

# Effects of multiple interventions on the hygienic standards of food handling establishments

## Abstract

**Background:** Food hygiene has become a major issue in Sri Lanka despite having a national level programme on regular inspection of hygienic status of food handling establishments. The objectives of the present study were to assess the effects of multiple interventions on hygienic standards of food handling establishments.

**Methods:** A quasi experimental study with an intervention and control group was conducted in two rural Medical Officer of Health areas. A sample of 133 food handling establishments from the intervention arm and a 140 from control arm were selected purposefully from eight clusters in each arm. For grading of food handling establishment (Health H800 revised) was used as the evaluation tool. Interventions included, strengthening multi-sectoral partnership, training for food handling establishment owners and workers, display of food hygiene rating at food outlets, and educating public on food hygiene rating system. The control areas continued the existing practices. Food handling establishments in both arms were assessed for pre and post intervention.

**Results:** Significant improvements in hygienic standards of food handling establishments ( $p < 0.02$ ) were observed in the intervention area (58.5%) compared to the control area (41.5%) after the intervention. The mean difference in hygienic scores between intervention and control groups before and after the intervention was highly significant ( $p = 0.0005$ ).

**Conclusion and recommendation:** Multiple interventions including display of food hygiene rating to public, training of food handlers and owners of food trading establishments, health education on food hygiene and strengthening multi-sectoral collaboration had significant improvement in hygienic standards of food handling establishments. It is recommended to carryout multiple interventions to improve hygienic standards of food handling establishments.

**Keywords:** food trading establishments, community awareness, food hygiene, multi-sectoral collaboration, lower-middle income countries

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## Background

Sri Lanka's Public health system is robust<sup>1</sup> and recognized internationally for its efficiency<sup>2</sup> and is often identified as a model system for other lower middle income countries to consider.<sup>3,4</sup> However, relative to its achievements in many health indicators (e.g. maternal mortality, infant mortality), Sri Lanka has fallen behind in improving hygienic standards of food handling establishments<sup>5-7</sup> even though inspection of food handling establishments is one of the main preventive health programs. The Public Health Inspectors and Medical Officer of Health are authorized officers appointed under the provisions of the Food Act.<sup>8-10</sup> They assist local authorities in the implementation of the Food Act and provide traders with the technical guidance related to food hygiene and food safety. Hygienic standards of food handling establishments are objectively measured regularly using the Health 800 Revised form. Food handling establishments are categorized into 4 levels depending on their hygienic standards as grade A (75-100% marks - good), grade B (50-74% marks - satisfactory), grade C (25-49% marks-unsatisfactory) and grade D (0-24% marks - very unsatisfactory).<sup>11</sup> Food traders are not legally bound to display their institute rating to the public. Demand for food safety is increasing among customers<sup>12,13</sup> and several studies concluded the importance of public awareness on food hygiene rating

system.<sup>14-16</sup> Most of the consumers believe that they have the right to know the results of a hygiene inspection.<sup>17</sup> Display of food hygiene certificates would help the consumers to take decisions at the time of food purchases.<sup>18,19</sup> Demand at good hygiene restaurants may then increase, and demand at poor hygiene restaurants may be lower. These activities suggest prices may rise at good hygiene restaurants and fall at low hygiene restaurants. However, restaurants with poor hygiene may be able to improve their hygiene quality, at some cost. If the cost of increasing hygiene quality is less than the benefit from facing higher demand, restaurants may make hygiene improvements. Profit is one of the main targets of food handling establishments<sup>20</sup> and therefore, knowledge of the food handlers on food hygiene may not translate into practices.<sup>21-24</sup>

"Scores On The Doors" system was introduced in some developed countries<sup>25,26</sup> to improve hygienic standards of food business. The system used different methods to display hygienic standards which vary from numerical scores, symbols (stars or smiley faces), letters ratings (eg 'A'), or statement cards (eg pass, closed). A significant improvement of hygienic standard Scores were observed six months later in an evaluation of a before and after study done using Scores on The Doors system in the United Kingdom.<sup>27</sup> The Danish government launched a so called "Smiley scheme" in 2001.<sup>28</sup> All inspections results

are summarized in the form of a symbol (a smiley face ranging from big smile to sad face) and food establishments are obliged to publish this symbol at the entrance door to the eating place. By doing this, customers are provided a simple and convenient way of identifying the hygiene conditions of specific food establishment. A market survey conducted 2007 showed that 97% of consumers supported the smiley scheme.<sup>29</sup> Another comparative study done in Europe also found food hygiene rating scores of food establishments with implemented hygienic rating system were significantly higher ( $p < 0.0005$ ) compared to food hygiene rating scores of food establishments that had not implemented the rating system.<sup>14</sup> The evidence shows that multiple interventions are more effective than single intervention<sup>30</sup> and should be carried out at different levels (individual, group, institutional and community) to achieve a substantial impact in health promotion interventions.<sup>31</sup> The passive approaches are generally ineffective and unlikely to result in behaviour change.<sup>30</sup> Multi-sectoral action<sup>32</sup> and community empowerment<sup>33-36</sup> are strategies in changing the behaviour. Several studies recommend the training of food vendors<sup>37,38</sup> on good hygienic practices. A significant improvement in hygienic practices in food handling establishments were observed following the training of food vendors.<sup>39</sup> The objective of the present study was to assess the effects of comprehensive intervention including training, strengthening multi-sectoral action, health education, and community action and assessment on hygienic standards of food handling establishments. We hypothesized that the comprehensive intervention would be more effective in improving hygienic standards of food handling establishments.

## Methods

### Research design

The study design was a quasi-experimental non randomized, controlled trial. It was carried out in purposefully selected two Medical Officer of Health areas from 2 districts in Sri Lanka. Among them, one Medical Officer of Health area was selected randomly as the intervention group and the other area as the control group. All the Village Town Centers in the Medical Officer of Health area was listed and eight clusters /Village Town Centers were selected purposefully from each intervention and control arm.

### Participants

Food handling establishments in Kalutara and Rathnapura district consist of the study population. All the food handling establishments and ambulatory street food handling establishments operated within the clusters of Village Town Centre during the study period were included. Street food handling establishments selling only machine vended food and/or bottled beverages were excluded. Study unit was the food handling establishment. For the purpose of the intervention, we define clusters. A cluster (Village Town Centre) is a group of 15-20 food handling establishments which are located geographically close to each other in an area not exceeding one square kilometer.

### Intervention

The comprehensive intervention is a combination of training, health education and multi-sectoral action with the integration of components from health belief model<sup>40</sup> and social cognitive theory.<sup>41</sup> The primary target group was the traders of the food handling establishments whereas the secondary target group was the customers. Intervention package was developed by the principle investigator in

consultation with the relevant experts in public health (two Consultant Community Physicians, a Sociologist a Medical Officer of Health). The package included low cost interventions to improve hygienic standards of food handling establishments, training, health education, method of evaluation using Health H800 revised form and a problem solving session. Advocacy to the local authority and the owners of the food handling establishments in the intervention area was done by the principle investigator and the area Medical Officer of Health at the beginning of the interventions. Food handling establishments in the intervention area were divided into four groups according to the type of food handling establishments. First group included only the owners and the food handlers in hotels. Second group included owners and the food handlers in the bakeries. Other two groups included owners and the food handlers in tea kiosks/ snack bars and groceries. The curricula were divided into four one-hour sessions and administered to the owners and the food handlers of the food handling establishments during week days by the principle investigator and the area Medical Officer of Health at their office. Each training session had a lecture on introduction to the programme, group discussion based on Health H800 revised form, a session to share experience and a session to discuss problems. Following the training individual attention was paid to each food handling establishment at their premises by the area Public Health Inspector to explain the changes needed to get a higher rating. Area Public Health Inspectors were specially trained to give additional instructions to food handling establishments at Village Town Centers in intervention areas. Local authority was regularly advocated every three months by the principle investigator and the area Medical Officer of Health. In order to improve compliance formal letters were delivered to the owners of the food handling establishments one week before the training explaining the objectives.

In addition, community in the intervention area was educated about the rating system used on hygienic standards of food handling establishments by displaying bill boards on roads, using public address system and health education sessions. Most of the health education sessions were conducted during routine clinic activities and school health education sessions. The above activities were commenced one month after the training of food handling establishments. Inspection of food handling establishments was done between the pre and post assessments randomly. Food raids were also carried out as a routine work in both intervention and control areas. During the one year period of the study, there has been 10 and 11 food raids conducted by Public Health Inspectors in intervention and control areas respectively. Both intervention and control area, food handlers received training on hygienic standards of food handling establishments but the training on intervention area was more intense. Post intervention assessment was done on intervention and control groups one year after the initial assessment using the same Health H800 revised form. The project started in December 2012 and ended in December 2013. Baseline survey and the post intervention survey took two weeks each.

### Outcomes

The outcome of the study was the scores obtained by the food handling establishments. Data were collected using a paper-based, close-ended response Health H800 revised checklist which has been used island wide to assess the hygienic standards of food handling establishments since 2011. The area Public Health Inspector collected the data under the supervision of the Medical Officer of Health. The same questionnaire was used at each of the study's two data collection

time-points. Although Public Health Inspector and Medical Officer of Health are familiar with Health H800 revised form, training sessions on measuring hygienic standards of food handling establishments using Health H800 revised form were conducted and the objectives were explained by the Principle Investigator to the Public Health Inspectors and the Medical Officer of Health. As there were obvious differences between treatment and the control group, the trial was not blinded.

**Sampling**

Good hygienic standard was taken as the main outcome variable. Good hygienic standard was defined as having “B” grade or above according to H800 revised form. Sample size was calculated to test an improvement in the percentage of good hygienic standards of food handling establishments from 28% to 36% following multiple interventions. The statistical power of 80% and  $\alpha$  error of 0.05 were used. The total sample size according to the formulae described by Pocock<sup>42</sup> was 93 per arm. In order to adjust for clustering, this number was multiplied by a design effect of 1.5. The final sample size was 140 per arm. There were 26 Village Town Centers in the intervention area and 31 in the control area. Eight clusters were selected purposefully from each arm and all the food handling establishments in each cluster were included in this study. Altogether, there were 133 food handling establishments in the intervention arm and 140 food handling establishments in the control arm. Food factory, hotel, bakery, tea kiosk/snack bar, grocery, supermarket, and others were included as food handling establishments.

**Ethical considerations**

Ethics committee approval was obtained from the ethical review board of the Sri Jayewardenepura University prior to the commencement of the study. There was no need to get permission to inspect food handling establishments as Public Health Inspectors are duty bound to routinely inspect them as stipulated by the government.

The study was conducted ensuring minimal disruption to the business of food handling establishments. Those with lower ratings (grades C and D) were not forced to display their ratings to the public as the rating indicates unsatisfactory and very unsatisfactory respectively.

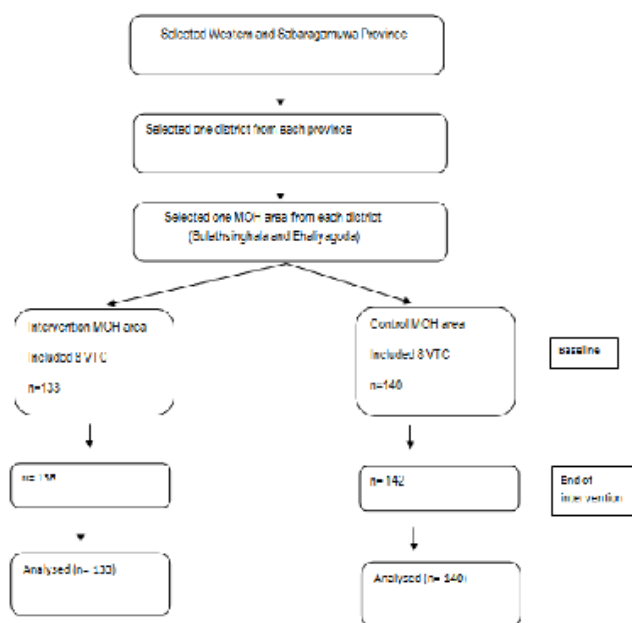
**Statistical methods**

Epidata 3.1<sup>43</sup> was used to enter data and data analysis was performed using SPSS 21.0 statistical software.<sup>44</sup> The unit of analysis in this study is food handling establishments. Exploratory analysis (Kolmogorov- Smirnov test) revealed that baseline scores and the post- intervention scores were not normally distributed. Differences were considered significant when  $p < 0.05$ .

**Results**

Of total 273 food handling establishments, there were 133 food handling establishments from 8 Village Town Centers in intervention area and 140 Food handling establishments from the same number of Village Town Centers in control area before the intervention. There were five new food handling establishments in the intervention area and two new food handling establishments in the control area at the end of the intervention due to establishment of new food handling establishments (Figure 1). Majority of the food handling establishments were snack bars in the IG and the CG (23.3% and 27.1% respectively in the IG and the CG (Table 1–3). A significantly higher proportion of grade A and B food handling establishments were found in the intervention arm (55.8%) compared to the control arm (41.5%) after the intervention. This difference is significant ( $p = 0.02$ ).

The H800 revised format gave hygienic score in each food handling establishment. Mean difference before and after the intervention was calculated for the intervention and the control areas separately. Difference between the mean was tested and the results is shown in Table 4. A significantly ( $p < 0.0005$ ) higher mean difference was observed in the intervention group compared to the control group.



**Figure 1** Study Participants by groups from baseline to one year follow-up.

**Table 1** Type of food handling establishments in the intervention and control groups

Food business type	Intervention n(%)	Control n(%)	Total n(%)
Hotel	27 20.30%	23 16.40%	50 18.30%
Bakery	28 21.10%	31 22.10%	59 21.60%
tea kiosk	24 18.00%	29 20.70%	53 19.40%
Snack bar	31 23.30%	38 27.10%	69 25.30%
Small scale retailer	23 17.30%	19 13.60%	42 15.40%
Total	133 100.00%	140 100.00%	273 100.00%

n represents the number of establishments, (%) represents their share in the sample.

**Table 2** Distribution of grades between intervention and control groups before the intervention

	grade before intervention 1=A+B, 2=C+D		Total
	1	2	
Intervention	37 47.40%	96 49.20%	133 48.70%
Control	41 52.60%	99 50.80%	140 51.30%
Total	78 100.00%	195 100.00%	273 100.00%

Nearly 50% of the food handling establishments were in A and B category both in the intervention group and the control group before the intervention.

**Table 3** Distribution of grades between intervention and control groups after the intervention

	group - grade after intervention 1=A+B, 2=C+D		Total
	1	2	
Intervention	55 58.50%	78 43.60%	133 48.70%
control	39 41.50%	101 56.40%	140 51.30%
Total	94 100.00%	179 100.00%	273 100.00%

$X^2 = 5.5, df=1, p=0.02$

A significantly higher proportion of grade A and B food handling establishments were found in the intervention arm (55.8%) compared to the control arm (41.5%) after the intervention. This difference is significant ( $p=0.02$ ).

**Table 4** Mean difference between intervention and control groups before and after the intervention

	Number	Mean difference	SD	SEM	F	P
Intervention	133	3.2	2.98	0.26	1.03	0.0005
Control	140	1	2.95	0.25		

## Discussion

This quasi experimental study found that the hygienic standards of food handling establishments in the intervention area were significantly improved ( $p<0.0005$ ) compared to the control area, one year after the initiation of multiple interventional activities. The present study reported the effect of a comprehensive community based health promotion intervention. Intervention conducted through existing resources with multi-sectoral collaboration and activities were designed to get active consumer participation. The control group was selected away from the intervention area in order to avoid contamination bias. Response rate of the present study was 100% since examining food handling establishments by the PHIs is carried out as part of the routine duty. The outcome was measured objectively using the existing standard evaluation tool, the H800 revised form which has been used to evaluate the hygienic standards of food handling establishments is land wide since 2011. This is the first study in Sri Lanka to evaluate an intervention on hygienic standards of food handling establishments. Literature review identified the place of inter-sectoral collaboration in health promotion interventions.<sup>45-47</sup> The present study identified partners which included primary health care team, local authority, owners of the food handling establishments and consumers. One of the main roles of the preventive health team was to strengthen the multisectoral partnership. Interventions were designed to get active community involvement for the project throughout the period since studies have repeatedly shown its effectiveness.<sup>45-49</sup> A group based training as well as individual training was used to improve knowledge and skills of the primary target group (owners and the traders of the food handling establishments). Advocacy, training of the traders of food handling establishments followed by technical assistance to individual units (food handling establishments) were carried out to the primary target group in the intervention area. After the initial advocacy and training, Public Health Inspectors in the intervention area visited each food handling establishments in Village Town Centers selected for the study to assess the present standard and to assist food handling establishments to develop their hygienic standards. This procedure ensured individual assistance for food handling establishments in the intervention area. Several interventional activities were carried out targeting customers in order to increase knowledge about the rating of the food handling establishments. Bill boards where rating of food handling establishments were marked as grades A, B, C and D were displayed in public places, rating of each food handling establishments was displayed with the view to increase public awareness on the rating of food handling establishments in the area, leaflets were distributed among the public and small group discussions were conducted in the intervention area as interventions to the secondary target group.

Considering the ethical issues the traders were not forced to display the ratings obtained. Those who obtained grade A or B voluntarily displayed their ratings while those who obtained grade C and D didn't. As the interventions were also targeted to increase awareness



of the public about the programme and the rating system, those who obtained grade C and D lost their profit while those who obtained A and B increased their profits. This scenario led for grade C and D food handling establishments to improve their hygienic standards to higher grades (ie Grade A or B). The limitations of this study should be carefully considered. First, the study was not a quasi-experimental design. The selections of clusters were done purposefully. Second, evaluation was done by the PHIs who were serving in the study areas since this was their routine work. Third, as there were multiple interventions, it was not possible to assess the effectiveness of each intervention. Finally, the intervention may have other effects such as profit of the food handling establishments because the public choose to buy food items from grade A (highly satisfactory) or grade B (satisfactory) food handling establishments. Profits of Food handling establishments were not assessed in this study. Therefore, it is not possible to conclude that profits have increased due to interventions.

## Conclusion

Multiple interventions were effective in improving hygienic standards of food handling establishments in the intervention area. Statistically significant improvements of hygienic standards of food handling establishments were observed in the intervention area after the intervention.

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## Conflicts of interest

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