized control group, the change in accident indicators was measured before and after applying the intervention, allowing inferences to be made about its effect [16]. The study was at a descriptive level, as it focused on characterizing the situation of Occupational Safety and Health (OSH) and describing how accidents vary without explaining complex relationships [17].

Its longitudinal temporal scope was justified because the monitoring of workers was carried out during two moments, one before and one after the occupational safety and health program was implemented [18]. In this case, the population consisted of 25 workers, distributed in 5 areas, which are administration, warehouse, production, packaging, and milk reception. The inclusion criteria focused on factory workers specifically employed in the dairy production area. Only employees exposed to the identified risks—inadequate use of PPE, cuts, falls, and ergonomic risks such as repetitive movements, lifting heavy loads, and awkward postures—were considered. Furthermore, they had to be over 18 years of age and capable of active participation. Workers who were not directly involved in milk receiving and administrative tasks were excluded. The sample, selected by convenience, consisted of 16 productions, warehouse, and packaging operators, adequately representing the personnel exposed to the evaluated processes at the dairy factory.

Systematic, non-participant observation was used, which allowed for the direct identification of actual working conditions and the occurrence of workplace accidents [19]. Additionally, a survey was used as a structured data collection technique, useful for obtaining quantitative and qualitative information on workers' perceptions and opinions. For the PSSO variable, two instruments were used: a checklist with 15 dichotomous items (Yes/No) to assess the presence and application of its components, and a 30-item Likert-type questionnaire designed to collect workers' perceptions of its implementation and effectiveness. For the workplace accidents variable, an analysis form completed by the supervisor was used, organized into 11 aspects that record observed accidents and exposure by task, which allowed for a systematic collection of incidents that are not always documented in formal records.

IV. RESULTS AND DISCUSSIONS

The first objective of the research was to identify the initial situation regarding the frequency of workplace accidents, the level of compliance with occupational safety and health regulations, and the ergonomic risks present in the company. The third objective sought to evaluate the improvements achieved after the program's implementation, comparing these results with the initial assessment. Since both objectives are directly linked—the first describing the starting point and the third analyzing the changes achieved compared to that same scenario—the findings are presented in a single, integrated figure, avoiding redundancies and allowing for a clearer interpretation of the evolution before and after the intervention.

Table 2: Checklist, before and after the plan.

Dimension	N°	Statements	Percentage "YES" pre test	Percentage "YES" post test
1. Regulations and Commitment	1.1	The Occupational Health and Safety Regulations are approved by senior management.	0%	66%
	1.2	The Regulations are disseminated to all personnel (e.g., infographics, presentations).		
	1.3	The Regulations are reviewed periodically.		
2. Hazard Identification and Risk Control	2.1	A current and updated Hazard Identification and Risk Assessment (IPER) matrix is in place.	0%	100%
	2.2	Responsible parties have been assigned for each critical control.		
	2.3	The results of the IPER are communicated to the workers.		
3. Training and Competence	3.1	An approved annual OHS training program is in place.	0%	66%
	3.2	Signed attendance records are maintained.		
	3.3	The effectiveness of the training provided is evaluated.		
4. Emergency Preparedness and Response	4.1	An emergency plan is documented and accessible.	33%	100%
	4.2	Drills are conducted according to schedule.		
	4.3	Emergency equipment is inspected and operational.		
5. Monitoring, Auditing, and Continuous Improvement	5.1	Scheduled internal inspections are carried out.	0%	100%
	5.2	Corrective actions from audits are closed within the established timeframe.		
	5.3	Management reviews the OSHPP at least once a year.		

Source: Authors, (2026).

Table 2 shows the contrast between the pre-test and post-test, demonstrating a notable improvement in the level of compliance with occupational health and safety measures. In the initial assessment, all dimensions evaluated showed zero compliance (0%), except for the emergency preparedness and response dimension, which reached only 33%, reflecting poor implementation and the urgent need for corrective action. After the program's implementation, the results revealed significant improvements: dimensions two, four, and five reached 100% compliance, while dimensions one and three achieved 66%, showing significant progress compared to the initial state. This comparison demonstrates the positive impact of the implemented interventions and confirms a substantial improvement in preventive management within the organization.

Table 3: Questionnaire, before and after the plan.

	Pre-test value			Post-test value		
Dimension	**Value obtained**	**Interpretation (Likert Scale)**	**Percentage of response**	**Value obtained**	**Interpretation (Likert Scale)**	**Percentage of response**
1. Regulations and Commitment	2	Almost never	100%	5	Always	100%
2. Hazard Identification and Risk Control	3	Sometimes	100%	4	Almost always	100%
3. Training and Competence	1	Never	100%	7 P (Always: 5) 9 P (Sometimes: 3)	"Sometimes" predominates	56%
4. Emergency Preparedness and Response	2	Almost never	100%	5	Always	100%
5. Monitoring, Auditing, and Continuous Improvement	3	Sometimes	100%	3	Sometimes	100%

Source: Authors, (2026).

Table 3 shows that, prior to the intervention, there were marked deficiencies in training, competence, and emergency response, revealing low compliance with safety measures. After the plan's implementation, the post-test showed significant improvements, notably that dimensions such as regulations and emergency response went from 'Almost never' to 'Always,' demonstrating a clear strengthening of preventative management. The second specific objective was: To develop a STEP to prevent workplace accidents in a dairy factory in Cutervo, 2025.

Table 4: Summary of the action plan.

Aspecto	**Descripción de lo que se hará**	**Referencia (Artículo, Título y Capítulo)**
I. Occupational Safety and Health Regulations	Development of an internal safety regulation based on Law No. 29783, approved by Supreme Decree No. 005-2012-TR, promoting the proper use of PPE and ongoing training programs.	Article 34, Chapter 3 on "Organization of the occupational safety and health management system."
II. Hazard Identification and Risk Assessment	Identification and assessment of hazards present in daily work activities, using tools such as the Ishikawa and Pareto diagrams. The focus will be on ergonomic risks, cuts, burns, and falls. Additionally, an IPERC matrix will be implemented to assess risks and prioritize preventive actions.	Article 19, Title IV, Chapter I on "Worker participation in the occupational safety and health management system."
III. Training and Awareness Strategies	Implementation of training programs, initial induction, periodic workshops, and emergency drills. Emphasis will be placed on the correct use of tools, first aid, and ergonomic techniques.	Article 35, Chapter 3 on "Organization of the occupational safety and health management system."
IV. Emergency Preparedness and Response	Establishment of specific response protocols for different types of accidents (cuts, falls, burns). First aid training and evacuation drills will be conducted.	Article 83, Chapter VIII on "Planning, development, and implementation of the occupational safety and health management system."
V. Monitoring and Auditing	Perception surveys and internal audits will be administered to evaluate compliance with the plan.	Article 43, Chapter V on "Evaluation of the occupational safety and health management system."
VI. Evaluation and Follow-up	Monitoring of workplace accidents and trend analysis will be performed. Implementation of periodic surveys of workers to evaluate the effectiveness of the measures implemented and make adjustments.	N/A

Source: Authors, (2026).

The "PSSO" (Workplace Safety and Health Program) demonstrated a comprehensive and detailed approach to managing workplace safety, based on Law No. 29783. Essential areas were covered, such as the creation of internal regulations, risk identification, ongoing training, emergency preparedness, and compliance monitoring. All of this helped create a safer work environment and reduce workplace accidents, demonstrating a commitment to employee health and well-being. The overall objective was to implement a Workplace Safety and Health Program for the prevention of workplace accidents at a dairy factory in Cutervo by 2025.

Table 5: Identifying the influence of the PSSO.

Benefit / Indicator	Description / Observed Result	Quantitative Data / Pre-Post	Achievement / Impact
Reduction in workplace accidents	Reduction in incidents thanks to training, regulations, and ergonomic improvements	From 17 to 6 accidents/month (−64.7%)	Reduced frequency and severity of accidents, greater safety for workers
Ergonomic improvements	Evaluation using the REBA method; reduction in postural risk thanks to changes in tasks and posture training	Risk level from 5.5 → 2.38; cylinder transfer: 13 → 1; transport to packaging: 10 → 2	High risk reduced to low, improving working conditions and injury prevention
Increased employee attendance	Reduction in medical leave and breaks due to muscle discomfort	Full attendance of all workers	Greater staff availability and operational continuity
Compliance with safety standards and staff competencies	Post-test checklist showed progress in all evaluated dimensions	Dimension 2, 4, 5: 100%; Dimension 1, 3: 66%	Strengthened knowledge and regulatory compliance, improved safety culture
Improved safety knowledge and practices	Pre- and post-test questionnaires demonstrated significant progress in regulations, commitment, and emergency preparedness and response	Total average reduced. From 1 > 5.	Staff better prepared to prevent accidents and respond to emergencies
Efficient safety management and PPE use	Consistent participation in tasks, faster response times, and compliance with PPE use	Response time: 3 min; PPE: 100% omission → 0% compliance	Greater efficiency in accident prevention and improved workplace safety culture

Source: Authors, (2026).

The results showed considerable progress after the implementation of the PSSO at the Cutervo dairy factory. Table 5 shows that workplace accidents decreased by 64.7% (from 17 to 6 per month), and postural risk, assessed using the REBA method, decreased from 5.5 to 2.38, reflecting improved ergonomic conditions. Furthermore, attendance was perfect, compliance with safety regulations reached 100% in several areas, and the use of PPE increased from 50% to 100%. These results demonstrated that the staff strengthened their preventative culture, improved their preparedness, and helped create a safer and more efficient work environment.

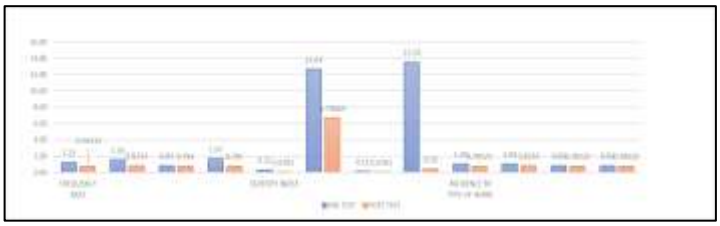

Figure 1: Comparison between pre-test and post-test accident results.
Source: Authors, (2026).

Comparing the results from August (pre-test) and September (post-test), a significant improvement was observed after the implementation of the "PSSO." In Figure 1, accidents were more frequent and severe in August, while in September the frequency rate decreased to low levels and critical incidents were less frequent. This demonstrated the effectiveness of the implemented plan.

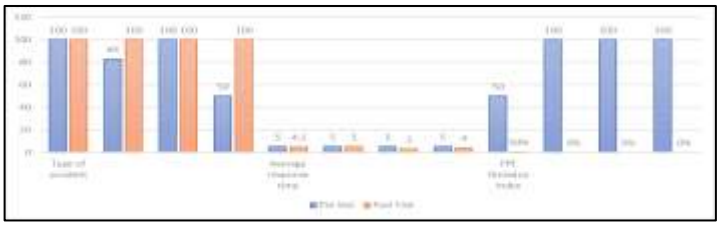

Figure 2: Contrast between initial and final evaluation of safety analysis results.Source: original work.
Source: Authors, (2026).

During September, the overall safety analysis showed a notable improvement. In Figure 2, the incidence rate by job type remained at 100% in all weeks, reflecting consistent participation across tasks. Response time to accidents was more efficient, reaching only 3 minutes in the third week. Furthermore, the use of PPE improved considerably: only in the first week was there a 50% omission rate, while in subsequent weeks full compliance was achieved.

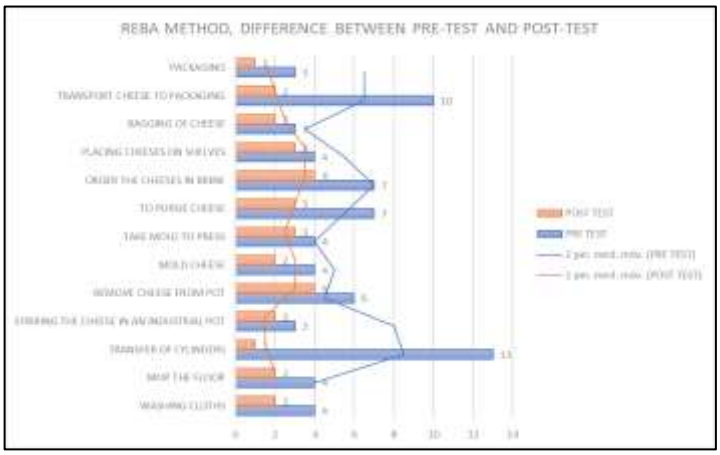

Figure 3: REBA method, comparison between initial and final evaluation.
Source: Authors, (2026).

Following the implementation of the "PSSO" (Postural Safety and Health Program) and training on proper posture, improvements in activities were observed using the REBA (Reduction in Postural Adaptation) method. In Figure 3, the transfer of milk cylinders decreased from 13 to 1 point after the elimination of manual lifting, significantly reducing physical effort. Activities such as washing rags, scrubbing floors, and molding cheese decreased from 4 to 2 points, reflecting improved neck and torso posture. Transporting cheese to the brine tank reduced from 6 to 3 points, while transporting cheese to the packaging area improved from 10 to 2, thanks to the use of lighter loads and upright positions. The post-test showed a considerable decrease in postural risk and an improvement in working conditions, demonstrating the effectiveness of the implemented actions.

V. CONCLUSIONS

The implementation of the Occupational Safety and Health Program (PSSO) at the Cutervo dairy plant initially identified a high frequency of accidents, low regulatory compliance, and significant ergonomic risks. However, after the development and implementation of preventive actions—including training, drills, ergonomic activities, the IPER matrix, the risk map, and the internal regulations—a considerable reduction in accidents, an improvement in postures evaluated with the REBA method, perfect staff attendance, and high compliance with regulations were evident, demonstrating that the program strengthened the preventive culture and comprehensively optimized working conditions.

VI. AUTHOR'S CONTRIBUTION

Conceptualization: Víctor Custodio Ríos and Luis Huaman Tantacure.
Methodology: Víctor Custodio Ríos and Luis Huaman Tantacure.
Investigation: Víctor Custodio Ríos and Luis Huaman Tantacure.
Discussion of results: Víctor Custodio Ríos and Luis Huaman Tantacure.
Writing – Original Draft: Víctor Custodio Ríos.
Writing – Review and Editing: Víctor Custodio Ríos and Luis Huaman Tantacure.
Supervision: Mirtha Yvis Santisteban Salazar.
Approval of the final text: Víctor Custodio Ríos and Luis Huaman Tantacure.

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