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A Study of Environmental Hazards Causing Unintentional Injuries in Bangkok Metropolitan Area Day Care Centers

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Abstract

The purpose of this research was to study environmental hazards causing unintentional injuries in Bangkok day care centers. Most such studies among preschoolers have shown a correlation with environmental hazards. The sample group consisted of 45 day care center teachers and volunteer babysitters. Interviewer-completed questionnaires were used to gather information from respondents, and day care centers were naturalistically observed in accordance with an Environmental Hazards Survey. Data analysis was conducted using descriptive statistical analysis.

Results revealed that most environmental hazards were sharp or square-edged objects. Poisoning was caused by poisonous substances or medicines lying on the floor or on objects located less than 1 meter from it. Burns/scalding were produced by electrical appliances or stoves located less than 1 meter from the floor. Slips/falls were because of furniture, televisions, or other objects which children could pull or climb on. Moreover, drowning was a result of water containers inside day care centers. Lastly, hazardous stairways were those with steps wider than 15 centimeters. Findings suggest that health care providers should educate teachers or volunteer babysitters at day care centers by using guidelines from an environmental hazards survey to create a safe environment for protecting against unintentional injuries.

Keywords: *Day care centers, environmental hazards, unintentional injuries*

Introduction

Unintentional injuries among children are a significant and leading cause of death and admission for treatment in hospitals of many countries worldwide (Towner & Scott, 2008). In 2013, the U.S. reported an estimated non-fatal unintentional injury rate among children aged 1-4 of 12,350 per 100,000 children. Slips/falls were a significant common cause, followed by being struck by a person or object, animal and insect bites, and sharp objects (Child Trends Databank, 2014). In Thailand, a recent report by the Thai Emergency Medical Services found that 129,002 children aged 1-14 had emergency illnesses, the leading causes of which were slips/falls, animal bites, burns from fire/ scalding/chemicals/electrical, drowning, and airway obstructions (National Institute for Emergency Medicine, 2015). As a matter of fact, unintentional injuries among young children are still an important problem in this world. A significant factor that contributed to unintentional injuries among preschoolers is hazardous environments both inside and outside residences (Caeiro Ramos, & Mateus Nunes, 2014; Phelan et al., 2011).

The Bangkok Metropolitan Administration has established day care centers in communities to care for children aged 2-6 years. This has been done to help relieve the burdens of low-income families whose members must work outside their residences and are unable to look after their children (Policy and Planning Division, 2007). However, an analysis of the situation of children and women by the United Nations Children's Fund (UNICEF) and Thailand in 2011 found that 20% of day care centers did not meet quality standards due to budget limitations, confined space, and lack of knowledge and understanding among volunteers who look after the children (UNICEF, 2011). The limitations such as location, environmental management, and building characteristics of community day care centers are certainly factors which may lead to unintentional injuries among preschoolers.

Research Objective

Numerous previous studies showed that unintentional injuries both inside and outside day care centers still occur as a result of hazardous environments, even though safety policies were established in accordance with national child center standards (Ministry of Social Development, 2012; Phelan, et al., 2011; Intraratsamee, 2014). Therefore, the objective of this research project was to study environmental hazards causing unintentional injuries in day care centers within the Bangkok Metropolitan area (BMA).

Benefits

These findings will identify and inform regarding environmental hazards in the present time that need to be monitored to prevent unintentional injuries to preschoolers. They may also suggest guidelines for hazardous environment management in order to prevent and reduce unintentional injuries in BMA day care centers.

Literature Review

Environmental hazards are the cause of unintentional injuries among preschool children and most of the hazards relate to sharp objects, poisoning, burns/scalding, choking/suffocation, slips/falls, stairway accidents, and drowning. According to numerous previous studies, it was found that **sharp objects** which posed environmental hazards were knives, scissors, rulers, sharpened pencils, glass/tiles/broken plastic, and nails (Qui, Wacharasin, Deoisres, Yu, & Zheng, 2014; Sitthi-amorn et al., 2006). In addition, nearly 40% of caretakers kept sharp objects in places where they could be easily accessed by children (Sitthi-amorn et al., 2006). **Poisoning** resulted from medications, cosmetics, and household cleaning supplies stored/placed less than 2 meters from the floor, including unlocked storage of chemical substances (Ahmed, Fatmi, Siddiqui, & Sheikh, 2011; Kamal, 2013). Poisoning frequently was caused by fever relief pills, cough syrup, cold medicines, medicine in the form of pills or liquids, soaps, washing detergents (Sitthi-amorn et al., 2006), bleaching and cleaning solutions, cosmetics, vinegar, fuel, insecticides, and herbicides/weed killer (Holder, Matzopoulos, & Smith,2008; Qiu et al., 2014).

Moreover, **burns/scalding** were caused by playing with matches or lighters, irons, uncovered electrical sockets, lack of fire extinguishers or smoke alarm detectors (Kamal, 2013; Theurer & Bhavsar, 2013), hot beverages, hot water equipment, stoves, and water heaters in bathrooms (Atak, Karaoğlu, Korkmaz, & Usubütün, 2010; Simpson & Nicholls, 2012). Furthermore, **slips/falls** were caused by furniture, absence of balcony rails, unguarded stairs, easily-opened windows, stair risers higher than 15 centimeters, double bunk beds (Theurer & Bhavsar, 2013), slippery floors (Simpson & Nicholls, 2012), playing equipment, bicycles and plants (Sirisamutr, 2008; Sitthi-amorn et al., 2006). Additionally, **choking/suffocation** was caused by plastic bags, coins, small parts of toys (Kamal, 2013; Qui et al., 2014), candy, bean seeds, popcorn kernels, chewing gum, fruit seeds, curtain cords, children clothes, non-functioning refrigerators, or balloons (Hockenberry & Wilson, 2013; Uppala, 2014; Rajanukul Institute , 2015). Lastly, **drowning** mainly occurred from domestic water containers such as buckets, basins, sinks, or bathtubs (Plitponkampim & Chinapa, 2014). Therefore, it is clearly evident that environmental hazards both inside and outside around day care centers were important factors that caused unintentional injuries.

Day care centers within the Bangkok Metropolitan Area (BMA) have been established to help low-income families who earn their living outside of their residences and not able to take care of their children aged 2-6. Meanwhile, they foster readiness and strengthen physical, emotional, and social development in a correct and proper manner for preschoolers before they enter into their compulsory studies. Day care centers are partially supported by budget appropriations (Policy and Planning Division 2007). They also set safety standards criteria following the standard model of the Health Promotion Division, Health Department, Ministry of Public Health (2013) including:

1. Child care center exteriors are sturdy building structures, with undamaged doors, windows, and ceilings that are readily usable, and there are no ponds, water wells, or hazardous materials outside of the buildings.
2. Child care center interiors have doors or barriers between the kitchen and other rooms to prevent children from playing in them. Nontoxic paints that comply with standards have been used on room wall surfaces and other utensils/wares. Bathroom and toilet areas are not slippery, and toilets are suitably installed for usage by children.

Cleaning equipment or other miscellaneous supplies must not be kept in bathrooms. Moreover, other safety measures including maintaining ready-to-use fire extinguishers, and employing teachers or babysitters day care centers who are capable of operating fire extinguishers very well. There must be two doors for entry and exit. Electrical outlets must be located more than 1.50 meters from the floor and have safety covers or socket plugs to prevent children from playing. Electrical appliances and electrical wires are stowed away in safe places and maintained in good condition for immediate use later on.

Preschoolers are girls and boys aged from 2-6. They are the most prone to accidents and loss of life from unintentional injuries (Atak, et al., 2010; Towner & Scott, 2008) due to their incomplete physical growth and development as well as their own risk behaviors. Preschoolers have small respiratory tubes and short visual acuity (Puckett, & Black, 2005). They are good at walking, running, climbing, and have strong muscles to swing on doors. They also demand freedom, help themselves, discover and experience their surrounding environments, are fond of experimenting, imitate images shown on television, play with all kinds of tools and equipment, and are beginning to know about some hazards such as heat from hot water (Siriboonpipatana, 2012). However, they still lack knowledge, appropriate decision making skills, and experience in making good judgments about safety, all of which are combined with curiosity; thus, preschoolers run a high risk of unintentional injury (Hockenberry & Wilson, 2013).

Research Hypothesis

Bangkok Metropolitan Area day care centers have environmental hazards that cause unintentional injuries.

Research Methodology

Research Design: A descriptive survey with a cross-sectional design was used for this study.

Population: The population was day care centers that are operated by the government or private sector, and located in communities, monasteries, welfare housing, or construction areas in the Bangkok Metropolitan area. There are a total of 301 such day care centers (Policy and Planning Division, 2007)**.**

Sample and Selection: A sample of 45 day care centers from the Bangkok Metropolitan area were selected from the population using a simple random sampling technique. The sample size was calculated from a known population with a size in the hundreds, using a sample size of 15-30% (Srisa-ard, 2010). Therefore, in this study 45 participants were contacted, which represents 15% of the number of day care centers. Then one teacher or volunteer babysitter from each center was chosen as a respondent representing the center. Inclusion criteria were simply that teachers or babysitters could read and write in Thai, and that they were willing to participate in the study.

Setting: BMA day care centers are divided into 12 areas and are located in communities, monasteries, welfare housing, or construction areas in metropolitan Bangkok. There are teachers or babysitters who are assigned to be responsible for training or educating children brought in by their parents for daytime care.

BMA day care centers are categorized by number of children at the center; i.e. small centers care for less than 50 children, medium centers from 50 to 100 children, and large centers more than 100 children. Generally, day care centers are one story buildings located close to byroads. The inside of center buildings consists of a large hall for various activities such as teaching classes, having lunch, and afternoon naps. Special purpose areas include cooking rooms and bath rooms. There are one or two entrance doors and a fence all around the outside of the center.

Instruments

Part 1: A demographic questionnaire was developed by researchers. This questionnaire consisted of 13 items. The researchers interviewed the teachers or babysitters and filled out the information in the questionnaire.

Part 2: An Environmental Hazards Survey was prepared by adapting the Home Physical Hazard Checklist of Klommek, Chaimongkol, Flick, Deenan, & Wongnum (2015) and adding items regarding the location, environment and characteristics of child day care centers (Ministry of Social Development, 2006).

The Home Physical Hazard Checklist (Klommek et al., 2015) was used to measure home physical hazards of Thai children aged 1 to 3 years in 250 households in Bangkok, Thailand. Moreover, the locations, environment, and characteristics of child daycare centers were established by the Ministry of Social Development and Human Security (2006) providing environmental safety standards in and around child daycare centers. Combining both, this Environmental Hazards Survey consisted of 2 parts. Part I consisted of 23 items covering six types of unintentional injuries which include sharp objects, poisoning, burns/scalding, slips/falls, choking/suffocation, and drowning. A four-point rating scale was used ranging from 0 (no hazardous things/ pieces/areas) to 3 (more than two hazardous things/pieces/areas). The total sum of the score ranged from 0 to 69, with higher scores indicating a high hazardous environment at a child care center, and lower scores indicating a low hazardous environment. Furthermore, Part II was composed of 9 items assessing stairways using a yes/no format. Additionally, content validity and language suitability of the two instruments were verified by three professionals, and the Content Validity Index was 1.0. These experts included a director of the Child Safety Promotion and Injury Prevention Research Center and two nursing faculty members. Inter-observer reliability was calculated and it was $r = .989$, $p < .01$ based on three observers ratings of the same child care center.

Data Collection

After receiving Institutional Review Board approval, the researchers contacted the District Director to request permission to collect data at the day care centers and explained the criteria for participants. Then the researchers made appointments with teachers or babysitters. At these appointments, written informed consent for completing the interviews and child care center observation was obtained. Data collection in a given child care center took approximately 30-45 minutes.

Data Analysis

Data analysis in this study was processed using a common statistical software package. The demographic characteristics of the sample and the environmental hazards were examined using descriptive statistical analysis, such as the number, percentage, mean, and standard deviation.

Results of Study

The findings from 45 BMA day care centers revealed that the most important cause of unintentional injury incidents in and around day care centers was slips/falls/collision injuries, which accounted for 86% of the total as illustrated in **Figure 1**.

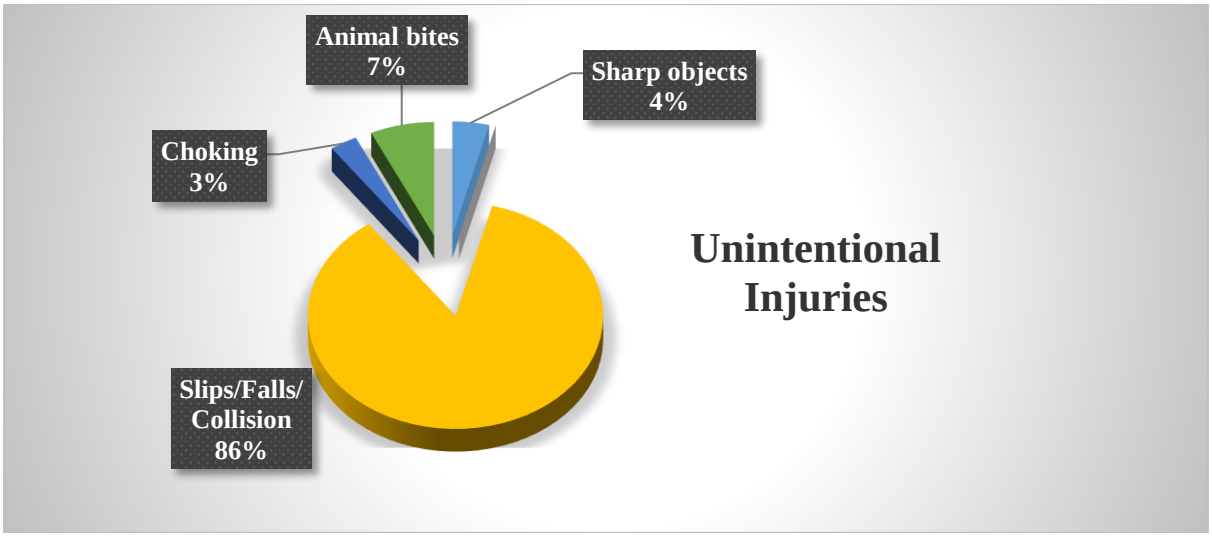

Figure 1. Incidents of Unintentional Injuries in and around Child Care Centers from May – October 2016

Environmental Hazards Causing Unintentional Injuries

All environmental hazards that caused unintentional injuries at 45 day care centers scored in the range of 7-29, with a mean of 14.80 and standard deviation of 4.62, while scores of each type of environmental hazard that caused unintentional injuries are illustrated in **Table 1**.

Variable	Interval Range		*M*	*SD*
	Possible Score	Actual Score		
Scores for environmental hazards causing unintentional injuries	0 - 69	7 – 29	14.80	4.62
Types of environmental hazards causing unintentional injuries				
- Sharp objects	0 – 15	0 – 10	3.36	2.15
- Poisons/toxins	0 – 9	0 – 3	0.44	0.78
- Burns/scalding	0 – 15	1 – 8	3.51	1.70
- Slips/falls	0 – 18	0 – 9	4.24	2.09
- Choking/suffocation	0 – 6	0 – 1	0.02	0.15
- Drowning	0 – 6	0 – 5	0.93	1.29

Table 1. Interval Ranges, Means, and Standard Deviations of Environmental Hazards That Caused Unintentional Injuries (N = 45)

Day care centers in which environmental hazards were found in 1 area of the center mostly consisted of charcoal or Liquid Petroleum Gas stoves that were located less than 1 meter from the floor (53.3%), followed by visible electrical appliances that were located less than 1 meter from the floor (44.4%). Moreover, for centers with hazards found in 2 areas, the most common problems were carpets, door mats, or mats that were not fixed firmly to the floor (26.7%), followed by shelves, cabinets with drawers, storage cabinets, televisions, or other objects which children could pull or climb on (24.4%). Where hazards were found in more than 2 areas, tables, cabinets, or other objects with exposed sharp or square edges (55.6%) were the most common problem, followed by shelves, cabinets with drawers, storage cabinets, televisions or other objects which children could pull or climb on (40%).

The 3 environmental hazards with the highest scores were "Tables, cabinets, or other objects that have exposed sharp or square edges" with a score of 95 points (*M* = 2.11 , *SD* = 1.11), "Shelves, cabinets with drawers, storage, televisions or others which children could pull or climb on " with a score of 88 points (*M* =1.96, *SD* = 1.02), and "Non-slip rubber sheets in shower areas, bath tubs, and in front of bathrooms" with a score of 75 points (*M* =1.67, *SD* = 1.51) as shown in **Figure 2.**

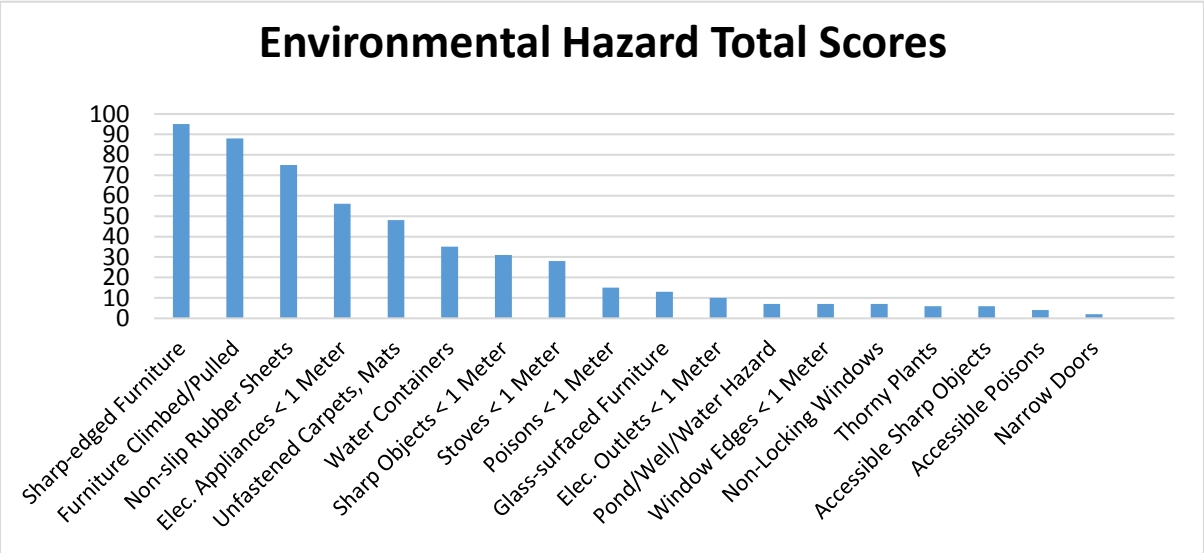

Figure 2. Environmental Hazard Total Scores at BMA Day Care Centers

Finally, 14 day care centers out of 45 day care centers (31%) were found to have stairways that created a risk of unintentional injury. Characteristics of stairway hazards at day care centers were slats/side rails that were less than 1.20 meters high (13 centers), day care centers stairway steps that were wider than 15 centimeters (9 centers), and day care centers slats/side rails with spacing wider than 15 centimeters (7 centers). Moreover, 6 day care centers had stairway gates or a door at the top of a stairway that was damaged or unsafe.

Discussion

The hypothesis of this study is that BMA day care centers have environmental hazards that cause unintentional injuries. This was supported by the findings, which covered 5 types of unintentional injury including sharp objects, poisoning, burns/scalding, slips/falls, and drowning, including unsafe stairways. However, choking/suffocation was not found to be an environmental hazard. Most environmental hazards caused by sharp objects were tables, cabinets, or other objects which have exposed sharp or square edges. Poisons included poisonous substances, medicines, or chemical cleaning solutions lying on floor or on objects located less than 1 meter from the floor. Causes of burns/scalding were electrical appliances or stoves located less than 1 meter from the floor. Slips/falls resulted from shelves, cabinets with drawers, televisions, or other objects which children could pull/climb on, carpets or door mats that were not fixed firmly to the floor and non-slip rubber sheets in shower areas. Drowning was caused by water containers such as buckets, sinks, basins, or water containers inside day care centers. Moreover, most hazardous stairways were found to be stairway steps with a width of more than 15 centimeters.

Additionally, 86% of unintentional injuries to children during the past 6 months were from slips/falls/collisions. The findings correlated with many studies which indicated that physical hazards in residences such as sharp objects, non-functioning equipment, furniture, household cleaning substances, and chemical products could potentially be dangerous and cause unintentional injuries to young children (Atak et al., 2010; Garzon, 2005, Phelan et al., 2011). Likewise, the study of Drago (2005) revealed that physical hazards to young children that caused burns consisted of uncovered electrical outlets and wires, as well as hot substance lying on the floor. Furthermore, many centers

lacked safety stair-gates, window locks or restricted openings, and slippery polished floors caused slips/falls (LeBlanc et al., 2006).

Study Limitations

There are two limitations of this research study. First, generalizability of the findings to other day care centers is limited. This research provided a representative sample of day care centers in the Bangkok Metropolitan area. Moreover, most of these centers had already received information regarding environmental hazards from the Child Safety Promotion and Injury Prevention Research Center. Therefore, the findings can only be generalized to similar day care centers in the Bangkok Metropolitan area. Second, the instrument should cover more areas such as children playgrounds, play equipment, and toys in order to more completely develop safety standards for day care centers.

Conclusion and Suggestions

This study identified the environmental hazards causing unintentional injuries both inside and outside day care centers in the Bangkok Metropolitan area. All hazardous environments are related to sharp objects, poisoning, burns/scalding, slips/ falls, choking/suffocation, and drowning, including unsafe stairways. The findings suggest that professional nurses, educators, teachers, and babysitters at day care centers can utilize these finding to develop or create safe environments for pre-school children and apply the Environmental Hazards Survey questionnaire for guidelines in surveying environmental hazards inside and outside day care centers. Additionally, child safety standards should be expanded so that tables or other equipment purchased should not have exposed sharp corners or square edges. Measures should also require that carpets, doormats, or mats are firmly attached to floor surfaces, and non-slip rubber sheets or mats used in shower areas or bath tubs. Inclusively, training should be provided for teachers or babysitters at day care centers, including surveys of the general public regarding hazardous environments that cause unintentional injuries to pre-school children.

Recommendations for Future Research

There are two recommendations for future research studies suggested by these findings. First, it would be useful to replicate this cross-sectional design in day care centers that have not received training from the Child Safety Promotion and Injury Prevention Research Center and in rural day care centers. Second, experimental intervention research may be conducted that modifies environmental hazards to prevent unintentional injuries in and around day care centers.

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