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Cooking processes and occupational accidents in commercial restaurant kitchens

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ABSTRACT

This study is concerned with the cooking processes in commercial restaurant kitchens and the characteristics of occupational injuries according to cooking processes. In order to obtain an overall picture of cooking, questionnaire survey was carried out. Furthermore accident data for injured persons were categorized by the cooking processes in progress during the accident, and were analyzed in terms of age of injured person, work experience, accident type, and agency of accident. Survey results of questionnaire show that heated cooking constitutes the largest part, followed by non-heated cooking, and preparation. Also results show that the cooking process in time of the accidents resulted in differences of, such as, type of accident, period of work experience, and agency of accident; (1) Accidents during preparation were caused mainly by machine and tools (86.7%), and most victims were injured in the forms of getting caught in and between objects (45.7%) or with cuts, amputations and punctures (43.9%); (2) Cooking utensils and caldron were behind 55.4% of the accidents, and 73.3% of the accidents during heated cooking processes revealed problems with abnormal temperature; (3) Accident during handling/storing ingredients and serving were most commonly in the forms of slips and falls. Finally, a hazard identification and risk assessment table of kitchen works was derived to classify the possible incidents according to the levels of risk. These findings of accident properties according to cooking process can be used as baseline data for the establishment of systematical preventative policies.

1. Introduction

Occupational accident analysis in various industries is a crucial process in developing preventative policies (Jeong, 1997, 1998; Ahn et al., 2006; Lee and Jeong, 2009; Buchanan et al., 2010; Haruyama et al., 2014). Strategies for accident prevention should be in reasonable agreement with significant variables of occupational accidents (Jeong, 1999).

In various countries, restaurants employ a large number of people, and many of these employers are young workers under 20 years of age (Teo et al., 2009; Kokane and Tiwari, 2011; Huang et al., 2012; California Department of Industrial Relations, 2012; Haruyama et al., 2014). However, kitchen work requires long hours of work in a limited space with inconsistent workload. In a survey asking cooks of the contributing factors that made work strenuous, included work environments and work speed/load (Ahn et al., 2006). Cooks are frequently exposed to hot pans or fryers, increasing the risk of burns, and slips and falls due to moisture on kitchen floors (Courtney et al., 2006; ILO, 2011; HSE, 2015). Also, musculoskeletal problems may exist among kitchen workers who routinely carry heavy objects (Chyuan et al., 2004; Ahn et al., 2006; Kokane and Tiwari, 2011). Furthermore, tasks in kitchens involve machinery with sharp blades for slicing or grinding, and are exposed to risks of explosion due to gas used in heating processes (Haruyama et al., 2014). Hazardous and dangerous substances can cause injury or illness if people come into contact with them or do not use them properly (California Department of Industrial Relations, 2012; HSE, 2015).

This study concerns the cooking processes in commercial restaurant kitchens and the characteristics of occupational injuries by cooking processes. In order to develop methods of prevention, systematical analysis of cooking processes in accordance to accident properties is needed. This study contributes by examining the injured persons of commercial kitchens according to cooking processes.

Restaurants can range in size from a small local diner to a large hotel restaurant. Kitchen works vary according to the place that a worker is employed (Kokane and Tiwari, 2011). In the case of smaller restaurants, kitchens require cooks to take up various tasks such as preparing and cooking food, handling and storing ingredients, and cleaning and keeping maintenance of the kitchen area

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(ILO, 2011; California Department of Industrial Relations, 2012). Furthermore, Korean kitchen workers tend to work without a clear division of tasks (Ahn et al., 2006). Therefore, this study defines the job of a kitchen personnel in a general sense; those who are responsible for cooking, handling/storing ingredients as well as serving and cleaning.

2. Methods

2.1. Task analysis for cooking processes

In order to obtain an overall picture of tasks that workers are required to do, questionnaire survey was carried out. A sample of 100 cooks for Korean, Chinese, Japanese and Western style commercial restaurants were chosen to respond to the questionnaire, which was designed to investigate cooking process and composition of cooking tasks. Among the sample of 100 cooks in the commercial restaurant kitchens, there were more males (80 cooks, 80.0%) than females (20 cooks, 20.0%). Regarding the cooking process and composition, cooking tasks were categorized, with preliminary approval of the manager, into the following seven customary categories: handling/storing ingredients, preparation (such as trim, knead, slice and fillet), heated cooking (such as cook rice, boil, bake, broil, fry, and griddle), non-heated cooking (such as seasoning vegetables, making fruit juice, sandwich, or sushi), serving, dish washing and cleaning, and others. A day's work constituted of these tasks in certain proportions, and subjects were asked to report in full sentences of their work methods and tools.

2.2. Analysis of occupational accidents in commercial kitchens

Subjects of this study include injured persons of accidents in commercial kitchens that have taken 4 or more days off following the accident. In this study, 1962 injured persons of accidents between 2009 and 2011 have been examined. Research has identified accident properties according to the cooking process that was involved during the accident. Accident data for injured persons were categorized by the cooking processes in progress during the accident, and were analyzed in terms of the age and work experience of the injured person, accident type, and agency of accident.

Chi-square test was used to test the equality of independent distributions, considering p values below 0.05 as statistically significant.

Also, this study identified the hazardous factors for each cooking process from the characteristics of occupational injuries. Risk assessment was carried out to classify them according to the levels of risk, so that priority could be given to those requiring urgent control measures.

Table 1
Cooking process by restaurant type.

Process	Restaurant type			
	Korean cuisine	Chinese cuisine	Japanese cuisine	Western cuisine
Handling/storing ingredients				
Preparation	• Trim • Slice • Knead	• Trim • Slice • Knead	• Trim • Slice • Fillet	• Trim • Slice • Knead
Heated cooking	• Cook rice, • Boil • Bake, • Broil • Fry • Griddle	• Cook rice, • Boil • Broil • Fry	• Cook rice • Boil • Bake • Fry	• Boil • Bake • Fry
Non-heated cooking	• Season		• Make sushi	• Sandwich • Beverage
Serving				
Dish washing and cleaning				

3. Results

3.1. Cooking process and distributions of work time and injured persons

3.1.1. Flow of cooking process by restaurant type

Table 1 illustrates cooking processes for each type of restaurants in order. Difference in specific tasks has been identified according to the type of restaurant. As shown in Table 1, Korean cuisine restaurants performed various tasks, such as kneading dough, trimming vegetables, cooking rice, slicing and broiling meat or fish, and seasoning vegetables. Chinese restaurants were highly occupied with kneading flour for noodles, cooking rice at high temperatures, boiling the noodles, broiling and frying. Japanese kitchens were filleting fish, making sushi and sashimi, boiling, baking and frying. Western restaurants were making sandwiches or hamburgers, kneading and baking flour, slicing meat and vegetables, boiling soup and producing beverages.

3.1.2. Distributions of working time and injured persons

Table 2 presents the distributions of work time and injured persons according to the relevant cooking process. The percentage distribution of work time answers the question on the composition of different tasks in a day's work. Table 2 shows that the percentage of heated cooking was the highest at 18.4%, followed by non-heated cooking at 18.3%, preparation at 17.0%, dish washing and cleaning at 14.2%, handling/storing ingredients at 8.5%, and serving at 7.3%.

The percentage distribution of injured persons represents the results of accident analysis for 1962 accident injuries. In the percentage distribution of injured persons by cooking process, as shown in Table 2, indicates preparation (38.4%) was the most common cause, followed by heated cooking (20.8%), dish washing and cleaning (15.7%), handling/storing ingredients (13.2%), and serving (5.6%).

We derived the relative accident risk based on the percentage distribution of work time and injured persons. The relative

Table 2
Percentage distributions of working time and injured persons, and relative accident risk.

Process	A. Working time (by questionnaire survey) (%)	B. Injured persons (by accident analysis) (%)	Relative accident risk (=B/A)
Handling/storing ingredients	8.5	13.2	1.553
Preparation	17.0	38.4	2.258
Heated cooking	18.4	20.8	1.130
Non-heated cooking	18.3	1.2	0.064
Serving	7.3	5.6	0.768
Dish washing and cleaning	14.2	15.7	1.109
Others	16.3	5.1	0.313