Design and Evaluation of a Web Application for Improved Allergen Control in Large-Scale Catering Operations

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Food allergy incidents have emerged as a growing concern worldwide, posing significant challenges for hospitality establishments that manage diverse ingredients under rapid food preparation conditions. In Sri Lanka, catering operations, including hotels and airline services, largely rely on manual documentation and verbal communication for allergen management, increasing the risk of misinformation and unintentional allergen exposure. To address this gap, a web-based application was developed to improve ingredient transparency and allergen awareness in large-scale catering environments. A mixed-methods design was adopted, beginning with focus group discussions and key informant interviews involving 20 staff members, including chefs, quality assurance personnel, and purchasing personnel, from two large-scale catering establishments, Sri Lankan Catering Ltd. and Cinnamon Grand Colombo, selected as Sri Lanka's sole airline caterer and a leading hotel and resort operator, respectively, to identify system gaps and functional requirements. Based on these insights, a customized web application was developed featuring comprehensive ingredient and meal databases, allergen identification, storage and shelf-life details, and role-based user access. The system supports two user levels: general users, who can search meal and allergen information, and staff users, who can update and manage data in real time. Effectiveness was evaluated through a pre- and post-knowledge test administered to the same 20 participants, whose mean scores increased significantly from 6.95 to 8.10 (paired t-test, $p = 0.025$). Overall system performance, assessed using a one-sample Wilcoxon Signed Rank test, showed high user satisfaction, with median ratings of 4.00–5.00 for navigation, intuitiveness, reliability, responsiveness, compatibility, loading time, clarity of information, and engagement ($p < 0.001$), while the feature set attribute recorded a median of 3.00 ($p = 0.083$), indicating room for further enhancement. In conclusion, the developed web-based solution is an efficient, reliable, and sustainable platform that bridges the existing communication gap in allergen management, enhances staff awareness, and supports safer food preparation in catering facilities. Its integration into the food industry is expected to bring about a meaningful shift in allergen control practices, strengthening regulatory compliance and consumer safety.

Keywords: allergen management, food safety, web application, catering operations, ingredient transparency