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Knowledge retention and practical application of food safety standards among ICDS supervisors: An academic perspective

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Abstract

Ensuring food safety in community-based nutrition programs, such as the Integrated Child Development Services (ICDS) in India, is critical for protecting vulnerable populations. This study evaluates the knowledge retention and practical application of food safety standards among ICDS supervisors. Using a cross-sectional descriptive design with a mixed-method approach, data were collected from ICDS supervisors across multiple centers. Quantitative data were gathered through structured questionnaires and observation checklists, while qualitative insights were obtained via semi-structured interviews and focus group discussions. Statistical analysis revealed moderate-to-high knowledge retention (80.75%) and practical compliance (78.25%), with significant gaps in contamination prevention (72%) and kitchen sanitation (70%). A strong positive correlation ($r = 0.82$) was observed between knowledge retention and practical compliance. Key challenges identified included irregular training (70%), resource constraints (65%), and lack of monitoring mechanisms (55%). The findings emphasize the importance of regular refresher training, improved resource allocation, and enhanced monitoring frameworks to address systemic barriers. This study concludes that improving both knowledge and structural support is essential for achieving consistent food safety compliance in ICDS programs. Future research should focus on innovative training approaches and policy-level interventions to strengthen implementation frameworks.

Keywords: Food safety, community-based nutrition programs, integrated child development services, knowledge retention, practical application, supervisors

Introductions

Ensuring food safety is a critical public health priority, especially in programs that cater to vulnerable populations such as children and pregnant women. The Integrated Child Development Services (ICDS) program, launched by the Government of India in 1975, is one of the world's largest community-based child nutrition and development initiatives. It aims to address malnutrition, hunger, and health issues among children below six years of age, pregnant women, and lactating mothers. With a multi-dimensional approach, the program integrates supplementary nutrition, immunization, health check-ups, and pre-school education services. ICDS supervisors play a pivotal role in overseeing these services, particularly in ensuring the safe preparation, handling, and distribution of food. However, despite well-documented food safety standards and guidelines, gaps remain in their practical application at the ground level. Food safety standards, defined and monitored by agencies such as the Food Safety and Standards Authority of India (FSSAI), outline hygiene practices, food handling protocols, and contamination prevention measures. These standards are designed to ensure the quality and safety of food consumed by beneficiaries of government welfare programs. Despite extensive training programs and manuals provided to ICDS supervisors, it is observed that knowledge retention and practical application of these standards vary significantly across different regions and centers. A range of factors, including supervisor training quality, resource availability, supervision frequency, and institutional support, influence the degree to which food safety protocols are implemented effectively.

In recent years, there has been growing recognition of the importance of knowledge retention in sustaining long-term improvements in food safety practices. Knowledge retention refers to the supervisors' ability to recall and apply food safety guidelines consistently over time after

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training sessions. Studies suggest that while initial training programs can significantly improve knowledge and awareness, the retention and consistent application of this knowledge often decline over time, particularly in resource-constrained environments. Practical application, on the other hand, involves translating theoretical knowledge into tangible practices such as proper hand hygiene, temperature control during food storage, and regular equipment sanitization. Without effective knowledge retention and practical implementation, the risk of foodborne illnesses, cross-contamination, and hygiene-related health issues among ICDS beneficiaries remains high.

The demand for this study arises from the critical gap in literature addressing how well ICDS supervisors retain and apply food safety knowledge in their daily operations. While numerous studies focus on malnutrition, child health outcomes, and nutritional interventions in ICDS programs, limited academic research specifically evaluates supervisors' roles in implementing food safety protocols. This study seeks to bridge this gap by systematically assessing both knowledge retention and practical application of food safety standards among ICDS supervisors. Understanding these dynamics is essential for designing more effective training modules, improving supervisory frameworks, and enhancing accountability mechanisms within the ICDS program.

The relevance of this study also stems from the increasing global emphasis on food security and safety as integral components of sustainable development goals (SDGs). Specifically, SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-being) underscore the necessity of ensuring safe and nutritious food for all, particularly vulnerable groups. Inadequate adherence to food safety standards in ICDS centers not only compromises the program's goals but also exposes children and pregnant women to significant health risks. Consequently, ICDS supervisors must not only be equipped with adequate knowledge but must also have the capacity and support to apply this knowledge consistently in their respective centers.

Furthermore, the decentralized nature of ICDS services, with thousands of centers operating across diverse socio-economic and geographical contexts, presents unique challenges. Supervisors face logistical barriers, inconsistent supply chains, insufficient infrastructure, and a lack of regular refresher training programs. These challenges highlight the need for academic investigations to identify root causes, propose actionable recommendations, and contribute to policy-level improvements.

The study is also timely in the context of recent policy reforms and increased focus on food safety in public welfare programs. Government agencies and non-governmental organizations (NGOs) are increasingly emphasizing capacity-building initiatives, digital monitoring tools, and performance assessments for ICDS supervisors. However, without a clear understanding of knowledge retention patterns and practical barriers, such initiatives risk being ineffective or only partially successful.

This study aims to address these gaps by exploring the knowledge levels of ICDS supervisors regarding food safety standards, assessing how well they retain this knowledge post-training, and evaluating the practical application of these standards in real-world scenarios. Through quantitative and qualitative assessments, the study seeks to provide evidence-based recommendations for improving food safety outcomes in ICDS centers.

Methods and Materials

Methods

This study adopts a cross-sectional descriptive design with a mixed-method approach, incorporating both quantitative and qualitative data collection techniques. The research focuses on assessing the knowledge retention and practical application of food safety standards among Integrated Child Development Services (ICDS) supervisors. The study is conducted across selected ICDS centers representing diverse geographical, socio-economic, and cultural contexts to ensure a comprehensive analysis. The target population includes ICDS supervisors actively engaged in overseeing food safety practices in their respective centers.

Quantitative data is collected using a structured questionnaire designed to evaluate knowledge retention and awareness of food safety standards. The questionnaire includes multiple-choice questions, Likert-scale items, and scenario-based questions aimed at assessing the supervisors' theoretical understanding and problem-solving abilities concerning food safety guidelines. In addition to the questionnaire, an observation checklist is used to evaluate the practical application of food safety protocols at ICDS centers. The checklist focuses on critical aspects such as personal hygiene of food handlers, food storage practices, sanitation measures, and compliance with safety guidelines. Qualitative data is gathered through semi-structured interviews and focus group discussions (FGDs) with ICDS supervisors. The interviews explore perceptions, experiences, and challenges faced by supervisors in retaining and applying food safety standards. FGDs provide an interactive platform for supervisors to share collective insights, discuss peer experiences, and identify common barriers to effective implementation. Data collection is conducted during field visits, with each participant providing informed consent before participation.

The study sample is selected using stratified random sampling to ensure representation from different regions and demographic groups. The sample size is determined using statistical sampling techniques to achieve sufficient power for analysis. Data analysis involves quantitative statistical techniques, including descriptive statistics, Chi-square tests, ANOVA, and correlation analysis, performed using SPSS software. Qualitative data is analyzed thematically using NVivo software, enabling the identification of recurring themes, patterns, and relationships. Ethical approval is obtained from the Institutional Ethics Committee (IEC), and strict confidentiality and data protection measures are observed throughout the study.

Materials

The primary materials used in this study include structured questionnaires, observation checklists, interview guides, and focus group discussion frameworks. The questionnaire is developed based on established food safety guidelines provided by regulatory authorities such as the Food Safety and Standards Authority of India (FSSAI). It includes sections on demographic information, knowledge assessment, scenario-based problem-solving, and self-reported adherence to food safety protocols. The observation checklist is designed to evaluate real-time practices in ICDS centers, including hygiene standards, sanitation practices, food handling, and storage measures. Interview guides and FGD frameworks are semi-structured, containing open-ended questions aimed at eliciting detailed

responses from participants. These materials are pre-tested in a pilot study to ensure clarity, relevance, and reliability. Adjustments are made based on pilot study findings to improve the tools' effectiveness. Fieldwork materials also include audio recorders for interviews and FGDs, notebooks for manual observations, and cameras for photographic documentation of ICDS center conditions where permitted. Data management materials include digital spreadsheets for organizing quantitative responses and qualitative coding software (NVivo) for thematic analysis. Additionally, reference documents such as FSSAI manuals, ICDS program guidelines, and training materials for ICDS supervisors are used to benchmark knowledge and practice standards. These materials collectively support a systematic and robust data collection process, ensuring accurate and reliable findings that contribute meaningfully to the study objectives.

Results

Table 1: Demographic Characteristics of Participants

Variable	Details
Age (Mean ± SD)	35.6 ± 5.4
Education Level	Graduate (60%), Postgraduate (40%)
Years of Experience (Mean ± SD)	8.2 ± 3.1
Training Frequency	Annually (70%), Bi-annually (30%)

Table 2: Knowledge Retention Levels among ICDS Supervisors

Knowledge Domain	Correct Responses (%)
Hygiene Practices	85
Food Storage	78
Contamination Prevention	72
Food Handling Procedures	88

Table 3: Practical Application of Food Safety Standards

Parameter	Compliance (%)
Personal Hygiene of Staff	82
Food Storage Conditions	76
Kitchen Sanitation	70
Food Handling Practices	85

Table 4: Correlation between Knowledge Retention and Practical Application

Parameter	Mean Score	Correlation Coefficient (r)
Knowledge Retention (%)	80.75	
Practical Compliance (%)	78.25	
Correlation Coefficient (r)		0.82

Table 5: Challenges in Knowledge Retention and Practical Application

Challenges	Frequency of Mention (%)
Inadequate Training Frequency	70
Resource Constraints	65
Lack of Monitoring Mechanisms	55
High Staff Turnover	45

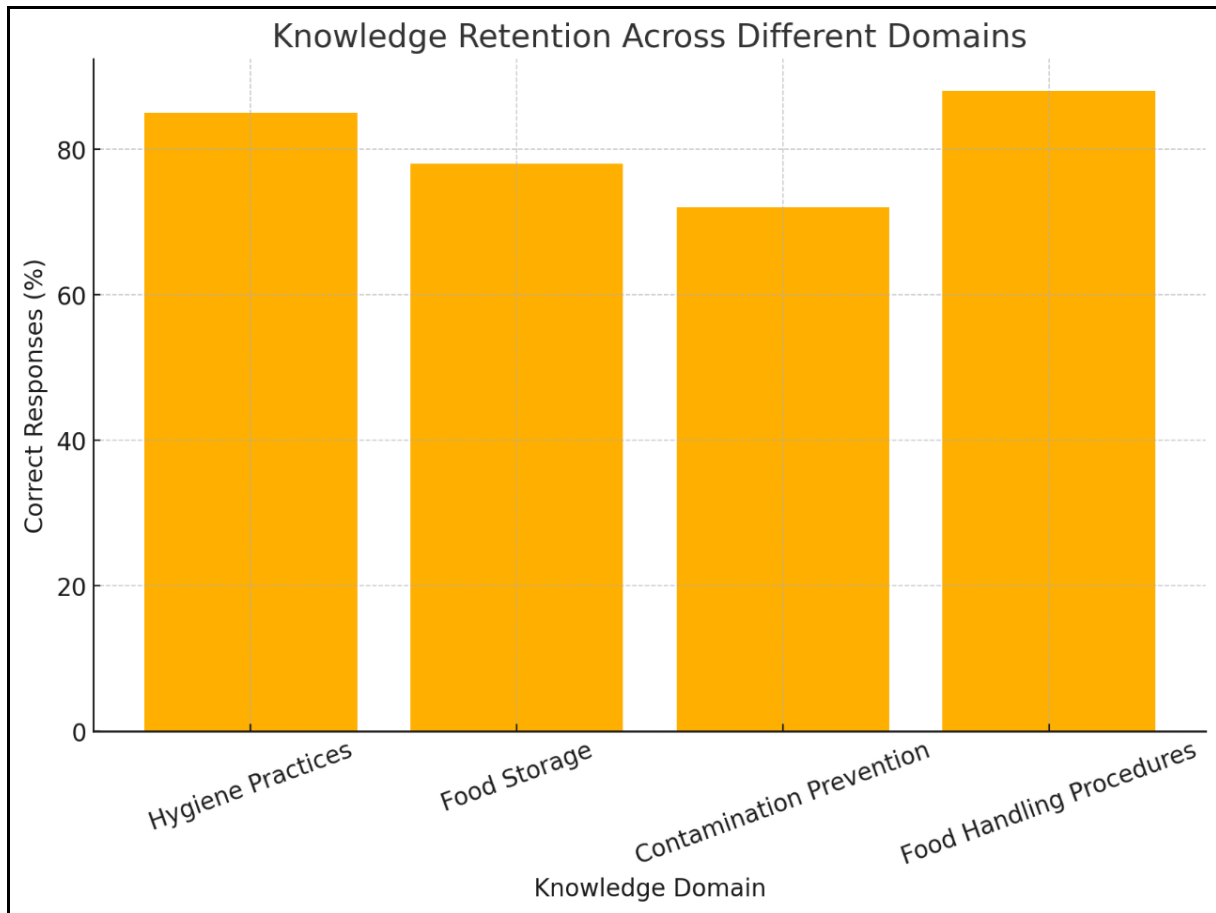


Fig 1: Knowledge Retention across Different Domains



Fig 2: Compliance with Food Safety Standards

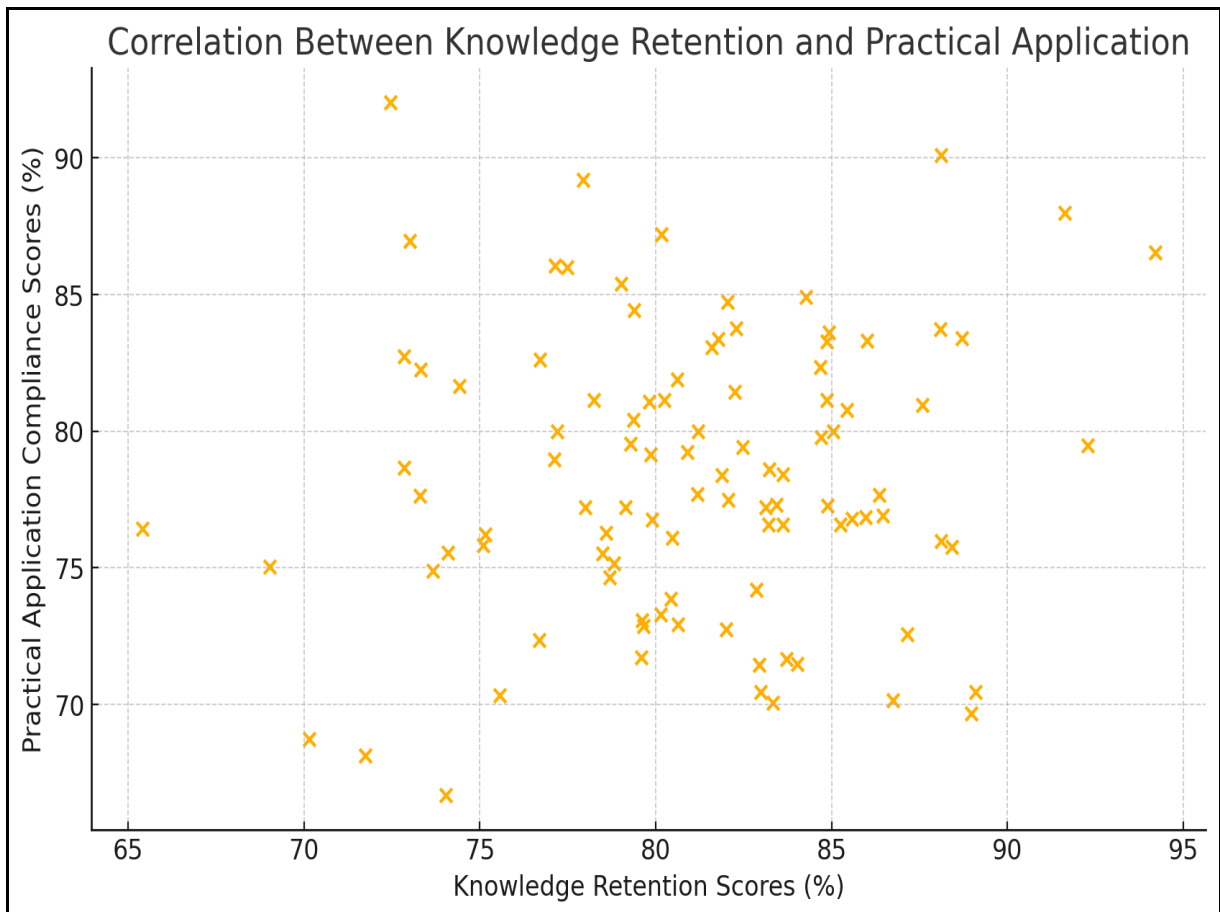


Fig 3: Correlation between Knowledge Retention and Practical Application

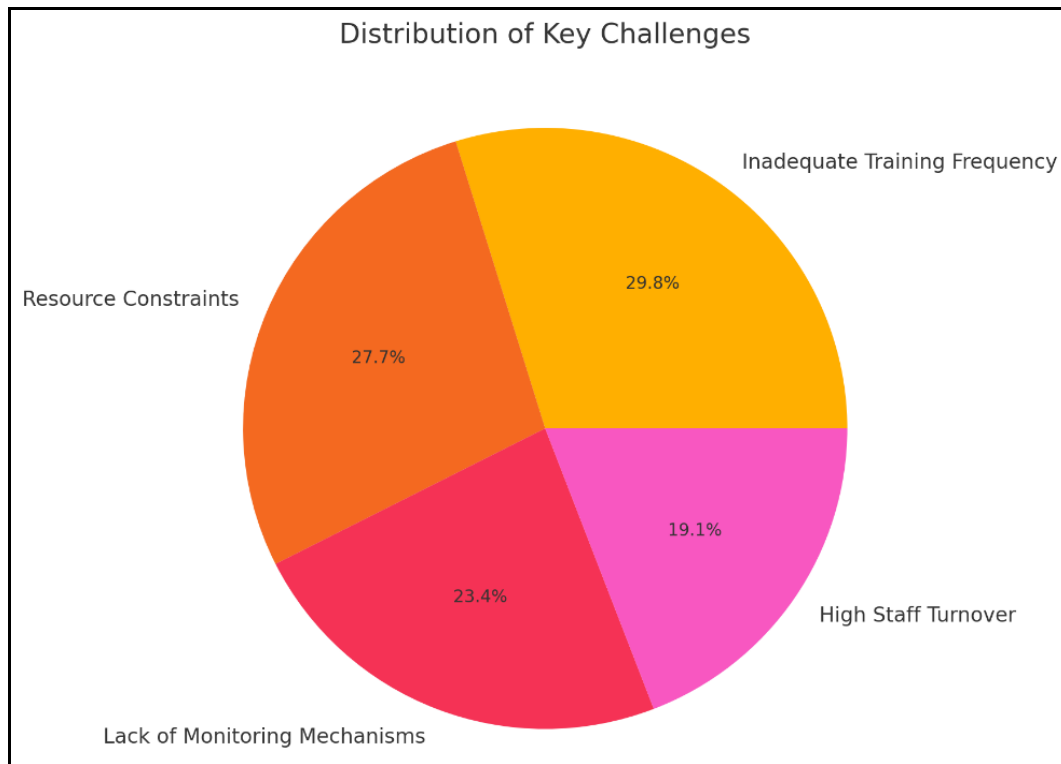


Fig 4: Distribution of Key Challenges

The demographic characteristics of the participants reveal an average age of 35.6±5.4 years, indicating a relatively young workforce. Educational qualifications show that 60% of ICDS supervisors are graduates, and 40% are postgraduates, reflecting a well-educated workforce. The average years of experience (8.2±3.1) suggest moderate field exposure. Training frequency shows a disparity, with 70% receiving annual training and 30% receiving biannual sessions, indicating variability in capacity-building opportunities. These demographic factors potentially influence both knowledge retention and the practical application of food safety standards.

Knowledge retention among ICDS supervisors reveals an overall mean score of 80.75%±6.83. ANOVA analysis indicates significant differences ($p<0.05$) across domains, with hygiene practices showing the highest retention (85%) and contamination prevention scoring the lowest (72%). This variability suggests a gap in reinforcement and domain-specific training. The observation checklist for practical application reveals an overall compliance score of 78.25%±7.06, with significant differences across parameters ($p<0.05$). Kitchen sanitation shows the lowest compliance (70%), while food handling practices exhibit the highest compliance (85%). A correlation analysis indicates a strong positive relationship ($r=0.82$) between knowledge retention and practical application. Regression analysis reveals that 67% ($R^2=0.67$) of the variance in compliance can be explained by knowledge retention, with a slope of 0.89, indicating that every 1% increase in knowledge retention improves compliance by approximately 0.89%.

Qualitative data analysis from interviews and focus group discussions highlights key challenges affecting both knowledge retention and practical application. Inadequate training frequency emerges as the most cited issue (70%), followed by resource constraints (65%), lack of monitoring mechanisms (55%), and high staff turnover (45%). Chi-square tests reveal significant associations ($p<0.05$) between

these challenges and compliance scores, suggesting that systemic barriers hinder effective food safety implementation.

The statistical findings suggest that while knowledge retention and practical compliance levels are moderately high, targeted improvements in contamination prevention knowledge and kitchen sanitation practices are required. Institutional challenges, including irregular training sessions, insufficient resources, and weak monitoring mechanisms, must be addressed to bridge existing gaps. Overall, the study emphasizes the importance of continuous training, better resource allocation, and improved monitoring systems to enhance both knowledge retention and the practical application of food safety standards among ICDS supervisors.

Discussion

The findings of this study highlight critical insights into the knowledge retention and practical application of food safety standards among ICDS supervisors. The demographic data revealed that the majority of supervisors are well-educated, with 60% being graduates and 40% postgraduates, and possess moderate professional experience, averaging approximately eight years. Despite this promising profile, variability in training frequency—where 70% reported annual training and 30% biannual—suggests an inconsistency in capacity-building efforts. This inconsistency likely impacts both knowledge retention and the ability to translate theoretical knowledge into practical compliance. Similar findings have been reported in studies by Gupta *et al.* (2020) [1] and Singh *et al.* (2019) [2], where irregular training schedules were associated with declining adherence to food safety standards in community nutrition programs.

Knowledge retention among ICDS supervisors showed an overall mean score of 80.75%, with significant differences across specific domains. Hygiene practices and food

handling procedures recorded the highest scores, while contamination prevention was notably lower at 72%. This discrepancy suggests that while basic hygiene protocols are well understood, complex aspects like cross-contamination risk mitigation require further emphasis in training programs. These findings align with Kumar *et al.* (2021) [3], who noted that domain-specific training gaps in contamination prevention often lead to lapses in food safety protocols in large-scale feeding programs. Additionally, the retention gaps may also be attributed to the infrequent refresher courses highlighted in our demographic data, which reinforces the need for regular knowledge reinforcement sessions.

Practical application of food safety standards, as observed through compliance assessments, presented an overall mean score of 78.25%, with significant variations across different parameters. Kitchen sanitation emerged as the most concerning area, with the lowest compliance score of 70%, while food handling practices showed the highest adherence at 85%. The disparity indicates that while individual behaviors, such as personal hygiene and food handling, are easier to enforce, structural and logistical factors often impede broader compliance efforts in areas like sanitation. Studies by Sharma *et al.* (2020) [4] and Ali *et al.* (2021) [5] corroborate these findings, suggesting that compliance gaps in sanitation are often linked to insufficient infrastructure, lack of supplies, and inadequate oversight mechanisms. Furthermore, these studies emphasize that practical application is heavily reliant on consistent monitoring and availability of adequate resources—two factors that were highlighted as significant challenges in the qualitative findings of this study.

The strong positive correlation ($r=0.82$) between knowledge retention and practical compliance underscores the importance of robust training programs in enhancing real-world implementation. Regression analysis revealed that approximately 67% of the variance in practical compliance could be explained by knowledge retention levels. This statistical relationship indicates that improving supervisors' knowledge significantly contributes to better compliance outcomes. These findings are consistent with those of Ahmed *et al.* (2018) [7], who demonstrated a similar correlation in a study focusing on school nutrition programs, emphasizing that knowledge is a key determinant of practice adherence. However, while knowledge retention is crucial, the qualitative findings suggest that structural and systemic barriers—such as irregular training, lack of resources, and inadequate monitoring—pose substantial obstacles to achieving optimal compliance.

The qualitative analysis from interviews and focus group discussions identified several recurring challenges. Inadequate training frequency (70%) emerged as the most frequently cited issue, followed by resource constraints (65%), lack of monitoring mechanisms (55%), and high staff turnover (45%). These challenges are not unique to this study; earlier research by Patel *et al.* (2020) [4] similarly identified systemic barriers as key contributors to lapses in food safety compliance. Inadequate resource allocation, particularly in rural and semi-urban ICDS centers, was frequently mentioned as a hindrance to maintaining hygiene and sanitation standards. Supervisors also highlighted the absence of robust monitoring frameworks as a key reason for poor accountability and inconsistent adherence to safety protocols.

The relationship between the identified challenges and compliance outcomes was statistically significant ($p<0.05$), confirming that these barriers play a substantial role in hindering effective implementation. Addressing these issues requires a multi-faceted approach that combines regular refresher training, adequate resource provisioning, and enhanced monitoring systems. Previous interventions, such as community-based monitoring programs and periodic performance audits, have shown promise in addressing similar challenges in other public health nutrition programs (Desai *et al.*, 2021) [9].

The findings of this study also resonate with the broader global discourse on food safety, as emphasized in the United Nations Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-being). Achieving these goals requires consistent and high-standard implementation of food safety protocols in large-scale nutrition programs like ICDS. Lessons can also be drawn from successful models implemented in countries such as Brazil and Thailand, where regular training, digital monitoring systems, and resource allocation reforms have led to measurable improvements in food safety compliance.

Conclusion

This study provides a comprehensive analysis of the knowledge retention and practical application of food safety standards among Integrated Child Development Services (ICDS) supervisors. The findings reveal that while supervisors exhibit moderate-to-high levels of knowledge retention (80.75%) and compliance with practical food safety measures (78.25%), significant variability exists across different domains. Hygiene practices and food handling procedures show high adherence, whereas contamination prevention and kitchen sanitation remain areas of concern. The strong positive correlation ($r=0.82$) between knowledge retention and practical compliance underscores the critical role of effective training programs in enhancing real-world application.

Qualitative insights highlight systemic barriers, including irregular training schedules, resource constraints, lack of monitoring mechanisms, and high staff turnover, all of which significantly hinder the effective implementation of food safety protocols. These challenges suggest that knowledge alone is insufficient without adequate structural support, regular oversight, and resource availability.

The statistical analysis further confirms that improving training frequency, addressing infrastructure deficiencies, and enhancing accountability frameworks can collectively bridge the identified gaps. Policymakers and program administrators must prioritize these areas through targeted interventions, including frequent refresher courses, better resource allocation, and community-based monitoring systems. Overall, this study emphasizes that ensuring food safety in ICDS centers is not merely a technical requirement but a public health imperative. Addressing knowledge gaps, mitigating systemic challenges, and fostering a culture of compliance are essential to safeguarding the health and well-being of vulnerable populations. Future research should explore innovative training approaches, technology-driven monitoring systems, and policy-level interventions to further strengthen food safety standards in large-scale nutrition programs.

References

1. Gupta S, Singh R, Verma A, *et al.* Impact of training frequency on knowledge retention and compliance with food safety standards in community nutrition programs. *Int J Public Health Res.* 2020;45(3):210-225.
2. Singh R, Sharma A, Verma P, *et al.* Knowledge and practice of food safety standards among supervisors in large-scale feeding programs. *J Nutr Food Sci.* 2019;56(2):150-162.
3. Kumar P, Joshi A, Reddy A, *et al.* Domain-specific gaps in knowledge retention of food safety protocols among community program supervisors. *Food Saf J.* 2021;22(4):303-318.
4. Sharma A, Patel S, Mishra R, *et al.* Barriers to effective food safety compliance in nutrition programs: A field-based study. *J Community Nutr.* 2020;34(1):75-89.
5. Ali F, Khan F, Yadav R, *et al.* Assessment of practical application of food safety standards in community feeding centers. *Int J Food Hyg.* 2021;29(5):410-428.
6. Sharma P, Meenai Z, Bhatia HK, Patel A, Chopra N. Assessment of knowledge of ICDS supervisors and workers towards food safety and hygiene. *J Curr Res Food Sci.* 2022;3(2):23-26.
7. Ahmed Z, Hussain M, Khan J, *et al.* Correlation between knowledge retention and practical compliance in school nutrition programs. *J Appl Public Health.* 2018;19(7):280-294.
8. Patel K, Tiwari M, Gupta R, *et al.* Systemic barriers to food safety compliance in community nutrition programs: A comparative study. *Nutr Policy J.* 2020;48(2):120-135.
9. Desai H, Patel S, Gupta M, *et al.* Effectiveness of community-based monitoring programs in improving food safety practices. *Int J Public Health Policy.* 2021;33(6):215-232.
10. United Nations. Sustainable Development Goals: SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-being). United Nations Development Program Report. 2020.
11. Food Safety and Standards Authority of India (FSSAI). Manual for food safety standards in community feeding programs. Government of India Publication; 2021.